

*Aquatic and
Wetland Plants
of India*



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Aquatic and Wetland Plants of India

Aquatic and Wetland Plants of India

**A reference book and identification manual for the vascular plants
found in permanent or seasonal fresh water in the subcontinent of
India south of the Himalayas**

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Preface

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II I 1 M RATIONS

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TERMINOLOGY

All the pl.tnu ,u<- given 1 ,<nt> n.tinn No MIUWH has been made to list ethnic or local names because I have no way of knowing if they are correct. MOM pl.t<tt\ today, unfortunately, have more than one Latin name. One name alone is correct; the others are synonyms. Onh the*yncHiyn» which appr^j in widely use: Indian IU.tisii. WO I... are cited. Above the level of sp... there are \f unt Herm diff... in opinion as to when to draw the lirnM ol thr various taxonomi: categories. I have taken >h<, I nope, pfW "K.ii... solution and tried to adopt the system used in the most widely used local Floras unless there are convincing nulti; reason* foi d... imBCnrIM... urns lit... choice is difficult and occasionally I have gone against flir wki... spread Indian usage. For example, I have chosen to accept the genus Scopus (Cyperaceae) in... try restricted sense because it seems to me motr important to be botani-

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I have wirinpifri to beep the hntmirtl lerminol... as simple as possible. Whenever it is reasonable I... chosen Anglo-Saxon vv.>)tis h.tii not irichoinr. woolly tnatead d tanafe, vpaN not rah*x,)H-r>K fiot > >IM>lit and mm) othen When detcrttitng lead mrfiacei md bilai... raly symmetrical flowers ihr lenaa tippet "venf.../dresal" and "pinter...-or attterioj... are as 't^{rv} tūMH MM) nMt.iltv rnnniklprpri interchangi... rbe> become (tun* rn ins> meanjngteat wtim thr l<... are upright or the flowers an hanging. I have used thr... da adaxi.il' f... surfaces that arise low... ird* I In... and 'abaxial' fat I... faces as it,tj{ .i*;w irom thr ...

A C S N O W J I D (I M I N I S

This book iuk iu» iK-nt nrktea wtduw ,v... mds grants' or UD) paid tr.hm.at .wi... With the exception... ii ./t.J..v/.KM-;ri_dPv-,t>,j-the-University sub- structure, this book has com... imrd n< taxpayers monn The... Gesages und An... time Chara-Sitt... it,K }a> **PP... ReW »»OJ* in iadb i biM, how... received... it UBOUMI < unpaid aatawu... I... raid hkr u> thank thr Fofollowing p, ... people for their help: ,, K. Am... in <. \ { College, Kozhikode, Kerala; Dr N. P. Haiakmti... Botanical Survey of India, Coimbatore, Tamil Nadu; Prof. T. N. Bhadrappa, Kona Open University, Rajasthan; Or K. c;... |... lhat, Ponnarajna College, I cittpi, Kam.ujk.i \t Josef Bogner, Botanischer Garten, München, C... Prof. Subin K i... University of Kalyani, West Bengal; f>!ht;; Gopal and his research students, Jambhal Ndra University, New Delhi; Prof. E. CMmndarajal... University of Madras, Tamil Nadu; Dr K f I**ph... University of Cal... it Konkode, Ken... Mtl... r... Krabeller, University of Zurich, Switzerland; Prof K s Manilal. I nm... University of Calicut, Konkode, Kerala; Mr P. Thomas Mathew, NBPGR, Thiruvr (Trichur), Kerala; Father K M Vtitthc*... St Jose ph. College, Trichichur... pp^llt. Umtl Nadu; Ut k I. Mathew, Em... Environmental Resources Research Centre, lh, f<(v.»uMih.,M»,t4,n .li... U»imJu Melita, Chanchal Project, Kona, Rajasthan; Prof t M V. Melian Ram, University... of Delhi. Delhi; Di Marian Degaud, Roval \... Veterinary and Agricultural University, Fredricksberg, Denmark; Prof. Mohammad Qaiser, University of Karachi, Pakistan; Dr Manjula K. Seneta, University of Rajasthan, Jaipur, Rajasthan; Dr Sylvia Phillips, Royal Botanic Gardens, Kew, U K Hi R. Rostkhaus, University of Zurich, Switzerland; Dr M. Sivasubramanian, University of Calicut, Kozhikode, Kerala;

INTRODUCTION

5

Prof. V. V. Sivarajan. L'nivctMiv ⇨! (alum, Kozhikode. Kerala; Prof. Thomas Siiit/cl. Ruhr-l'iversitat. Boehum. Germany; Dr R. Vasudevan Nair. Palakkad (Pfelghat). Krrala. Special ihank.% go to the librarians and herbarium curator* of: Conservatoire et Jardin bouniques de la Ville de (^neve. Switzerland; The Royal Botanic Gardens, Kew, UK; Institut fur Systematise he Botanic der Univrssiiai Zurich, Swiuerland.

Conventions and abbreviations

Names in square brackets are, >> the wider sense, synonym.

Ind. = Indian • **afauthoi** = concerned with Indian plants
 ntm, ilU'g. • <> MM not in accordance with the international code of botanical nomenclature
 I inn! = III altered spelling not in the international code of botanical nomenclature

subsp. = subspecies
 var. = variety (varietal)

LIFE FORMS

• annual. (O) • **aceatia** annual > sometimes perennial.
 Mherwiw ill pi.urn assumed to be perennial.

GROWTH FORMS

Ej = Epiphyte — fitted with ti, hanging leaves.
 t!j> = !I epiphyte — Attached to but not penetrating substrate.

Hel = Helophyte — fringing plant* which tolerate submergence.

Hj> = rhyperhydric — EB>eiyn< aquatic (flower parts submerged in water).

Fla = Flaccid — Krrr-*wimmii below the water surface.

Flc = Flaccid • w — Free-flourim (at U. water surface).

km = K.Mii — Submerged, bottom rooted, leaves in a rosette.

Ten = Tenagrop • v t<-...| ttwile submerged, usually terrestrial.
 = Vittar — Submerged, bottom rooted, cauline.

When the abbreviation is in brackets it indicates that the plant only occasionally has this kind of growth form.

DISTRIBUTION

• denote* endemic (used for countries).
 < denote n iniduuued in hktorical An... the date and place of bttfodnctkia 1* |h«en when known

(1) GEOGRAPHICAL ABBREVIATIONS

Th* : borders of the countries and states are taken from Muttiah, S. (ed.) An Atlas of India. Oxford University Press, Delhi (1966).

Ban = Banarash

Bhu = Bhutan

Bui = \hintnar (Bun)

Cey = Sri Lanka

Ind = India

Ncp = Nepal

Pak = Pakistan

An = Andaman and Nicobar

Yini = Yini Pradesh (including Yitani)

Vr = Arunachal Pradesh

As = Assam

Btl = Bihar

fl = De [hi

Gj = Gujarat (including Daman and Diu)

Go = Goa

Hp = Himachal Pradesh

Itr = Haryana

Jk = Jammu and Kashmir

kt = Kerala (including Malabar)

Ki = Karnataka

ti = Lakshadweep

Mg = Meghalaya

Mh = Maharashtra (including Dadra and Nagar Haveli)

Muz = Mizoram

Mp = Madhya Pradesh

Mi = Manipal

Ng = Nagaland

Or = Orissa

Jl = Jilimj.tl)

Bj = Bjalimlilim

Sik = Sikkim

Tn = Tamil N-uiti (linc hiding K.H.nk.ii and

Pondk < 1979)

Tj = Tjipara

Up • Ujur Pnulsrl>

Wb » West Bengal.

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Statistical record* ha* been pgbUhtfd «n th<- following g
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the Bounu.i | Society >! Brumal; Biiltriiri ni the ft*>u*tital

ttii' inuinii *... Bombay Natural History
Journal of the Indian Botanical Society, Journal of
the Indian Botanical Society (Guelph)

The Botanical Survey of India has published numerous
U>ral V<i! they are not all cited individually.

Taxonomic monographs and revisions are cited in the
text along the family or generic description. Hie lii
more general works ("a.c." indicates those that I have not
her 11jblritiv).

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STERCUACEAE: *Melochia cochorifolia* Linn*
M. concatenate I.iniaei.s; *fentapett* phoenhva* I fnnTIH
 III .IACHAK: *Cotvharus aestuaru* Linnaeus; *C. capsulan**
IJnaem
 VfoI A< 3EA£ *liybanthus suffruticosa* Bail lot) ex I am

Large fwit-itniii plants found in wet or moisi pta
 in for CMS bin not ID wctl.ttKls;
 MAKAN I A(.l-.t.: *Danax arundtutrum* Loun
Pkrynium syt \ *Schumanianthus* \ *Clinogyne* \ *dichotoma*
(Roxburgh) Gagnepain

Trees and **thrubi tolerating** <\wm.il **flooding:**
 AREC.ACE.AE [PALMAE]: *Calamus errctus* Koxtxiryh:
C. tenuis **Roxburgh**
BAKXINGTONIAI I M [1 I (VI HID \i I \! ; *Barring-*
tonia accttangula il imi.it-:)

MBRH \< I \J *Trrmtnaia arjuna* (Roxburgh)
Wtghl et Ainott
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EI PHORBIAl ! \! [BISCHOFIA* EAEJ: »i*thofia
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FABM **i u :in,i rttf-"~rrri n-fa wh*iti-^***
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Don

MVRTAi tagtMa a m M (Ltsai
RUBIAC3 \I- *Cephatanhta ofxidmtatu* I .iiuu'i^
SAUCACEAE: Vqi* *trtrwperma* **Boxblllfh**
1 UfARI< A(! U /o<in> c/i<<<> Roxburgh I
ruirfcf Rottlrt, 7\ *troupii* **Kok**
VERBENACEAE: *Oendndrm mtticum* (UoJtW
 Knn!/c; Htex *nepmdo* Imn.u-u<.

Identification keys

The identification keys are Muted in Bwoui of easily seen vegetative character*. Ththa has the consequenc* iii.ti n u) taxa appeal several toes, Ae keys are thus lengthened but ii IS hoped that this will enable pUuu to be identified in die B&Jd without the me <i » microscope. Also the user a«ed not aiorrj wo much when confronted with difficult <» determine alternatives because the ptsni m% appeal mbodi

Key to major groups

1. Vegetative parti MM differentiated into iteflM wuh leaves (leaves scales oi bractsm*fbt found jp*btkm **BOM** K I > 1 P . I S

1. Vegetative parts <L> 1* dttfcretrtiaied into st<ms with leaves "i >> .

2. Leaves (KM photofrathedc, M-«l»<<<1 k scale* (stems green Bndphottwynthetic Waded « laminate leaves also)

1 Leaves photosynthette, <» - ale-like (non-photosynthetic) v/mhe* - . . i - maj be presetu <» n paru-n iusi bekm it»- Soww

3. i leaves ju imed between riwath -^ blade (the bate oJ the i<^i »^ • cyiindrfsJ ^x--"'. i>" or united at th- edge topping the swn;abo« the ah tin)»L<k iv free; between ihe blade uad iheatB ls • bint usualh bearing a membranous Ugufc but •otnetimei a swelling oi rowd bain)

Key 3 p. 14

1 Leaves without »» tota' l » - vtu%uh , UHl hU < l r

4. 1 eai blades i^lin<- (attached k» thei pedota taakfe the margin), oon-pelta* leaves "»T <» present on otba partioi the same pbwi

Key 4 p. 14

4. 1 Leaf blades over petiole

5. Leaves in whorls « clusters of teawescaum; (disjunct) ilong elongated Refa* ai man (of low reguba ti (stems))

6. Leaves , \, i more a) mon nodes

Key 5 p. H

6. 1 BM s oi tateach nodt

7. Stenu creeping, rooting <i mosl BOON (rrer-floaiingoi boUotn (stems))

Ko ftp. 15

7. IteflM O (stems creeping, floating or submerged) usually rooting on 1 1 over B P d M

8. Leaves in opposite pairs

Key 7 p. Ifi

8. 1 esves I U en li node

Key 8 p. 17

5. Leaves of whorls n < lusters <t leaves not regularly dispersed akmg elongated stens, m»»sj in ba,s;il <» i<-l-ttima! rosettes <r clusters (^t^l^A often truncated, t <>iiii-iik<- of rhizomatous)

9. Ai lctsi some rrtWay leaves dearly • tLs< renttated into petiole and blade; blades Rattened ami lamingw

Key 9 p. 19

9. Leaves without a fiisiimt petiole; blades flattened "t inn

Key 10 p. 19

Key 1: Vegetative parts not differentiated into Menus with leaves (leave*, scales or bract* may be found just below flowers)

1. Ai]< MM the basal portion of die plant Bnnl] attached to and Battened against .i hard wbstwab (tisuaQy m. n. d. I Ua-flowfaig-watsr) •

PodoKlemacrac p. 316

1. Ptanu 'iiu attached k» and flattened against ,* bard snlvstrate. lii-e swimming. f< <•H-urinn ti attached and penetrating s soft subtrase

2. Vegetative]>.uis filamentous, ^ptaifdh and regularly branched; roots sJwent; with animal catching hi;tdrrs (inosiK BibiBfrgfd) Utricularia p. 231

2. Vegetative pans not filamentous, Erood-like, etthei globose or Rattened and dkwoki i» elongati roots absent n present (mostly frw floating, some sui> merged t>nt then found neai the surface)

Lemnareae p. 226

Key 2: !!mis with sicus and leaves but tbr lravas reduced to non-photo*ynthetic acale*, tin- stenu green and photosi-nthetic (bUdrd or laminate leave* abmst).

i. s< .fit * united below, si i merged in regul.tr w)n

2. Lateral branchi in regulai whorls oi ab

Equinetum p. 23

2. Lateral bram hes ki < luster* -u nod

Cyperaceae p. 94

1, s< if* v not united k imv arranged spirally m in pain

3. ScsJet m opposite])^nv

4. i'et.tlv united to .i int» behm ttwnent not

1; fruit t ni.iinunlid (, IIM!!!

Dopatnum p. 342

4. **Petal* free to base**, ^ale-like; **stamens exerted**; **fruh** of 4 mem arps Myriophyllum p. 213
5. Scales spualk **arranged, usttaBj .it base "t Men or**]
5. **Fmit a Needed mm perianth of hairs, brisdes or absent**; **Men solid** Cyperaceae p. 94
5. **Fruit a manyacced tapsule**; **perianth of ***, M.IH- scales; **Mean hollow** juncus p. 222

Key 3: Leaves jointed between the sheath and blade (the base of the leaf is a cylindrical sheath enveloping the stem, free or united at the edges; above the sheath the blade is free; between the blade and sheath is a joint usually bearing a membranous ligule but sometimes a swelling or row of hairs i

I, **Leavea pamatrty nerved, with straight and parallel nerve* diverging** Gran the midrib (large emergent ho I) Canna p. 83

I. **Leave* noi pinnateh, nerved <i it pinnate then nerves not straight and parallel**

2. **Leal Inserted at iuu- i>a^e of ihe sheath**; MIWI urrKiilarlv DBM lie*! Potygonum p. 325

2. **Lead inserted at or towards the apex <f the sheath: nerve* indifttau 11> purafld**

3. **Leave* in 3 rows (stem* sometimes twisted)** Cyperaceae p. N

3, i 2 rowvsoi sjiir.i!K arranged

4. **iv riail i th pi CM-in (ail Kgmnu petaloid, petalokJ and sepaloid or appearing a* icalea ,ii[i* bed to stamens)**

5. **Perianth entirely petaUtte** Ponlederiaceae p. 328

5. **Perianth with both petal* and tepala M entirely KpaMIke**

6. **Petak Ac ben MaDted, all fertile M li>- Ranunodial (without fertile andier** (immelinaceae p. 85

6. **Petals absent I ftke; anihert H-VMIC OI neailv to, >!! fertile** Potamogeton p. 331

4. **Perianth abaent <i techi< ect n> bain, briauV**

7. **tmitt leaatte in leal asili <i m loog-<talled u-itiiin.i! racemet; teavca withoui lilka >> unens i <i 'i (total) submerged)**

8. **FruJta In lermlna] timtwN, borne on loog Beribte italkx; itamena L' Rupptn p. "J%H**

8. **Fruit HI neart) to in lead axils; uiien 1 Zannichrllui p. 370**

7. **Fnms fan apikea, raceme* oi bead* with silica bodie>; M drf,acario<itbracti,] HUM**

9. **KhmesK usualh VM h (ghnne), various!) irrang**

usually solid and triaiiKuLti is nwrw section, **withoui swollen nodi** (baas) and in 3 row Cyperaceae p. 94

9. **Flower* each endoaed by 2 bract* (lemma outside, palea Inside), arranged ha spikelea each asua% subtended by ! oc '2 emptj bract* (ghnne* osuaUji boBow u><t round to ttMnvene sectkm, whs soHd and awoBen nod cam&ne and la 11 Poacrae p. 280**

Key 4: Leaf blades peltate lattathed to their petioles nisidf ih<- margin), plains may also bear non-peltate leaves on other part* of the stew

1. **Leaf Mad (usually <{htate < baa} or ekmgBie-eDiptu .it**

2. **leaves m^th radical (bortu pehate leal blade* rigid petiolea and beW above the wan ,lv divided mbmerged leaves absent** Ar>ce>ep. 50

2. **Lea* borne on Bexible petioles, Roating; finely divided submerged leaves pn tbeavaa p. tl**

I. **Lead bladesentire, wUfaoi without astnt U preseni run reaching the p irhi< ular < i**

than 10 cm in di

4. **Lead bfadea widMNM apim it* with milky plant* without milk] bun N.yaaalkWMaM p. 17S**

• • i < sl blad i Mhh spine* on the under »ui plant* without milk] bun N.yaaalkWMaM p. 17S I, **Petiolea widtow spine*; teal b! in diame**

5. **Plants bearing bladder*t&e, ankna] i ft< tang tups; ftowera buateraD; •vmnv • Uu kadarhi p. 231**

5. **Planiv iM.f bearing blad UOnbeK lic.<U ei whorl* tavaaa j> W**

6- i conapfa uooa, boi ti r pai u ttui< Hfcgfnoui jefi)

6. **Flowcm fat UOnbeK lic.<U ei whorl* borne below die leal M, <Irv undrrw.iirt (MIH* kh BUM ibginou* |<lh llydrmntyle p. 45**

Key 5: I aavaa wHorted (3 nr more at mo<t nodes) *nd rauline I dispersed along eluttgaied Mem> >Ireg iar interval., noi m termiwl or bwuU IMafIBH >r

1, **Whorfa with I diilrrrnt kind* o) leaf (Boathlf. raandrouMfl Sah-inla p. 29**

- I. Whorls wiili .ill Iretvr* alike or nearly so
 - 2. Plains bearing bladder-tike, animal catching traps
Utrioularia p. 231
 - 2. Flams not hearing bladders
 - 3. leaves terminating in an orbicular lobe hinged along ihr midrib (catching animals) and -Mf bristles
Aldrovanda p. 182
- S. Leaves not terminating in an orbicular and hinged lobe, terminal bristles absent or less than 4
 - 4. Ix-jves compound «r simple divided into secondary linear or capillary segments
 - 5.1 raw* pjrmatelv divided
 - 6. leaves ii-pinnate or l-pinnate with at least the lower segments forked; petals tubular
UntartU ilic base Umnophila p. 545
 - 6. Ume* I-pinnate, all segments «'''I>lt>; 1^{Mlal}* free, caducoui
MyriophyHum p. 213
 - 5. I-eaves repeairdi) Uwkrci oi then wRim-nts rrepeatrdh/ forked
 - 7. Ultimate segment* with small, marginal thorn-like projections and icrmiii.il hi \<*W% all division* 2-fid (simply forked)
Oraiophyilum p. H4
 - 7. Alt segment.....!! I<iv<it <liuill, rrs D, (r
^H^ Cabomba p. 81
 - 4. leaves simple and enmc
 - 8. ITMintenpenrd with hard and sharp spines; •red* inserted on hardened, hook-like outgniwiths from the central placenta (retinacula)
Hygrophll* p. 30
 - 8. Ixavei not interspaced with spines; seeds in«-ned diirri1v.«i the placenta or seeds solitary
 - 9. leaves lain wilalr to ovate (submerged, dark green or reddish, •omrwrw'' iraiwlurrnt with marginal ipine.)
Hydroch«iuce« p. 215
 - 9. l-cave* linear locapillan
 - 10. Uaves not equally *pa*rd around the mKW(Jeavetinrlusteriaieaclim>de)
 - II. |>eavei Hal. translucent, with loothed margin. ' N.j« p. 267
 - 11. Irave* capillary, noi iramluirnf. w.th entire marffiiM
 - It. Riwr* MNnrtum. MitHrmlccJ l« ^»- rally amriK'-l plumrv in i»«M bead\$
Cyper*c*»e p. 94
 - If, fhmct* K-«ac. I '»»«« »nd , (rm;llr telrala»,h tarfd-UL. p. S70
 - 10. I.eavr. eqiallv .pated around (he node. (There i> a remarkable aimmnt of«<>nvergeni rynlution among aqua... * with ihis particular grtwrth form. .dentiJication without liters is nut practical)
IS! Flower l*uds enclosed wthm a .pathe
Hydnllap 21

- 13. Flower buds not <-ni lost-d within a spathe
 - 14. Petals united below into a tube
 - 15. Infloewence very dense, sptkr-likr. mostly lerminal; fruit of 4 nutlets
Pogostemon p. 224
 - 15. Inflorescence lax and racemose, if spike-like then not dense or flowers solitary; fniii a (apsulc
ScTophulariaceae p. 338
 - 14. Petals free or absent
 - 16. Sepals free, not approdagrđ brfwrii lobes; petals and stamens free from the «-[i;ds; fruit of 4 merit arps
MyriophyHum p. 213
 - 16. Sepals tubulai. out n appendaged bciween lobes; petals and stamens inserted OII the inner surface of ihe sepal tube; fruit a capsule
Rotala p. 252
- Key 6: 'Creepers'; Leaves 1 or 2 at each node (alternate or opposite), stems creeping and rooting at most nodes (plants Tree-floating or bottom-rooted),
- 1. Plants free-floating (pleustophvies): ll<Müti« haves M-vsile or nearly so. in 2 rowv
 - 2. Floating leaves opposite. 1-lohed, aen.tl sutiarr with multKellular hairs
Sdvinia p. 29
 - t. Moating leaves alternate. 2-lobed. the lower lobe in contail with ihe waier, aerial surface without inul- [iicllilalr hairs
AZOIB p. 22
 - 1. Plains bottom-rooted or if floating then floating leaves with petioles and not in 2 rows
 - 3. I-eaves elongate, ± terete, without a flattened blade, noi differentiated into petiole with blade
 - 4. leaves 2 ai each node, in opposite pairs; plants without bladders
Scrophulariarrae p. 338
 - 4. leaves I ai each node; plants with |>li<tdivi-like. animal catrtng traps
Utricularia p. 231
 - .1. leaves with flattened blades, usually clearly differentiated into petiole with blade
 - 5. leaves rnnipound M <ir more leaflets cm r.uh petiole)
 - 6. [jrvavs I- IN ^-pinnate; each iratlet \MII midrih and lateral veins; stems usualv soniewhai wix>dy but when in water spongy
Fabaceae p. 206
 - 6. leaves with 4 terminal leafleis; «««) i leallet withrtui midrih but with repeaiedlv forked veins; Merm (»« -•'idvand no) spon^v
Marsileaccar p. 25
 - 5. Ixawk simple (Mmtrtimrn kibrd to the midrib)
 - 7. leaves 2 ai ea<li n<>de. in opposite pair*; leai blades usually sessile or nearly so
 - 8. Flower* in drtwe terminal or axillary heads
 - 9. Meads not surrounded by enlarged brad*, usually white and paper-like; tn-arien stip«t ior
Amwanihaceae p. 40

- 9. Heads strnmnded b\ **enlarged bracts**, not **white** and paper-like; ovaries inferior
Asleraceae p. 66
- 8. Flowers solitary in **leaf axils** or in loo* **cyme* Of**
TUK'S
10. **Petals united** io i tut*- **beta****
t1. **Ftoweri radiaQj symmetrical**; ovaries **inferior**
Kuhiaceae p. 335
- 11. **FlowCn bilatmillv svmmetiu.il: OVaiiri superior**
12. Seed* **insetted** on **hardened**, hook-like outgrowths from **the central** placenta (rein ula); **raprolri usually, elongate**
Acanlhaceae. p. 30
- 12. Seed* **insetted direcdy on the central pflawTBfa. hard**, hook-like **outgrowth* absent**; capsules **usually globose**
Scrophulariaceae p. 3S8
- 10. **Petafa free io the * MM-**
13. **Ovaries inferior; petals usu.dk ibowv, yellow or white**
Usivrigta p. 27(>
13. **Ovaries superior; petais either Inconspicuous** ui **11 ibowjl then |tmk. red 04 purple**
14. Sepals tin' k> lire **petth* lire- tlom** (he M pah
Elatinaceae p. 184
- 14. **Sepsis united into a tube surrounding** **prwh borne SJ ih<- lop of (h* sepal mi<- between th<- lepal lobes**
tythraceae p. 248
- 7. leaves I ai t\U\ node, **alternate**; k'ii **bladei Nt^ilc at with petioles**
15. StL-im **rhixomatous, covered with brownish M ales; leaves rolled spirally in bud, M otamrit) bcaiiing ^i s:i: renj**
MitT>*ciruni p. 27
- 15. Stems oi **rhfoomeswkhom browuish Kah not railed spirally in bud, not bearing sporangia: lowering pfaam**
16. s u m s wf>od\ **throughout; fitiif\ toft orange to reddntf] icyriwerbeds)** Kotulap. 78
- 16. **Stem herbaceous • tfanes SOOM**
WIMMK .it the bs • i iit^, mt'i
capa [oranfe n r<d
17. **I eat d < the base o(,»tubulai »h< whi< h eovetopi die sictii (oi bn**
Poly^onum p. 325
- t7. **Leaves not inserted ai the hist- <i .i sheath**
18. **Leavei crisped, aiyiiiuiital. wnii than wetn, pct.ils .met sunn-m usu.UK }**
< oldrntap. 75
- 18. **Leaves tl.it. inn crisped, symmetrical oi ncarh *>, toothed tnd rtiwnrs etthef 9 or otore**
it, Flowen inconspicuous; <»>.inr\ ml- tiutt ot g BMM I
Apiarrar p. 44

- 19. **Flow in comi>minus; ovaries superior; Bruits capsules**
20. **Perianth eotiret) petaloid**
Pontedriiaceae p. 328
- 20. **Perianth differentiated into trpalom lepsds and petaloid petals**
21. **Petals 4, irrc to base; munnrt 6**
Nasturtium p. 78
- 21. **Petals 4-8 turner) imo A tube below: Ramens as many as the petal iob**
22. **Petals ") the lobes mm h shortei than the tube; leaf blades with midrib and pinn.tu- net usu.iiK acu;U, the maigina usually lobed**
Convolvulacear p. 91
- 22. **Petals)-' , the lobes mmlt longet than the tube: leal blades wttbout a dominant midrib, patnv atehi oened. uauaBj Boating^the QMCgfatLcnj**
NvjasAoMas p. 263
- Kry 7: leaves 2 at each node, in opposite pair* regularly dispersed along erect stems I stems emerffi-nt. lltmtng or submerged, wtually rooting onh' at the k n w nod
- i. **Plants firmly attached to rocks m s>iitlv (lowing waiei**
Podwttefnacear p. 316
- 1. **Plants nK>ttny in a soA subs**
2. **Leaves divided faato Uneai legments, the rint M hin>{ the midrib <t leal b**
3. **Leave* pahnatg^ divided; lepalS, free io base; petah S, free io base; stamen** Cabomba p. <i
- 3. **Leaves pinnateiv divided; lepak 1 o) uaked .H thi base; petals S, free or united >t ihe baa BSS or t**
4. **Fruit breaking into 4, beaded mericarps M BUS in* onspi o the base, often cadu**
M\Tiaphyllum p. 213
- 4. **Frail brealiii^ mi*. <dfii tncriai petals shovdv. tutked huo tube belowj**
5. **Ir.it tegmentsdkdncttyfl notched, the naargiru notched OI IOOthed** Aranlhacrae p. 30
- 5. **Ix-af M) filifonn, flattened, 'he margins em**
< tophuUriacear p. 338
- 2. **t... hng the midrib**
6. **>... juSl.m with sheathing stipufaM base* (usually submerged lirtw)**
7. **Floweri stalked, bom in < the like bisexual** I'ouaaagston p. 331
- 7. **Flow in Irat uniM-xiiiil** /jdnUhrDu p. 370
- 6- 1 • **oves not capillary, wite>it tbrat hng stipulat b**

8. Rowen m beads subtended by an bwolucro o
AMERACEAE p. 66

8. Flower* m>i tf) head) 01 H In h <* tii(in ,,ol Sltt>
tended !* an Involucro <(braca

9. Ftowen naked (whhoui lepata and petali or
perianth) Caliche p. 81

9. i ah Kpabaod petals oi tperianffl

10. Ovarkt complete); Inferioi

11. M., l. ... « i» ihr luM. |>elaK SIKWV, velluw oi
wh t e Ludwiffia p. 276

U. Petah nailed to i tube below; iel..mriy small
whinsh R,biaceaep.555

It. Ovaries superiM << perigynous

12. Plants with milky hue* capsules swelling and
inflated M imiinnn.^.-,dswiwh hairs

(v%vi.l mi p. 6b

12. i>l.»t, without bttejxj umi DM a capsule m Ifa
capsuk then not wwfllng ai maturity? leedi
without bain

IS, Perianth ol 4 dry, nanbranow legmentt;
ftowen umaBy In *« <hiu- beadJ

Amanuithaceac p. 40

IS. Perianth of. i ,,uK .H-V(. d.^ ...ui
i, s i k t - i w h i t - h .

14. Petabfree i-.thcbaw

15 Sepabfl<eorunhedoiUf<!J
Klatinarcae p. 184

IK. Sep ^ wHted toto a p w j B J ^ ^ f *

I uhnucar p-

14. PetakUl ! n.tmU. I. .: U. MI

16 Pruto breaking Into 4, l-<eded nudett
Poga<t<.m<n p. 224

16. FlU!i%L>-v:tlvoti.if>MiU
17 prtali radially ijnninetrical, twitted in
,,,,,;,,,,,, I..K-I HoPp*-p.212

17 Pruli u«uallj bilaterall) qpuMtrical,

»IM<K-(l.n.,ii<.M'<lm !>.<!. |< iil 1-1 -

tiTsecd* interted on hardened, hook-
)ik, wths from the central placenta
(nriinacula) Acamhacear p. 30

18 Seeds ntierted directh oo the central
bootoke outgrowth.
'HIMU, s.n a W r i M W p.

KM H Laami tfatay <' <><d<< (f ^

d i ^ n ^ ^nn,t er ^ t »lr<>> (rfrow rmergrnt, flo.nnK
or wbmcfxrd, usually rating only ai th* lower nod<<<)

1. bmm .luviir hkr (with pktMi^ awwfed marfteal
Spbacraiiithiw p. 71

L-UMtttOIII

LLaaffetodctd > I equaBj a\

S. Each leaflet with midrib and lateral triaa; Menu
usually wmewhai woody but when in water spongy;
flowers borne in iht- udli <f bm t>

(.iivsaspis p. 208

S. Each leaflet without midrib hut wiwh repeatedly
forked veins; stems noi woody and not •ponay
flowers absent, iporq borne in iporocarpi tow
the bate Of die p^tfojft Marsileaceae p. 25

2. Leaf blade* never of 4, ± equally si/cd leaflet!

•i. Leaves (impound of teal))lades lobed

5. Leaves palmately divided or [MIUHICK lobed

6. Rowers imonspii UOIU, boinc below lh<- leal
hl.ities; ovariei inferior: fruits meicafpl

Apiaceae p. 44

6. Plowen coatpicuout, borne above ilic I* ,ii
blades; ovalet wpa Un\ Beuin bead* ol nudeti

Rariititulujt p. 334

5. Leaves pitmatch/divided ot pinaacety tobed

7. I eawet '2- in more-pinnate with regular, ovate
leaflets Ntptunia p. 209

7. Leaves l-pinnate ov pinaatetj lobed

8. Flowen loHtary in leal udl*, ratbei bw onapic-
noiiiv; £niit> ttj) mericarpi Myrioph>llump. 213

8, Flowen in tnfloreceacea, naked <> it« Hie
axils i>) brads; intit-i no; ot 1 mei

9. Ftowen In denae beads, each bead wiwh an
Involucro <f hi.u a Awleraceae p. 66

9. Flowen in lax i.urines or umbclv without
involucres of braca

10. The !<-.itltt\ tr pinnae entire .tint terj
En rise and ihape hi any ringk ti .<\

usually Mirnewh.il wood) hill when in
water apongj Ftbaceae p. 206

10. The leafleti M ptnnaf lobed and wartyou
in si/e and \hape in any single leal; Menu
berbai eons, ool wpongy

11. Inflon <i EM • * i .i' i note fmiis <i.
< <iii t .ij>Mil<\ Nasturtium p. 7H

11. Inflorescence! umbellate; fruii of 2
aeril arpi Oenanthe p. 45

4.1 ewciranpleand endrc

12. I (.i'i - lust IK (i .ii die bate ol •• siitmLu ibeadi
which entelopi the Men (oi h

Polygonum p. 325

12. Leaves noi taaerted M the bast "i a sheath
is. Fkn Mded HI denati I gjubow heads;

headi tubtended h\ an awolui re oi tterik brat ts

14. Pedun t^" (culms) <IK losed tan.»ricath ai M<
BowetiuniMxtut: rootsmtvenelj •eptatt

Eriocaulacfar p. 187

14. PedundeI Dd enclosed In -i iheath at
the DaM; flowen I entile or b

56. Inflorescence a densely packed spike; capsule opening by an apical lid Sphenoclea p. 363
 56. Inflorescence a panicle of loose axillary rays; flowers solitary in leaf axils; capsule opening by longitudinal slit or valves Hydrolea p. 221

Key 4: leaves petiolate and not regularly dispersed along the total length of the stem, most leaves in basal or terminal rosettes or clusters; stems often truncate, corm-like or rhizomatous

I. Leaf compound or at least some leaves lobed to the midrib or to the midrib

2. Upper leaflets irregularly pinnate or near the sinus; petiole spinose; stem a pedicel surrounded by a sheath Ar. ce. ep. 50

3. Leaflets not pinnate 1. ... 2. ... 3. ... 4. ... 5. ... 6. ... 7. ... 8. ... 9. ... 10. ... 11. ... 12. ... 13. ... 14. ... 15. ... 16. ... 17. ... 18. ... 19. ... 20. ... 21. ... 22. ... 23. ... 24. ... 25. ... 26. ... 27. ... 28. ... 29. ... 30. ... 31. ... 32. ... 33. ... 34. ... 35. ... 36. ... 37. ... 38. ... 39. ... 40. ... 41. ... 42. ... 43. ... 44. ... 45. ... 46. ... 47. ... 48. ... 49. ... 50. ... 51. ... 52. ... 53. ... 54. ... 55. ... 56. ... 57. ... 58. ... 59. ... 60. ... 61. ... 62. ... 63. ... 64. ... 65. ... 66. ... 67. ... 68. ... 69. ... 70. ... 71. ... 72. ... 73. ... 74. ... 75. ... 76. ... 77. ... 78. ... 79. ... 80. ... 81. ... 82. ... 83. ... 84. ... 85. ... 86. ... 87. ... 88. ... 89. ... 90. ... 91. ... 92. ... 93. ... 94. ... 95. ... 96. ... 97. ... 98. ... 99. ... 100. ...

borne on a spathe. not surrounded by a sheath
 S. Leaf, partially lobed; fruit of the stem - mirtrj Rmnunculii p. 334

S. Leaf, pinnately lobed; fruit of free nutlets or fern without fruit

4. Young leaflets not spirally rolled; mature leaves not bearing sporangia; flowers in umbels (leaves ± triangular or irregular in outline; most pinnae pinnately divided or rarely forked)

Oenanthe p. 45

4. Young leaves spirally rolled; mature leaves bearing sporangia on the abaxial surface

5. leaflets very constant in shape from top to bottom or each leaf, margins entire; leaf, erect up to 3 m or more long AcrwUchum p. 27

5. leaflet "mable in shape from top to bottom" of each leaf, margin usually beaded; leaves smooth, erect. rarely more than 1 m long Cer. top. emp. 27

I, Leaves simple, entire or lobed only at the tip

6. Upper leaves forming a circular mosaic of leaves floating on the surface

7. Petiole, not inflated; fruit flattened and winged. Kitluiu lateral horn; flowers unisexual. without perianth; male flowers with 1 stamen

7. Petiole inflated; stem with 2 or 4 lateral, hard horns; flower bisexual. with a spathe "nd p"

Tr. p. 365

8. Inflorescence not forming a circular mosaic of whorled leaves floating on the surface

8. Inflorescence a simple, upright spike (spadix) of small and inconspicuous (lower, subtending a spathe) Ar. ce. p. 50

8. Inflorescence a spathe. spathe absent or if present then of 2 thin segments

9. Carpels 2 or more, free

10. Leaf venation almost regularly rectangular; flowers in simple or branched spikes

Aponogetonaceae p. 46

10. Leaf venation not regularly rectangular; flowers in spikes

11. Leaf margins lobed or notched but not sagittate; flowers not in rows (petals and sepals 5, stamens numerous) Ranunculus p. 354

11. Leaf margins entire or sagittate; flowers 5-merous

12. Fruits 1-seeded nutlets; (lower borne in whorls Alismataceae p. 37

12. Ovaries containing many seeds, the ovules scattered over the inner surface of the carpels; flowers borne in simple umbels

Limnocharitaceae p. 247

9. Carpels 1 or more, united

13. Styles united into a disk with radiating stigmas; stamens more than 6 Nymphaeaceae p. 273

13. Styles not united into a disk, without radiating stigmas; stamens 6 or less

14. Ovaries inferior; male flowers if present 5-merous Hydrocharitaceae p. 215

14. Ovaries superior; male flowers 10-merous

15. Perianth differentiated into sepals and petals; bisexual flowers 4-merous Nymphaeaceae p. 265

15. Perianth either sepaloïd or petaloïd; flowers 3-merous

16. Perianth sepaloïd or bract-like, not showy; leaves stiff and distinctly ribbed; petioles not inflated (Sri Lanka) Huigana p. 214

16. Perianth petaloïd, showy; leaves not stiff and not distinctly ribbed; petioles often inflated (widespread) Pontederiaceae p. 528

Key 10: Leaves without distinct petioles and not regularly dispersed along the total length of the stem, most leaves in basal or terminal rosettes or clusters; stems usually truncate, corm-like or rhizomatous

1. leaves flattened throughout most of their length (parallel-sided in transverse section, sometimes V-shaped or curved, not terete, imbricate in the bud, not triangular, not rectangular)

2. (leaves widest towards the apex (spathulate, obovate or obtriangular)

9.1. a. Blades bearing sensitive, sticky, gland-tipped tentacles, spirally rolled in bud; in March in the spirally rolled (helioid) Drosera p. 185

3.1. Leaf blades not bearing gland-tipped tentacles not spirally rolled in bud; inflorescence, erect, not rolled

4. Leaves densely pubescent; plants free-floating
PLstia p. 65

4. Leaves glabrous; plants attached to the bottom

5. Fruits splitting into 2 or 4 mericarji-
6. U t u .it j>- 1, **Battened Mad** winged; **Rowers** uni-
Ksual; **perianth absent** Callitrich* p. 81

6. **Men** **carpa** **t** hemispherical; **ftowen** bisexual;
perianth of 5 sepals **to d S** petals Phyla p. 566

5. **Fruits capsules**; **petaii united into** »tuJ><< below

7. Hams with bladder-like, animal **catching** a
petals with abaxi.tl spurs; **leaves alternate**
Utricularia p. 231

7. Plants without animal **catching** trap*; **petab**
without spurs; leaves **oppOlil**

Scrophulariaceae p. 338

2. **Leaves widest at oi** towards tin- base or **leaves paral-**
lel-sided

8. Midrib running asvmtneln< ,ill\ (owaid **one** side of
the leaf; **inflorescence cylindrical** **apparent** **j** **vising**
aeai ni bate <> **i the u-** \\ Acorusp. 50

8. **MUdrih** running symmetrically up the middle of
the leaf or **midrib absent**

9. **Leaves with distinct s|>im n**

10. **Stems emergent, elongate, bard, wood)**
su|>. Pandanus p. 279

10. **Sterna HiDtnerged, conn-like oi it elonj**
then **soft* flexible, never wood**]; >v.u ies **uiferiot**
Hydrochariaceae p. 215

9. **Leaves with entire** <r inittmtely **toothed marg**

11. **Flowen in compact, yherkal to discoid heads**

12. **Heads yvsile MfTOUnded h\ atnl fmiwdiled**
in foliage teavet (minute beri

Trithuriap. 215

12. **Heads i>>mt' on sulks <i cufans, held above**
the foliage lean

13. **Flowers unisexual**; petals small, imi **ihow,**
white oi black; **seeds soBtar)**

Kriix-auion p. 1R7

1!t. **Flowen** >i: |<<t,K shiiw\, yellow;
dsSorm in **tchlocuhu** X>T<p. 367

U. **Flowen not in compact, ipherica] n> dbcoid**

14. **floweisdenaelj pat U>\ }B napk i|**
operposed spikes on i single axo, **Rower**
I Typhap. 364

14. **Flowen** not densely packed, nr,t m **cyndri**
t,il **infioreta**

15. **Perianth united lato tulx: belon**

16. **heriaoth bnc t> purple**; **stamens** & **naft**
annuals wtdioui **ATOOWXMk**

Burmutnta p. 79

16. **Perianth white Unfed with n**;
(i; r*Mitstm k a bulb Crinum (> »|

15. **Perianth d Erec tepali tarn** | **free petals**

17. **Perianth of s< arums, biai i-hke segments**; **haves**
usually with : **teseptae** |>IXIIS| p. 222

17. **Perianth cit Sfpalciid sepali And petttoid jx-tah**
(**pt** .tIs **KMnaeumes** reduced or absent); **leaves**
without spurs:

J

18. **Carpels her, fruit a head oi I** **nutku**

I*. **united; fruit .t nuin** **ipsuk**
Alitnuitareir p. 37

19. **Ovarj mperfon**
with aetfeupportiRg lean

Comtn<Hnsre>e p. 85

19. **Ovary inferior stems submerged with sn|>-**
BMrgedoa floating te

Hydrtx h>rilat t-ar p. 215

1. **Leaves not Rattened throughout mosi of then**
rectangufaur in tranm **on**
ubr.e&iptotdat, trianguhu of

20. **Flowers capillary (bair-ttkeand flaccid)**

21. **Flowen tightly packed in globose heads**; **heads**
subtended bj an Involucre .f br> ts

22. **Perianth dry, papery, inconspicuous, greytah**
or **bi.i, kivh, Bowen osia**

Efiocaulon p. 187

22. **Perianth i> petaloid, shaves vt-Uow.** **hjm**
rareh whih **flowers** **il**; **roots DOI septate**

Xyrn p. \$67

1\ **Flowen not tightly pat ked b globose beat**
U M> then the heads not **Hbtended b)** an **DVOHm K**
ol brat is

23. **Flowers radl IK vMnmctruat. Nbnnw|; periaudi**
of .e etjiuth rind dry .md u ate4Bte -y*<<**

Juneun p. 222

25. **Flowers not radau) qnm** **each itbtended (w ! ghmw-Uke bract;**
nub absent >> <,t Kalesoc !>n

t vjHTacrae p- 94

20. **Lcawi n.t capanttj (awUfl** **or elongate. <U**
Mpporung)

24. **Leaves -tit t. In f luilinsl. teptate K-I<< canab**
ible in traawene section); *> **rattn**
and us **leaves bearing spores** **baseta** p. 23

24. **Lams WlBOM (. i..nK,tu din,tI. jja* < 'male; leaf**
baftci DOI swoSen, m **ring *|><**

25. **Perianth absent ot** **of scales or** **itfea**

26. **Lewes m *> rows, equttant; Inflo** **t ol**
1 **operposed spikes (male above)** **sad femak**
Wl **lM,hap. >64**

26. **Leaves m** **orange^t ipimilv.**
M equHjtil; nfiot **M t|>»M-d**

Ekes

tt. **Pirtanth al>wni or .f < alri or bm(lr>**

Cyperaceae p. 94

tl. Periamh of 6 scarious segments

Juncu* p. 222

15. Pertamli sriwloid and/or petaloid, not of scales <i>

bristles

28. Flowers radially symmetrical; stamen* 6; rootslock a bulb
Crinum p. 43

28. Flowers bilalrralh wmintrrti al; Mamrn I: mm-
-lockacorm
Philydrum p. 280

Descriptions

PTERIDOPHYTINA (fcrtu and lent aihw)

Ptem vsitti jn alteration oi free-living generation*. Sporophytes hcrbacroIM. with vatcutar (iafur. rcpro ilium* In »[Mit«> ikhu*h Rvþ uw to *iiuU, rfoottved j-jnn[tt|>nir» (pinilullo lw-mni{ •iringOnja and anll»rii«iu

UJOLLACTAE: I genii*

Aioiia: ft %K-cits: through UwmhaCfiQDI iblKW) com- !M>|H1HJJI, I vjx*i if» in Itidiii

ziMa ptmmM R. fmm tul»p ammtim R. M K. Saunders C1 k hrtvki [A ii»U*vato (Ruxbiirgh ex Griffith) N.ikai, V pttiutta var. n*£m4Jrt |Ri»xbnrj{h rx (•irilith) tini4|urtf*t' Fig. 2

KNL umpir. braring nunicrou* rtxil hairv, root hai« in i>blkjiirl- arana- <1 J/nupt x {3"} ML Meim abacrnately hca. • hrd. hranihrt unngcd pfaauti ly or bipinnately (l)H- whnLr pljnt iippruring dt'llnid or traspriid in ouilmc). up (o 4 <ni Umg btn u»ua)K IF*L. Lcaua abarv if. IJ\ M irrt-TLipping mraKal thr- iiptof ilu bran '» ii <"Jir, tbnuK, rarh dmd<d into 2 lobn; ihr jdaiial (upprT) hilw ihlcl, grcn and OMaO] u>inrw«l reddikh^ borne abnvr ihe w*tr i >.nh f> trlrtr! }M(iilUe ^itan^rd in iirgubi nMO, ihr margin liyjilmr AIM) - r> r> « • ; (heahnUal (kmri I lohr 1 cell iliii k. UIM.H1. M 'tiort and hnw d (Irn^th to width ratio ± 1.2:1>, in Cdtilaci triih the water on (he abaxial surface only, with carritieJ luuallr inhabtcd hp a cyanobacteriu in l 111 • tai m • aiifcl Til itturgLI) _ Sporoc- IM borne in pain in ihr • ois of tbc hi« Iravr* of branch™ on older parts of the plani: meKuporanKtal iportxarp* amaO. each prducing l megasporangiu v<ilh l mqra»p<*r; mrfnporci CJM h

Microsporangia tpitrttrjvpa Uigcr. pnxhinit UP to 100 microsporangia, rach containing Xf or 64 in microspores; microsporangia free floating. other in groups with hairs or hooks (glochidias). Glochidia on thr microsporangial tnaMulac taiihoui barb*, liirvad-likr, borne only n ilw iniwr «*HJ.

Annual or -miffHHf-* |> annual in perma<irill -MAli Free-floating mi prnnanrnt .unl irmporav tnUrr. kn rtc* 1* 1 -> <:anal\jnd punda. li rarctv

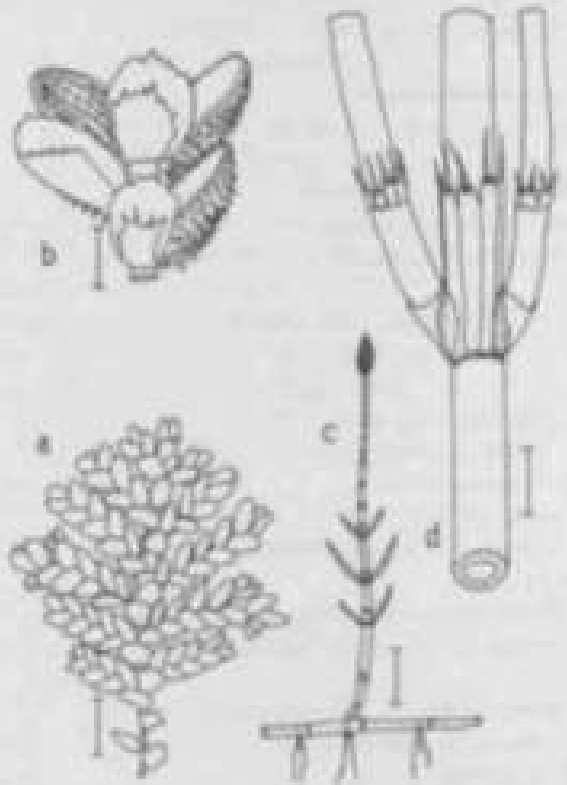


FIG. 2. *Azolla javanica* subsp. *indica*: a, plant viewed from above (2 mm); b, shoot with three leaves viewed from below (0.5 mm); c, leaf showing venation and sporangia (2 mm); d, leaflet (2 mm).

reaches peak proportions in India. The disseminules are sporocar **I»Ot^»aiv** in groups (m,*«ila.M dispenrd by *. and perhaps also by animals.) f< megaspore germin **iir** <i the water ur!*ir *t*/ produce minute prothalli. Azolla is used as a fertilizer as it contains **otoogen I** living cyanobacteria. It can replace 25-30 k | N h i < M -p, . led through am««>• nitium sulphate. It can also become a s,<iil4ndm-. y be controlled by dwMi disulfates 250-1100 l ha² or by Diquat 0.25-ipp»»' or 3 kg ha² applied as foliar **firt*** or injected into coo 'mt-d ».,. Saunders, R. M. K. and Fo*(cr. k. A HMMph-J<v oral taxonomic revision it <4 At-IU Urn section *Misogonum* (Mey.) Mett. (Azollaceae). Botanical Journal of the Linnean Soc. 109(3): 329-357 (1992).

|(O) Pleaf. Tropical and subtropical Asia: Ban. Bur. Cey, Ind, Nep, Pak: Ap. As. Bh. Kl. Kt. Mh. Mn. Or, Rj, Sk, Tn, Tp, Up. Wb.

EQUISETACEAE: 1 genus

Equisetum: 29 species: almost oisnuWiian mainly in»i tli temperate zone

Haukc. R. A taxonomic monograph in the KCHJS *Equuttum* Part I, subgenus *Hippockastr*. Beihelte zur Nova Hedwigia 8: 1-123 (1966): part 2, subgenus *Kquiutum*. Nova Hedwigia 30: 385-455 (1978).

Excluded: the following are found in the Himalayas but do not extend to the Indus-Oangetic plain or into Peninsular India: *Equuttum diffusum* I. Don; *E. Jtuviatite* Linnaeus [£. *hm^um* Willclcnow]; *E. paltutr** Linnaeus; *E. ramosUsimum* Desfontames subvp *ramonssimum*.

EquuHum mmousttmum Disfontaines Mihsp. *Mite* (Roxburgh) Haukc [£ rfriifr Roxburgh 1: fig. 2

Rhizomes »rccping, giving rise to erect stems. Erect Items jointed, smooth, evergreen. 4-40 cm tall. 2.5^8 mm in diameter, usually freely branched; grooves 10-32: central hollow half to two-thirds the diameter of (he stem; Momata in 1 line on each side of the groove. Branches hollow, ft- lo 10-angk-d; the lowest internode much shorter than the sheath on the main stem. I-eaves whorled, scale-like, as many as grooves, united into a stiealh hehiw. green: teelh of sheaths breaking off. with narrow scarious border elon- Ratrd into an arisiate or cuspidate tip. Cones borne at the Mem lip. consisting of numerous, whorled. peltate sporangiophore*. Sporangia borne several together around ihe ..daxial surface «r the sporangiophores. Spores all alike, overlaid by 2 or 4 spiral bands (eUters). Gameiophytes unisexual, with cushion-like bav and lol>rd tip.

Perennial. usuallv found in moist soil. It is essentially a helophyte and sometimes grows in region* that are regularly flooded and mav even Dr found in shallow water. It is often locally dominant and can form extensive stands. The disseminiles ai<- ywm dispersed in clumps by wind: local spread is hv itu/omes.

IHell S and E Asia, extending to New Caledonia and Fiji: Bur. <>y. Ind. Nep: IU Hr. Jk? Rj. Tn. Up.

ISOETACEAE: 1 genus

I*»Ur ± ISO species (there are some higher m» mates): cosmopolitan

Stem, short, itiber-like. 2- or S-lobed; room forked. Uaves in a rosette, linear to subulate, each wuh 4 transversely septate, longitudinal gas channels and a central vascular strand: leal base upooiwhajird. with a membranous margin and a delicate ligule »n thr

adaxial surface where the leaf narrows. Sporangia develop near the leaf base, embedded, naked or covered with ihin tissue (velum). Spores polymorphic or dimorphic, mostly in separate sporangia (mega- and microsporangia). (iametophyies remain within thlr spore wall.

Submerged, emergent or seasonally submerged perennials. Heterosporous: disseminules mega- and microspores or fertilised megagamctophytes, dispersed by water and in mud by iinimals (the feet of birds, in excreta of earthworms, etc.). Some species are sensitive indicators of water quality. The stems are readily eaten by waterfowl and rodents. Srivasiava, G. K., Pant. D. D. and Shukla. P. K. The Onus *hoeUs* L, in India. American Fern Journal 83(4): 105-119 (1993).

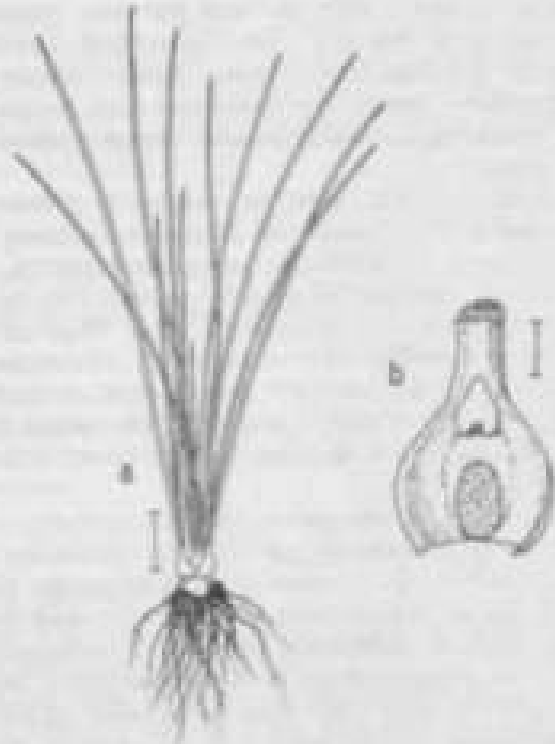
Thirteen endemic species have been described in India. Most seem to intergrade with each other and Indian authors do not agree alxxit their specific limits. I feel thai none have been adequately studied in the field and have, therefore, listed them circumscribed under the widespread species / . *caTomandftna* giving no more than (heir published 'diagnostii features'. 1 MIXMCI there arc no more than two or three species with perhaps some hybrids or agamospermous races and most of these names will later be shown to be no more than 'paper' species.

ltoetw\$ corotmandtHma Linnaeus fil. [/. *indica*]. G. König ex J. E. Smith, / . *brathyglnwa* A. Braun]: Kig. 3

leaves (5-) 30-60 (-H0) cm long, with 4 strong and several small peripheral fibrous strands; gas channels with internal hairs. Sporangia orbicular on the outer side becoming obovniid towards ihe centre, *1-14 mm in diameter; velum absent. Megaspores white when dry, grey when wei, di- or polvmoTphi<. (3(H-) 330-560 (-660) /im in diameter, disully uilxrcculate; tubercles blunt and rounded; the iriradiate ridges straight and simple. Microspores sometimes rare, reddish or dull, smooth or rough with papillae or spines.

Perennial. Usually found al thr edges «l n«<U .tnd lakes. The leaves sprout as the plants become ll<K>ded and wilhet when ihe waler recedes and substrate dries out, olteu remaining green for a few weeks only; dormant conns survive the drv season. They grow solilarv or gregarious, in open or dosed vegetation. 1'anigrabi recognised / *ht*ttk*g{B%ca a% .> iliuiuti uik species.

[Ros/Ten]. Disirihuiiui] uiKertam <h><D(lnig on ihe laxonomic di-lmulaiion cilhei widespread in tropical Asia, N Australia and N Italy or endemic to the Indian subcontinent: Oy, Ind: Ap. Rh. (.j, Kl. Kt, Mh, Mp.Or. Rj.Tn. I'fi. Wb.



Fit, S. / *... 4. whole |ibm (2 iml. b. adaxial surface of the leaf base showing sporangium and ligule <»-)-*

Isatis biknjmtmn C Panigrahi

Lilr / (tmman/lrlina but Iejnr* 5-10 cm long; whim covering two-thirds to ihrrr-qwuirt* of (ie- *po ranRiim; inejpupoftt 2M>44fl fun in diunrtrr. with puilulni of almoat equid >ur.

[Rm/T*Mij. tiulriiii- u> India: *Ind: Mp.

Isatis alimiri |>. V. Shrink-

[*K / iorumamirUna bin I leaves usually less than 25. cm WM&H; iutx <cles of ih* megaspores size, mcgMporo 5KV-5W) jun in <iam <., ,,,, rangia ov*ir. 3-6 mm long, 2-2 !• mm wide; megaspores echinate.

[Rm/ I>n|. fjwlcmk to India. •liwiMh

Isatis mahadranis G. K. Srivastava, 0.D. P w i i d p i Butkh

Likr f. fafBBWB^ifiw bat nwyAi|>r <reticulate; anticlinal • I tiri(((it J muii ROI f <cedia | rhr tangential iln. 'nurw nt <fi* imiiv, rUim nwhi. <entary.

[Rm/Tm|. f ndrmK to Indt* •Iml Up.

Isatis panchanani D. 1) PjiitrK. k Srivastava

Like / *... H htJl katn UMi<dh lew than 25- in long; nif|;A>pnr* rcrn nljtr em all uif*

velum imriini; 1 hull ihr i|Mtf jjiuil surface; megapom 110 410 ^m MI Hiamnci, iht muri ^cnrtally forming if ruin: megmporangu anl. 3-5 n>tn lung, 2-3 nut) wide..

[Rm/Tm|. \-lute-nut toincBi •itwf Mh. Mp.

Isatis panchanani G k SuvjttUm. D. l> P>W ri P K. SIIIUB

1 Eff / . fifiMwar^Winj liut nicR^jHurt vi<lt n-litnU-tioni on iln- frniui [uri ol the i<i>|j] ur ojily: irlum covering more ihaii (hrvr-qiuiini nf (br ipoi'ing¹¹¹¹

[Rm/Tm|. EndoBh totndis •lod Mh.

Isatis panchanani var. *longisporea* u (. K. SO-

... D. D. Pant et P. K. Shukla like / . *... but has larger megaspores with more areoles.*

IRi>t Tcn|. F.n<irinit 10 India; •Ind: KL

Isatis panchanani II. K. (kmnuni rt B S. Arr*

Like / <nroHdnd//ind but with a lillrd <chromorph (S4ab<) biit 1 lot* uiulkn than the orhrr 2) leaves 15-53 cm long: RKiEuporingu nnulat m otloaf¹ elongate, .1-7 nun king, £-4 mm bread; megaspores (77••) 28(M'<t JIII HI dMnrtrr <subovoid; megaspore lubrrtUt tujje jnd <null internal %rl microptor< 15-44 >un In rfum.

[Rm/ I Irn). Lndrmk tu TmtU. •Ind: Mp,

Isatis panchanani C a. O i u ct T. M. Bhattacharya

I ike /, n m m M M but leatn S-16 cm long; iik-gMpum irtKubir. vrlum tinrrtiin threr^uanrnor morr o'Tihe tptmn^u <uri* r, m qp ^om Mfi-V*)um in 1,1,f.,/r1 ntfTturphk. ftinr with > <antia I <alga. m<9ttpor>igM iw*lr lu rhui^.. <., 3-6.5 um long.

I-Umw

[Rm/ Trtil I India: •In.t |>.

Isatis reticulata M n Cca<i i \ Bhattacharya

1 ifcc / WMHRMIUI but le<r> 4-10 m lunf; ncf^{0''} Ddm luhrmibtr mi fee pnnMrul nufacr <ml rr- Utr fm (hr <inul ui <acr, v Hh cowiinf twH<<•< of tm*r .tl ihr ^xwan*. surface, m W<*** I<P-W* *** in dJumrr. dImarphk; inrfMpuruHtb o**)tf>^{111f1tU} L5-S.5 mm tn itumiriri

IX- [Rm/Tm|. KndrniK u, VuUm. •Indr K|

Isatis subpachanani

C. Putif(i4hi onh. mui j Like / < M M M M but lewm tmulh less than & <<' >'>> mrgMporima IIRMM it*ui. < 2 mm in ***>' <er: v lum <h>nM r<nplfi. with disc-like apertur •I the bate, dtbrr, In of ihr megaspores discate

but unequal in teg megaspores 325-430 pm in diameter; mül Rmporei it lini.Hc.

(Boa/Ten). Endemfa to India: • i>^i: Kl. Mh

like /. umwiiitint but feavea usually le< than 25cm long; velum tncomp* ring half to two-thirds; tubercles ei the megatporesconfiueni at tfadi bases, jiving MM- DO Irregularh branched ridges; megs* pom £MM58 M''' to «fiaa*Bten megasporangia oral, 2-6 mm long, 8-2'''''''' Hide.

(Ros/TrnJ. Kndemk to India: • Ind: Ap, Kt.

Wf << (wftereute/n <, li (.ru.irt I V Bhanft

Lftc /. iwiiiiiii'rfnnViti lacgaiporri trtoorpfik, IRm Pen] Endcm* to India; *Ind:Rj.

awfaa...ffinrir*... 1 E. Smith U »*><• D. D. Pant et G K Srhastava noa J G ... *• Smnli. / m ... utfG. Panigrahl <i Wi

i ik. ... »JWin/j inn the uieppoiti wWi Ae e* radfatt ridgi ... beanchd, the tubercka apering; imgaapora 90-640 pn in diiraftrir; OKgaaporangia eloc^ate, ft-t9 mm toog, »!* mm wide

i rul.MH. K.L.Kti.i: • 11.** lap. !". E p.

M \K.SII I 1CI \i I feoera

Marttiea I 48 M ... to warm regions of the world

M creeping or Soaring, roofngai nodes b apirafi) rotted whea young, compound; pedoka i<nw. mkming In I leaflet*; ksaflett arranged -v,i,n<- ci call cachobd. wae. the BMIGA eodn when growtaf in mm iawlh becoming toothed wfaei dry, the vdM wpeaiedj forked nagia tnckwd aporocarp* borne on Aort ifiUU arUng from die pedole<< '' * << * .iXIK s;1,1,1 '' (Knwiv usual}) found kogdfca ta *e iame ajMracarp; mega*p<<<rr<>M,liu.v;iiiHi. mnielWB

juver<il^ Mihmn ulM (loating, emerge ... j ial PUnu [uireanemci tod to develop iporocarp* The aj><<earp< aay remain viable fm U years, ihej abo nay germinate aftn ring through • duck The dhawatauka are ipofocarp, diapr, «1 In l>ird>(rtldo<<oochor). other aniniaJ*. In wain and proluhh also in mud • in... derrdtobea...toome In ric< u*d in in ub wed locally in med rtu b, [be aborigine, ta Ae

Monographs (CSBR, New r>dhi)

tlut wort bat Mki found acceptance; Uun< monograph] i "f the geauí Mawtfai Ltowj

bergiana Biol 273-315 (1968); Johnaoa, D. M 9jrMemadci of the New World ipwifí of Mmniim. Syttrmatk Botany Monographa 11: 1-87 (1966).

Excluded: MarsUea quadrifolia Unnaeuj is fmjiciiiily confwted with othei apieciea bo the Indian literature It occun In temperate Eunoia md it naturalized In \ Aniciit .t; in India itfa| confined to tin' NVV Ilimal.iv.iv and dod ooi extend rurther toudi in India.

I. Sporocarp stalks arising (mm the petiole well »>• ils axis, solii.iry oi united above the base (appearing pafa ed or dichotomoualjf brant bed) (NW i limalaya*)

M. qtwdnfottn

I, Sporocarp stalks ariatag u "i oeai die bate <t the petiole, free or united below (often in cluatrn bui ippraring unbranched) (Peninsulai India)

2. Leaflets with peBucid iderenchymatk IntendtiaI Mtreala (vktbk when held againM the light)! " i>ij>s wni } ill nidic, lateral ribs M. coromandelina

2. Leafiett without pellucid ttreatk; ^>orocarps smooth or with leat than i, rather (.tint, lateral ribi

3. Sporocarp almost teniare In lateral vi<^ utmost (ube), distiiKih truncate, with » dteinci HIMXII (dorsal) and frontal furrow M. atgyptiam

3, Sporocarpi longer than high (OVBj <>\ b shaped), without a dJtffiHi abaxial (donal) ,ni*i frontal (urrow M. mimtta

Manilta arf^ptta<n Wiildenow VM (mil.. K SL Gupta, AC fendimmit Baker, AC NBMBWMM K \i. Gupta iiom. ilU-^j: f-ig. 1

Plants Dt.n forming: rhtoowiei slrnder. wir-s, ICJHMI <(li\ branched, btiernodet iligfady pilose oi 0.5-1 cm long on land, Mji tO SO nil m w.ilií; nodes deiiivlv pilose. Petioles (1-) 3 (-4) rm lung tin landoi 'I i 5-6 (-10) oji in water. Leaflets wr) variable u-i*> (-SO) nun long, 1-80 (-15) broad: awmtrlal leal with outei oaarghu entire, bilobed, nany4obed, to >ly t lenulate; floating lealleis with margins eM Sporocarp Mattn free, lunpfe, (1-) S-H (-IS), ariatag at the base <i the petiole. Sporocarpa oaaafi) crowded 01 iaiel\ vilitaty, Kjuare to TTTtilWgiihM in latetal I... •ometime* adauall] curved, abaxially str Ighi oi saddle-shaped, b Idea wfdi a thalkm oi 4 curved vertical groom with the (rental lurrav uawatti pn sen! and ucti <Ap.unlerl over the abaxial (trial) sidr, deiiM'lv pilose altnst. MIIIII itiatu- 2-3 (-1) ntm long. t~8 (~4t MB (Hit V: rajtbe preacni but often mdistim t; teeth 2, the aupeiioi one prominent.

Perennial Found in abiaww watei in leat>nally Hooded areai but it can withstand considerable oV i.mem HMI is KMBcdmei found In <in babita

(Ten/(Pe)) NW tndta N Bad I Alrka and Madagav.i [ad GLOr, K]



FIG. 4. *Marsilea minuta* a. aqutik pfem (1 CJB); b. bind side of sporophyll fl * aw) with * do««*nrir.tl trnrntw section (100x). M n»**«*iMiM a. unres>ul JIJJM 'I >im wild (100x) a p*c« of leaf *nh pdhirui urrakt.H. UirnJ »toi «l sporophyll (LB mm) trlih J dunt-ventnl u«iw»nr section (100x). M. lateral view of a. <1 * mm; b. dnt#*ntiral transverse section (ktttrt); f. «j*wiKJirp vtrwfd frnM the hnni (1,3 mint).

Marsilea minuta WtIwNmW 1' *minutifolia* nith. null . if»" name Af coranmnMira N. I., BI>TIIUII in ITIVJIKII Fig. i

Drtk Me pbat; ibnom* wry fine, branched-like, repeatedly branched, ... mi* . i'v, in upright in a zigzag, glabrous or villous ...

Blifform flexible, 1-7 (-12) • •> !>». Leaflets small, (1,5-) 23 (JO) men U^i_K. 1.t-ft (-H) mm broad, with prUucid **Vi*n* hvm#ik ttrrikt i4 ...

... mm l«HR. ttendrr, win, utualW K ... SyuHKJip**" I "i), very rarely crowded, subsessile to br«> ally elliptic in outline, lemon-shaped >n dnf*. ... inlmm L7S (-4) mm lon| 3-2.5 (-3) tnm high, up to 1 75 mm thick, always distinctly bent i ir<l all round, with lateral wall ll* toiiffin IIIK^IV bul|^nf xntl when fulK rruruir, pritrn whrn \nuu^ KH ... nphr often *h<ifl r<nrru>n U*/I IO n ... itic

length of (h* ipororarp; trrih i, pritiniunu, ilic inf- inn iiMulK itirtvntvard potatfld
rvirttnjl or pcthi)* K*nctim« juittu.il Found at thr edge* of *null pimU and buffalo mDoM and in swamps. lv iwampy arew. Wbcn ihr kftM at dries "" the fporiKarp-hrn-tng stem* grow up ^ht. HbJ" AI ... I \ Bad M.iinu, P. CHmitMUun, intrj-pr. IIK ... lion MHI rpidernul Hiidirt of M T H I M ... in India. Non Hrdi«i(tta tA{l)- 45i-*tH (1974).
K O ^ T m l. India, Madafswat Booccm Mwiri ... Scnrgal Sucian. Taii/jiiu. tkituixW. Anflna, Marnibia Mnd Sooth Africa <n lt..t \p. KJ, KJ Mb. Kj. tn, Up,

Marsilea minuta 1 uu..»-in I \f ^nwwni Kolkiil: Fig. 4

An < »»" nifty variable pbutt cinhkm4itv on *! !*«' . t and in water. Internodes ... Uirtg. Petiole* t-S cm long on lml of til< m 2' * m « ... (-2.750 mm btarl. in ... r trich <rrnnUir ... margin*, in water rniirr. Sporocatp tt ... ata, arising onr ano*r thr iMbr at or nr«r the bue of the leaf stalk, mneiimr* 2-S <-4] umtrd at dM ... apiwuorp* tanaQy cttmdfd :: ... Uirrall ^irw. diti*IK munded. ciliptkal m ... tranwrrie iectioti, (?-) V7 mm Utitg. (0.V) 0.*-I-.* ... irmi dtkk,«tM D manm mxmM) ntl*t*n" ->nd dart ... M kin twHhtr* thr ... thr ... *h4«m and MuiMrr to the siaprii

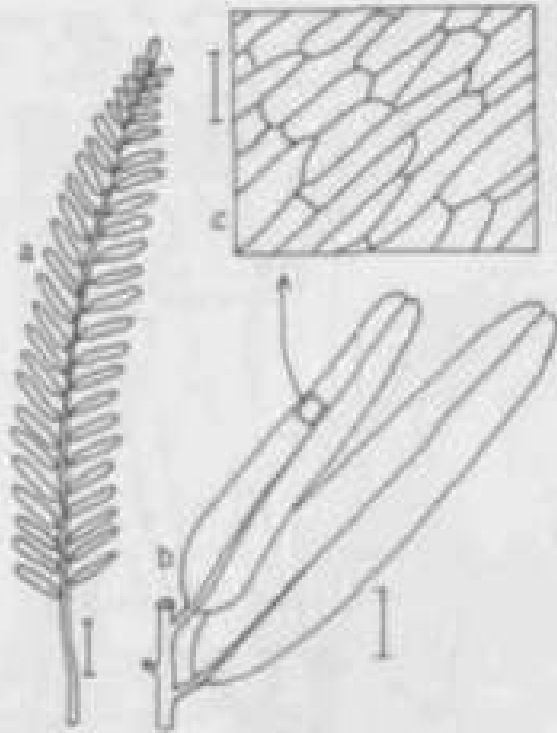
IVn itnul in KNKtinoi Jtnrnul Fofltld In shallow pool*. M thr edt; ... *n* and diu do aoH " . rice IK-UU It tk m m abundant (n trtDpocatih H«HJ« > placr* whrt> ... fbm Utqn? and dente • ... WIM. Ji t.m lirium*- kKalh d*.wiiti..n || WkMtn CO* «tder*blorKanir | v): ... (-nurafpii drwlop at the water r n r d n .

t(O) Tml TnifieaJ Afrw. ami A«u namnUwd tn thrNrwWr. ... VL \j>. \v W, M. CJ. Kl. Kt. 10b ... R).Tn, t > V ...

ft t« a hfeh ptMk > K in In O I U M .. imrrKtade* with M <pu>4-nf*tuL The lotknrmg Indian <prrie« *rr ut the aurpuhI ranaY i* tarUiHMi ,4 M mir in Africa and • i* thafM no more than > ... ally induced phenotypes.

Marsilea bicuspa A fraun
Like Al M>nila but iftt*ar*rp> not mo*r than 2 mm long.
Endemic to Mnnmar and trtdu *fV1(. IIK! In K»

Marsilea bicuspa A. Braun
Like M. ... -wdMla IMM ... Endemic to India, ... Tt»(i>K



ftc. «. |mntuh*m muwfwf, ft. rofnpfrt* leaf (25 cm); b. two leaflets (4 cm); c. venation (2 mm).

pmn jir. ihr lower <mn ilrritc and usually less divided ilun thr upper ofirv oilt-ii bearing l seeds which may develop into nrw pLinit; lrrtilr leaves hurh dividrd. «Wfc ipi>i JLIK⁻¹ . «one on veins on the adaxial surface; nurgiiu til (he fnnlc lcncl tcvfilntr. [Miih wwuin^ ihr tponngij l leaves trans i-Mi.il in fiam btw write and fertile (MKi often ih vrU>p.

Juveniles free-floating or sththitrik*-it. .triiiii W|>-merged, fcm floilfaf•p ino*tK atinujii. 11K- diwcmthi. itr spores or resting »rjtcUti*T fkuub. duprrr (Mr mnddy In mtef <ra&4>n« i« ruktrairtl in t Asia a «Hr« Hi* < i rd lo be » ***d tn the field* and nw«' made Wtd b ll Bko >i««l for ornament in aquaria 1J«^, R. M. S*mrniilK» of the genus C. parvula. IWinonla Vfi. 134-160 171).

l. |itwrr clrrriW lrrjn «4mpir with or without hn,M basal l«^, drli in Milling; p rles -lion. thick, uuulK mllairfl. l*rimdri abvr (bin brtow; ul rure trgntrin* «(iivuiwr frrtile l r a m irtlh mainin icv.i the only pan of the *iv U» the uritK (<nrrinj onh thr rHgr* trf ihr k « n «urtirr C. parvula 1. I iwrr rtnik leave* phnnati l> rimded* i rimg lar >n *-nil r pndia h«g triwfcf mat mftald, u«ull> broader brkiw ttun alMtwi uKtrtur M^mrm* of

margin trrnlr lcvrt with margin rrvrtlutr thr whole way IU ihr vtrin.rovrfin^ th* *»lmlf IOMM surface. C. subultride

Cnto^mi p

Annual. I'M UIU fin- floatinK hut *ii«nriinio WOK d TO \Ut %ubMi'Mr Fvvuii »> fob pt.«nd%. wain lmrr^ «ad Cfc UcUU. In litdu l mttfm i<n< mnr widch tribtiiiHt ihjin |HTt't«iu*h thodgfal and i «>|v n lahMrnOfird u C tiUJktnWn H «W conJiui.M man | t» H »« whether C nmur* and C ptfndo*dt% arr diutnt t tprv »» « |



C. parvula: a, complete young plant (2 cm); b, apical (wit <* a (rmtr lraf (9 «M pW* fttMN (feu 41 .wl.4 ^ r m U a kitOt Waf « <'>

[G Plc/(Epti/Hjp)>t. ^1'''''' throughout the tn and ufatreploi iwiulk ron*Hlcr*d »o br native « ihc OtdWbnl -Bi.it. -Hi'' l.-i.-ln«fc<A«.

Qp«Mlin*«aik<nidniliiiiwt>i BWOgart *« 7 l'rtiuk* bniK anddrnifcr. not Inflated, uwiJh bnwt c« at thr baxr. Su n|r ir.nr* •ttfamctged, Bowing or «nn_kini_m 2 or 5 timr* {Anna*, i»»- uliunw k'«i Mfmcoo Bnoi » obtoof, twpfloM « m angular. Fert ilr lcaw* H (-5) "me* pimuir; ihr ultimate iqf menu rUm(p«r, tip to ± 4 cro long and 0.2 cm wiH.: the .4 the raMURE lAKMK *cRinoits I t_jic whole w...theirin I* ***

Annual or prrhap« MueUOCi [^rfiifiwl I * bond in ticniiMiciUor •cmH''nwn«'in >«*« '' rvoivn nd unUhn *o in rto Betch wdteinau of floating v^rutcii Often itrwin merged btii wmtliBW becoming fluting l'>. fluting pU''t« cinah artJ dttl lir* It l' *.u>«-umr» took«) »» J vr_k-nd

(©1? Plc/Hyp/(Tcn)|. P*nlltfA Nq: An. A*. Bh. t/^ Co, Kl. Kl, Or. Rj. I I'

SALVINTACLAE: I g*n>!) »-! | i-, t 10 mctafc [t>i> b^fcr* iluou<li introduc*mut 4IH<-< cowwpolUwi. *h«n. Su-m. l'...ing, irregl'«T f«rt«J. »''>....I Leaves inwhorb of 3. fofd««««^ng Md I i_8 k>vrt phoio^NaeFc r,t,- iablc h«« on

iwnicd k*r, no* pi fiUmcentou. ^nii*»l. wh^ bew •' «riki^ '«^ hi-, SporocqH bonic on n.-l- m«,u of-ihcnc^ .TFajwWH^ «P**x |" Sloped h.M prod...ig up *' « m««Mp««lto. ariH^ rangia, each containing ,t,lJh M inn, hwhalii dmriop binidc l .|wfe*.

Therospores ... sporocarp or groups of sporocarp and perhaps also megasporangia. It can be a very serious pest, spreading by vegetative fragments.

MKJi m the warm temperate Old World. It is literature. It occurs in the Himalay M but does n,M extend IHHI fVnttuular India

1. Hairs 0« the adaxial surface of the floating leaves multiaxillary at the base dividing into 4 uniaxillary

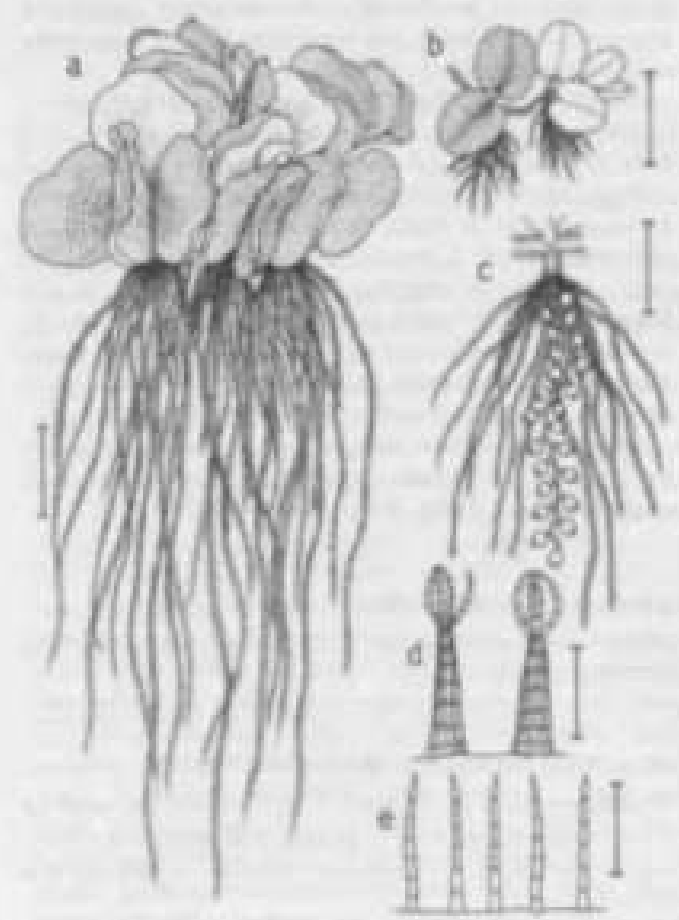
filaments above, such ilicii brndinff outwards below jn<l jotufng ab*>vr (thr wfmlr looking like an egg healer) C MoJnia

1, IUin on thr ariaxial wjrvfctcr of thr liiMUing lfavr* unUxitUn (em t, unUmnt-hr-fl and multuclluUr)

1.1Uu* OB (he JM<^''I turfacr of the IU>ating lfavr* «oliur>, kdimnnl WtlMUI HI) uWIWI [Mltnn OH >hi-surface S. cordata

2. IUir% on ihr abaxial surface of the floating lfavr in mil* of 3 of 1. tin- lufta thru rlrarly arranged in raw ilang dw •surface C. nativa

Soh*me otmthki RnxUiry, \ Fig. H Iikr 5 mnlttla|m\ vri> iniu li MiuDrr. Botillg l- 1-1 M cm wide; the .KIjVIHI l'face 01 ihr Rotting lfavr bearing timplr hair»: hair* unlu.iuu)ml mi



FH.. f. Sahmm mU-Ma a, >liuW jiUni in VittirH^1 dit 'maww' pha'r (1 «m(b. *tK4r pljtn la ttpm' «» 'olnncrr' phur (l cm); * Mib*nm|cd tml with «purarwp« (X im|, d. n'i «ft tm ihr »dnut wrfwr «f * Ouati^t >nf (0.5 mm) £ mnibl*: e. Aw trktramn on the «duiti urn of a floating leaf (0.5 cm).

trial plants. Flowers **eMOUBOpWVw*** Wfy **incompatible**. The disseminules are relatively heavy **Keds a<iivrl> eje<< ed fmm the I apsulOI Mail) art liou-bleaome weedi in rke Oetdi ami in ifrigadoii and drainage din bet; others are used in medfa inc to India and men] apeda *k< cutdnaed as decorative aquar-him pUnu MMM ipedes aw verj pm** and there »s considerable ttsonomfc contusion, rhii .mount is superficial and MM based on critical work; *e ml*-HygrophUeae is very m.ul. in need .f revision. enudhaven, C. P. H« 'A'«'''TO «••• « GmfaniW BuUetio oi the Botanical w.ety of India 10(2): 22S-223 (dated 1968, pwtiMahwl iw*9).**

Excluded the following *tpcda ma*) sometimes be found ... damp «.....daces bui the) arc DM Considered 10 DC wetland planW Hygruph.la trrrta (N i Burman) Hochfeutaa [H. »««J BUwe, RutlUn MdM N 1 Bunnan, 2^«a«««i«fti (VI J» i » kunCtt]; »• i««w« Nees: tInd: // . phlomo,da Nerv »Bui •Ind; // . thuyitetii (Brniham) lUnu [CMamalM tkmmtk BentfaMB, lUmimlhw t ihmtmM (Bentham) I iven]; •Cey.

following I. confined » lh« H.nu.layas: // . ptfithn I I Vrii. emadtewn [CaNIMFBM fn/Kt/Ut Bentham ex C » CtartteJ.

foOowittl »« [..ol.l«-n...., //• »**«•* (Ne, madhaven [Cawtorf*— " T i TM ; ' ' !v Bentham ex C.

T.Andenon «hur: N.e the Nees: probably W found t in India.

LPTanawkh hard and tba«n aadOary *spines H. abuli*
 LPiantiiwidMmtapteei

J. Rower, M, dSaoete, !,..,.....< wmtcal iptkec. bractanot like foHage learn, o*«e I... i>t«il». >" 4noJuaodo*eriappla]

J. H.w.,v ,,, ..x,l..» .l.w.-.,.t a-ftonolian-... L-I •dkbiBCiileaf<tt1be, not overlapping

S. Blades oi b«ci « ""bmeiid le«« plnnatg dMded into Uneai ie««eniaio. ,m.n.u.i.d; I.I.,I.S tfemefiemle«^pta«**»*i jtbedjmtaa. u k l . . . ical and awafbt. rather imaU

4. Stpak Uneai witfc I'''''''''. •'•'-' ; V'''''''''' d»TWi IV,MKhm-.n.-l.-l.-nni.Mur....>

vT..lM,l.Ml.w,l rmeR **Be«er« or flower daawi) hno**

Leaves as long as wide; emergent stems a... densely clothed in short, equally sized, glandular hairs; flowers usually in clusters of

Leal Made«.««<•< • ibtendU»»

(li.ui one and a h.ilt titties as long as wide; **emergent stenu and leave* densely clothed** in long and short **glandular** hairs; **floWCTI** often v PIII:IV or I or \$ in i i luster // . *difformit*

3. Blades til lower or rabtnerged leaves simple and entire; Martfn <<i emergeni leaves rimplf and endre; M'iiii.it ula lung and curved, mostly hooked

6. StimctiN 'J with fertile anthers, die adaxial (upper) pair reduced <> minute leeih; flowers usually in dense UT iinn.il spikes with imhricate bracu

H. polyphorum

6. Stamens 4 wilh fertile anthers; (lowers usually in axillary clusters or solitar) in leaf axils, if in terminal •)Otes tlun ipikes bllemipted tnlim .mil il»- hr.nis MMimbricate

7. Sepal luhe splil to tun more tlwm iwo-thinK. leaves subtending die flowers OI .Nill.f Mown i Itiv ters .ill leaf-like and looga ih.ni tin Bowenj Ments UMI.tK < it < I // . *iftuitlrrllrth*

7. Sepal tulx' spin .tlmoM to ihr base, tmnh more ili.in two-ihirds; leaves subtending the flowers or axillary flowei i lusters Ic.it-hkr and longer than the (lowers oulv .it tin¹ h.tsr ol the inMoiescence, tx-ttuning shorter and bract-like above; Menu iisii.ilK creeping B *Verpytkum*

Hygrophila balxamta Il.iuttacus HI.) Bafinraque [*Cardanthera aahaaijca* (I innaeus fit.) Bentham (B < l.ukr, *Adenmma thymui* Nee», *Cardanlhrta i-rttmt tula* (Neea) IVniti.im ex C B.Cbrke): Fig. 9

Stems up to 50 (-HIM cm Mil. branched, when *ub-saerged vwoOen m<t glabrous with Mabrid nodes, when emergent densely coveinl with short, ± equally long, gtmddtktt hairs. Leaves itioMk doCUWjate, srmsilr »i Bhord) JM th.laic; petiole up to 1.5 cm long; blades M base of "ptem <i wbuierged, phmatetj dMded into dnpkc oi branched llineai segments or pinnatifid, iisn.tih glabrous, up K> to an long; blades on emergent stem simple, bmceolate, S-€ can i°njr. 0.5-2.5 cm wide, denser) dodied la si»"ii. ± equally long nI.tiidnLit baars, base cunease, margin* MI mi

acute Flowers astiDary, in dusters >) 2-5. tarCK v bracts ekmgate-elUpdcal to ohowite ± -I mm long; bracteoles like bracts but MH.IICI, ± 5.5 mm limy; Sepal tube uin ijiii.ilh 'l>l>tx-(i, .IK¹ longest lobe hin-ii -lam i n.litt . | ii 7 tm lon^ Petals ("iipI- violet; petal IOIH- ± i mm long: petal lobes up !< I ana lony;. .td.ixial (upprti Itp glabreacent, dilate, sht. j< mi Si.iim n filaments in 2 pairs, 1 p.m I | mm long, iln- (iihci pah i i mm long; andtert unequal, t pair t 1 "mi long, the other paai I I 1 BUB long Capitules linear-otiiion^, t it BUB lonv;. hair) Si vdu nuaseraus, ± 0.4 asm long, ± 3 mm m dnani iii nntiiiK. niaJghe

ACANTHACEAE



Pic f, *Htpvftai* Wwvrn*: 4. boat<f plant (1 cm), b. »ub-mrr^ril Ir.it il im (2 mm): d, equal tube tS tumi.r. rtpwilr with w-rd* (1 mini

Annual or DtmoU In thalkm water, m n> ...
 • KfoundbfIMK ramne* fepjttacM ... and m
 rice HrkU. A wti antnulk plani apparntn ...
 la luh when gram »» aquaria. K ...
*HjgnfktIM balt*m*ta* (Ij)»n. 11 I Rafinesque: giting für
 Fiacbcl .f|tu PUnu 83(3): ...
 11 ;r rei I frlii End ... Sri Lanka and
 Slr.Hu («v •In-f. Ki. K». Mh. T.

Hedyotis diffusa (L.) ... »U[Mtatf ...
trfflma (Rnxhiiruli c « ... K Hamilton «». Vnitfi or
 Nr «. *Sfnmtmm trifltx* 1 Rti\|iirjh*» Sm) I> KiinUr I*

Like / t W w w i bui led b U n «i •HIIIIIMHIII M^OM
 (tutxrndng Howct* « Mo* or dsa i_rn) rdtpiifal to
 own c w d y m w r l l u n o n r ind a half timn H kiftg u
 wkk-: n n r n i p n i H r m i and le»r» 4* ...
 loaf anil Jiori ffUodulai hair* Ikmrr* o4lrn «ultun
 IX 2 • 1 II) ... IA> 1 Insert

Pcrrnmal or pchapt *omrttime* annual U«i
 found in •balkm walrr wlvrr U may be bouaoHWHrd
 or MranttinR wn thr turfacy. A »r> popular aquar-
 ium ptani.

U0>?r p / c n | . Proh>by imrtcmli i> [|tr avthera
 part of IHHIUI, thfonflBeiM. fottit.ili/r*1 ffl (the south
 •B-in. •Bui. •lr*H •%,,, . \v Hh • Kl, I p. Wh.

yp hrmn Si prmadhwan [*Adiantum adpressum*
 (L.) H) R. Br<mtt K \,,-,. *Conoclinium adpressum*
 (L.) T. F HantiJton ni R CURkp, ...
Hydrophilis
 nnr]:Fin. 11

Stctt) erect or decum ** » t V-<l mi ull. hf»m r. <l
 TOirrfcni p«m hull s,irM. f)JIM ijJ^e, nu»*ih A
 ««r, *rwlr or newry n; IraT hUdn of rmrnrnt ttam
 longw^iHptkl. wmpc. l-f> < m h
 ^-8o1m wirff. (^Hubr arul ^mirtirM-* aK hairy,
 ^.irracwrm Mr n,»r ...)
 V& | S-6 (-lf) cm long. « ... mipwd
 it the »u*r*trn in ftulc; btacu in < caoa. bnwUy««««»
 [...!...!...]»*-* mm k ^ . gUhroiM, gUmh.Ur ^.-1 M
 4rt .«u- bnwIK HUptk .1 V4 mm long
 f ± fqual. 4-5 mm WKig, t Of. l, wide at the
 -u««ualr » U T . hairn. Pttaii piirr.W
 : prul tube funneUhapcd. t 4 mm Uw««, vrIL*
 , hairy ^itJnn; ahuaia) (town I prta! It|. 1 ! run



Pic 18. *Hydrophilis diffusa*: a, diffuse. • Mr H mra with marginal glandular hairs (inset); b, spread part of a sub-merged shoot (2 cm); c, emergent shoot (2 cm).



whole plant (1 cm); b, leaf (1 mm); t, ofMife t*hr <* mm); <!r <M (mcirln 11 mm); c, stem (1 mm); d, flower viewed from the side (1 mm); e, flower viewed from above (1 mm); f, seed (0.5 mm); g, seed (0.5 mm).

long, 5-lobed, hairy; adaxial (upper) petal lip 2-lobed, ± 2.5 mm long, hairy. Stamens 4. 2 staminal pairs; adaxial (upper) uttben i > I'''» long adaxial (lower) pd S erT*P*»*li l i n R . b-6 mm long. Senk .r> -.*. chlo .m M ± M mm long, smooth. trUnM III.i unitf. J*r4lg*L Ann. yellow * are. in w n p . anrt rkt field*. also reports. ||iomiugu«*nrlteM> i., Hrll ProtMbl] Bftdook u> Uw. Indbn «ib- continue. • »> . • In .i:An.A]j.M>.<:>.Si.In

Hypochaeris glabra (Dobson) Sreenivasuluhan [Non] Ik-ntlumn". B. Clw tcIF<- 12 like // h+famx* IHJI »<<<* * n d , each di rI>N pinnatifid, sometimes bccomiii] crenate ltmJn,11, the ipex. . . . ll abscissa; sepal tube split above to 1/2 base; sepal lobes linear with pinnately lobed segments or if w g lobes entire then wider •bow lh<n oft m borne oti bu «l"* n H**^ Pmlulih tiwiid in •hilot* *•«" or In *«

1(0) Hyp/Tm illHli BndeDdt H HrniDiulu India: *!nd Ki.Mh.Tn. lip-

Hypochaeris pvhjxtma [KoabatgJ I Ami. rvtm | Hrmtdrphn puiytptrma (Roxbnr^ Nrt». HrmtdrfAu patytprrmil M < M\sinu\YK.vn rl HIMI.IV] KI^; 13

Stem* crrrping JH<1 000ting *" IHMI<^, nccndillQ n t. brwchtd, MMO (-KHD om ul>. when submerged nut niilnr.iMv MoOctL Submerged leaves usually (iitmuh >i.itl<d. tuiuilh glabrous, elliptical to nbiong. with rndic m*rg^W> UiB^i bjtgM than erhervd oacn cmrrgftti I'aves i wQl > shortly %uLkrd, jllalutnis of pubdernt, rttl|Hi*jl tet ii bewate- rllipi J i 1-4 < in king, with emtre marina Flowers iimstK in <liv<itn i iritditi.il spiL«"» JMI.n.tlK III Hi- lary clmtcn or wilit4n in Ww xkwt nl Ir^it-likl bracts, tpilirt tlrtyw, utihitii; Di illiuiiiii iiji m IS I ID IHIR. bracts brtuulU cltltplral. 0.6-] cm Long pubrtcent, usually mbritjtir ttrmtrtlr? UnrroUir t'i ltd<w, iirjirly 4t long MI the W|MI* V|ialt 'i. llir U<l» Inr.u with ciliatr uMiHin* fruh bhaE nr *»tut<, pubcaont, up in t 12 OUn l'nikj. pilMe i ab. i. v. d . lumri lip gJsbiiu) Sonwni '. - with irrnlr iDtbcn; adaxial (uppr) filament*Hitb an <*pfjridjnr iim.ni!* ih< base; thr iwtiuxl iip|kru tuning mhiced 10 BBjUW



tm. II. ttiftwfiktlm ptMHmufU* M. pan .if inll< • I .mi D, iiprrtrd peu] mbc {4 romi r. wpjilt (4 mmi, d.c. • l*uk urth 1 vftlv rrrtuwed (3 mm).



Flti. IS. *Hygophila polypora* a. habit (I <mj. h, spread petal lube (* mntK t ... (g mm); d, <jpwlr mrh t ... (2 mml.

Flu11 narrow, up < IA mm long. Nrrds 15-25; retinai- uij ii.u.i. ikndu • adomtd

Perennial <n perha> I.I>-U —"—* Found in manhv pU*«. rlrjinv temporary pooh JIMJ in riowl ITHAMK *Jin in Mnmm and raiiob,

[tO)>Hyp \K; HKH. to Indochina bttrdMo and rttiWtltlr.I in w.mr H.iirnrri pMfttoJ N .\nini ... Cev. tod, Nrp, J^A; Ap, A», Bh, IH. C^, Kt, Mh, Mp, ft, RJ.fp.Wb. 0-1200 m

Hygophila quadrivalvis (K IUmilum) Sec* | *H. abata* Wight, // . «i.n/r>/i* (Van!) Neev // *Hygophila* | ... nan R. Ik<<

Stems often creeping, often «OOMIMI woody below, up to. 1 IU ..1 inorr tall, anial pam imtalK hain I. l-n..ijir(petiole up << "i5 an kmg; bladrt simple. Itmrulair lo rUIptkatomir or otmwr. \$.5-4 . -10) cm kmK (3-3) I. I- W tm wide, base rikutulni nr utrniwtr, margin ... »> lo MMnrwhat encmur, up* ohlUir ~ acute. flowers in axillary whorls or occasionally solitary; bracts n-jlr-tikr. bfun^ir (n iibomr. i-9 mm | mn, brwirf>tn like Iwicto bui wdUrt. 4-* mm long Senk 19 mm kmf(. ihr lowrr quiuin to third unMrd bvlow. • IK Vlobrti tVub whhc K.tti pinV I... or pink to violet; <tll luhr it->mm Um%; MUXUI <upp.

lip ± 10 mm long, glabrescent, ciliate, sub-acute; abaxial (er) lip ± v» mm kmg, gtwdulai bail) outside. Stamen OLuwmnt b I tM.u, I JUII J-W mm long, the Mba p<t SJJ-fl mm fanp auhen uoeqaal, I pair IJW mm kxw. tbr <nhr p<. 2-2.5 mm long. Capsules line4i^ihU>iik, (otHct ihin the vpj ... Seeds 4-12. b. 0.7-J J müt in dtuwin; retiiwub long and curved;

PerennU prrh<p> HMnrtimm jrtniul In shallow water *' in "MM** habitau ami also R the banks of ... ttm 11 H often Rnvw ioiw and hmni dri<r »n<le-ipccla .litmpt. h h a very „U*k iprcic wiUi I long. ll.u. and afcMM RUBtOU* tram in •« r coodiioni and •hort, roufHled. my bak> onn in d>^ raoditkmt, In many Indian Islands. MOla plaoti --.h IVHJ ,-thf.iicaJ lea*r* JO.I braiu md drppK tIKtdrd *ful lubt^ air cjkid // wAn>f<; iritik ptasM vW abatae I^IT^ and bracu and ahofik dmdciJ «*|MI tub W. ofaMte. A> there air to m-ms inn innrtjan st

inewporate then all into U f>Wn ddi Lion] j . . . * Fwipn, I bwacw wd R ***** N. L. Burman, may prove to be conspecific. Midi A ... the earliest acceptable name is: ... Hygophila H. ... (c u » t R . a i . w , ... idd- • Hyp/Tcn|, N and SE A<< &u. Coy. In.1 v, . : An. Ap. W, Kt. Mh. Mp. 1,, 0-1200 m.



... M *Hygophila quadrivalvis*; a. flowering shoot II <—>. b hint 15 mm), i. nptaad ... tub* n mm), it. J luhr H mmi



FIG. 15. *Hygrophila schubli*: a, pair of inflorescences (2 cm); b, spread petal tube (3 mm); c, spread sepal with ovary (3 mm); d, capsule with styles (3 mm).

Hygrophila schubli (H. Schum.) M. R. S. M. Almirante
 [H. spissa T. Anderson, Anderson
 var. *auriculata* (K. Schum.) Heine].

Fig. 15

Schublii - herbs with axillary spikes up to 4 cm long. Stems (BH) 1-2 m tall, rarely unbranched. Leaves simple, in opposite whorls of 4 stems and 6 leaves, the outermost leaves longest, lanceolate to linear-lanceolate, 5-10 (-15) cm long, 1.5-2.5 cm wide, axillary.

Inflorescence: axillary, branched leafy. Sepal tube lobed, the longest lobes up to 1 cm long. Petals blue, purple or sometimes white, up to 2.5 cm long; petal lobes rounded to acute, the middle lobe of the abaxial (lower) with a yellow spot. Stamen filaments in 2 pairs, 1 pair 2.5 mm long, the other pair 2-10 mm long; anthers unequal, up to 3 mm long. Capsules linear-oblong, 2-3 cm long. Seeds 4-8 orbicular, 2-3 mm diameter, reticulate long and curved.

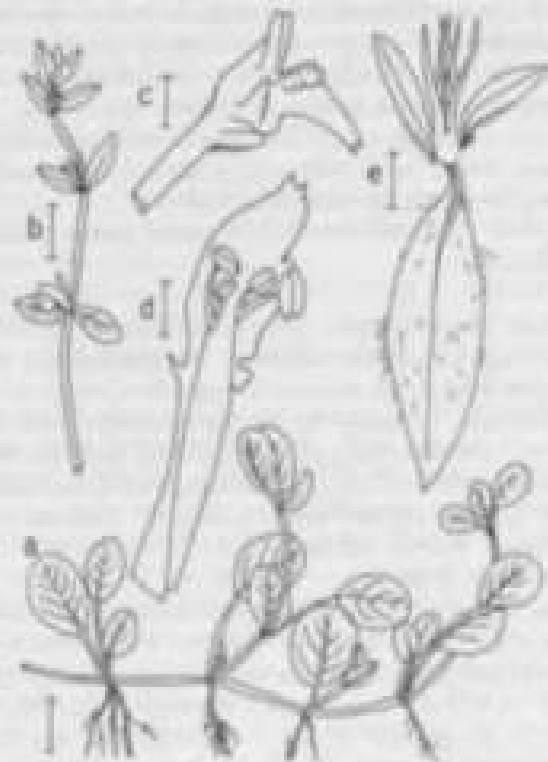
Found in swamps, in temporary ponds, at the edges of tanks, canals and ditches and in rice fields. Often abundant and rather difficult to remove.

M U btt *ZIV *K*rp (ptilfv it h^n Hiuii III)ju|K-tllc-i Milj i\ tivil IQCAUJ I'M d... 'it ilir iiniin «rinul wan and for ilropvv. Srrd v»!< dimmni ulh in marktci.

(Ten. Th p/Tcnl. S and SE A»ia: Ban. Ccy, btd Nep. Pik: A3. Mt. f., Co, KJ. Ki. 1^, Rj. Tn. Up, Wl». 0-700 m.

Hygrophila xfrilia ..Nrr.l f, A... [unpublished] orth. mut. /Ai>ifWim vrfnUum Ncrt, ftygnpkitii %h*kw T. Astdenoo]: Hn)»

hen «>tt>uLj(and nifrtng 4t IKKICI, wiit... oiou a«.rntdig or end llower-tmring *ht«Hi;... ttmM lwan lied. oAefl MDOd) 01 •* « Bfce, D01 DM... .lil«. mden when auhfloriRrd. mudtv nljthjou-... nearly so; erect; liouu imulk umplr up to ± 25 rm tall inii ilviuiN kw. umuklv dcn*rK dodbed in wtdtWi Hair* •bow ^utxnrrged lr*vr* utuuliv d^tirh ilv M, |L, |, | pctlok 0J-1.S (-2.5) cm tang: Wwk-t of mbMH^w) ... rllipiK^l in tthUxiK 01 ... up to 1 S l m long and + V! i tn wtdc. uuuliv nljimm*. *»th rntirr margins, bla!« of cme gnu buwufiCBitta w itfeorit) stalked. liuii r>lj(r tn flilpdral or OfMe, 1-2 (-4) < in long, nund) gtabfOWU mcMitv ptihrrwrnl. with long



h. flfwrriK tbtKM (I in), i, |H-Ml ml* >irwrdr fnwn thr ttrfr <Y mm t. <, qftrned pruj tuhr i / mm l, r. «rp*k «.u| ... n lo and brwt (£ mm l

while hairs and short gkuiduLii HAAUV margin* rni
 Flowers noHtlv in diitiiu t trnnui il spires, u iik- Iwgin-
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 almost to thr bam-, thr ! I Uncai i
 margin. 4.5 mm Jung. Pf-uU Infill'•
 li)fig. pubetreni; aAxial (Urwrr) lip t 4 mm long, ibe
 p^Uic bright blur with *hui>h •HrUingi, glabrous.
 sumen* 4, all with fertile anthen, aotben deep purple
 to black, the adaxial (upper) pair ± 7 mm long, the
 abaxtal flowrr) pair t 4 mm king, trim narrow,
 ± <i mm long. Seed* lit-lit. rnirui ula hand, lender
 andcunrd

Prtrnnul In nunhv pUtet. dijtiit^, HHHW) jKH>II
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 bracts it (i4t iMren named If. urpyll* var. fcodbrmijj
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 becomes whitMb-grrrn and looks wery unlike ihe wet
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 (Linnæus) Nees var. *Echium proce-*
les (Linnæus) O. Kuntze.

Jussiaea guineensis | ft R
 1/ prptmdn (Nrc«) T, Andenon, Ho*iWi«n*

Nees, J. *Jussiaea guineensis* (Nees)
 C. B. Clarke, v, fl. TMfitiiuHjrnAmt (J. (. k..nt(t e*
 (Rushbough) Nees< var. *frpitmin* i Nr«») tUi/MU]. hn 17
 Scems des ntiitUnt., r etret, ma la, i (in wJ), r, idant
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 (-44) " " I M_K. FVMCTI pairrd j& iwtdn. r* h Mibwied
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 ± ft mm Lung. ± 1 mm wide. gUI«.«u or neaih «'. the
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 Umg. tubtdai bekiw. 2-lij^rd. ibr «tnial (upper) Hp
 UulbntK S-l^bed. the ahuu) ilwrr) lip Vlol
 Stamem 2_T UirialK Mtarhrd at thr muar*, jotnol to
 petal i,l>- aJboic the mitdle. ttutunixlr
 hlamtnu united in *ptkw* b* a membra « < l> base;
 anthen £4octibi w* 3-bmlar. the



FIG. 17. *Jussiaea guineensis*: a, habit; b, flower; c, petal tube (2 mm); d, sepal (1 mm); e, capsule tube (1 mm); f, seed (0.3 mm).

each with a taiUikc **appiudair** N" tank-to,, **Katei** **eoatpfa nous**, ,u|.4y-,1 will. 2, 3 or 5 **tobet Owy** jflabtouv (.u>sHlr tMxded. ± 7 mm **bog**. ± <labrouv ,h<- hmv, ,,,,,, M--.I'. -1<1 ± a **quarter of Id length**. **Seed!** supported by r

Perennial oi **MHMIL In wet and** ;).K<V.H **theedgesot** ponds and streams. Also found in wet

and waate places aftei the inontooa E-We..NR at., ,1.,-Knns. Hants with small -mults!, leave* are h rather a lot of intermediate plants is i used recognized [UM one tavon.

M, [ndta to Indochin* Baa, Cey, ted, Nep, Pafc \p. Wi. ni.Ki. Mh. Rj. if

ACORAC1 \i lee \9A* ' v)

w ISMA rACEAE: 11 genera

Annual m p.-t.-nnial **LOWI** b.is.il **differentiated** int.. petiole and **Made** .in<\ Mhrnetged; **adnH kawa occa<tonaHy** UMUIV with **pedok and bawl**

nutteu or in Excluded: *Alisma* is found in the Himalayas but does not extend to **Mhin Indta M** >*. (a^^fata Wltherng: A- <<*"**• CO

1. tntl., Whotltd: **mmefM** 1. **hrfter<cen< MI V * ^** ndked, Hhortod < not; **MMnera 6 < note**

•Mag oodi oudtoe) 2. **g b<di ehto** II.UK-ii. 3. **M,ltri> fUu-nr.l. whru** 4. **him,** 5. **d flattened** eMpdcal lo

bocbicular, with base connate to deeply cordate; all flowers bisexual; nutlets laterally somewhat flattened, without lateral gas-filled chambers

1. **hrfter<cen< MI V * ^** ndked, Hhortod < not; **MMnera 6 < note**

•Mag oodi oudtoe) 2. **g b<di ehto** II.UK-ii. 3. **M,ltri> fUu-nr.l. whru** 4. **him,** 5. **d flattened** eMpdcal lo

bocbicular, with base connate to deeply cordate; all flowers bisexual; nutlets laterally somewhat flattened, without lateral gas-filled chambers

1. **hrfter<cen< MI V * ^** ndked, Hhortod < not; **MMnera 6 < note**

4. I>eaf blades Ix-arii^ MettatC baits, sagittate, with base **deeply (obed;** upper **Rowen** male; **nadeti** •**Wollen**, with 2 **buenl** gas-filled chambers *Ijmnophyton*

Caldena: %<4 ipedec CHd VVoild Leaves **Mbeaierged** or floating, rarely emergent; **petfr** i,les tr.IIIV\< ss<U sepialc: leaf **blades**dliplmal tobtoadlv **ovate** <si suborbiciilai; base **tnfflettc to deepft cwdaat** with **broad lobes**; lips **acute or rounded to obftiar**.

Howcn bisexual. Sepals **iadng** in fruii. Petals whkc or pinkish, wiih daw at **bate fftarnftwf** (-11), **Carpels**'2-9 (-30), **crowded oa** • small Hat N-i rp!a< lc style lateral. Nutlets **laterafij MOMS** whai (latHMcd, smooth, **ridged, wait**) **Of** spinv, isiaalK **perenniaL** Mostly foand growing m ihaBon water. The flowers are pothuaided by **tetectt** The **dis-minnulef** are **owoid oudeu** [or in cooler region* **inflorescence** bulbils) **diipened** m wain oi **perhapi** aKo by animals. **CaUoia** shows **grew** \atiablit\ in form **wad #ae** <si the **leal bbde**, **arnipwring** of the **nuiins** ,nu\ iii **number "t ^><<***— and **ovarte***. **Che drHmita-** non **d ipecki ia tincertata:** ii is in need of a world-wide **taxonomk reviaion**.

Fxttutd't: Cahfaiagmndisii. Sanindsson. it is found in the **eactera HBmatayai** but not in **Peninsular India** (Uke C *pn-nuisstijohn* but **generall**) larger, leaf **bt>** **leathery, noatiy broadei** than long, up **BO 10 cm** wide; **M** **carpefa (&-) LO-lt**.

1. **Bracti I-H fin tong;** transverse s<<i>ndar\ **veint** 1-2 mm **apart, connecting the main veina** at ± •0?> **nuilcts witi** wain ot spiti\ ribt *C. otigococca*

1. **Krai ts not more than 0.7 cm long;** **tranaverac** **sec-** **ondary veins** <t:w>.5 **aim apart, connecting the mam** \cins at **GO***; **nuuetl Midi aaOOta** ribs *C. pamcuriifolia*

(*aldrna oligococin* (F. von Mm-llici) **Buchenau** [*Alisma frlanduU>\um\w-.\|lc-*\|* Fig, 18

ivnuirv up to **W < n bog;** **leal bladei wbroergi** of **floating, niembranom, ova*e-cordate,** .Vl*> cm long, 4-K cm wide, with (§-) 11-17 veins, the trans, **sec-** **ondary veins** 1-1 nun **apart, oonnei ting the n an** <inu

at i 90 **MM** **bate dtipK cordate wuh a narrow ataut,** the **tobet ob** use of ,<utt (ii.iiiv **ekmgatHbuiceo** late with at me ups, **vet**) **large at bast >!** **inflorew em t up to** ^iin long, **becomkig** smailn **above**. **Scapei H**) -! i • cm **U>iif;** **pam< le Compound,** **pyamida!** 15-SS i in long **ami broad;** **pedkefa t-SJScm** long. **Sepal** 2-3 **Him** long, **peniateni** and **reflexed In Fruit**. **Pi** **ovate-lani eolaie,** 2-6 mm long. **Nudeta** 11 •• t **J-6 | 10),** **thiney ihn|Mid.** ^> mm long, 2-4 mm wide, **itmiair**) **i-dbbd,** the **ribi** uualiy warn, **endocarp** thick and

hard; <yle interred ventral* ilmoii ltu1fc.iv down. •., 1% <hort, drtiduout.

Prirnnidl or perhap* mrammalh annual In tuiul niK pcrjt4Mni-ni Ql frmpof} Hjirr in Ulv%, fxn,K 4/M| vry U. rt.lv fIONfaag riven, A way MdUble VMSOB^ p*r-tit alii K in lhe*fnl|.iiiiiiik; ^i the fiuil

JO? H^p|. W Ah b f SK V*M ind AUMMIU: BJH, Cry Ind:KJ,r|.l p.Ui.

Callitriche parviflora (L.) B.S.P. (var. *parviflora*) Parb var. *major* (Michx.) Btiffhriuu [^mfvtnau/olia' 0 th. mm

Petioles up to 10 cm (-50 cm k>o({; | at base [M M|h. merged or Botfajg, leatfaefr, rllil/(M,.i m MiboH<i<ubar or rrrntlorm, t2-> Mt (-121 on Um^). (2-) 4-8 (-1H)tm wide. *ut> | l-lfi (-17» »nm. rh rautcne nrljM vrin» 0.3-0.5 nun Mp<it. common dug ihr main vctiu at ± 60*, lxuc itn»,i, 1,. eonbic wuli rounded k>«>. B m u «bifm<-ljjn<..fjt. up 1,, 1 //n kwjn- Scapn 30-100 cm l..n. panic ir caapumwl or r-rrh simple: j<edicels 1.5-4 cm. l.nK, Fiotmi b wfioiU of S wineUm<ft pr<.

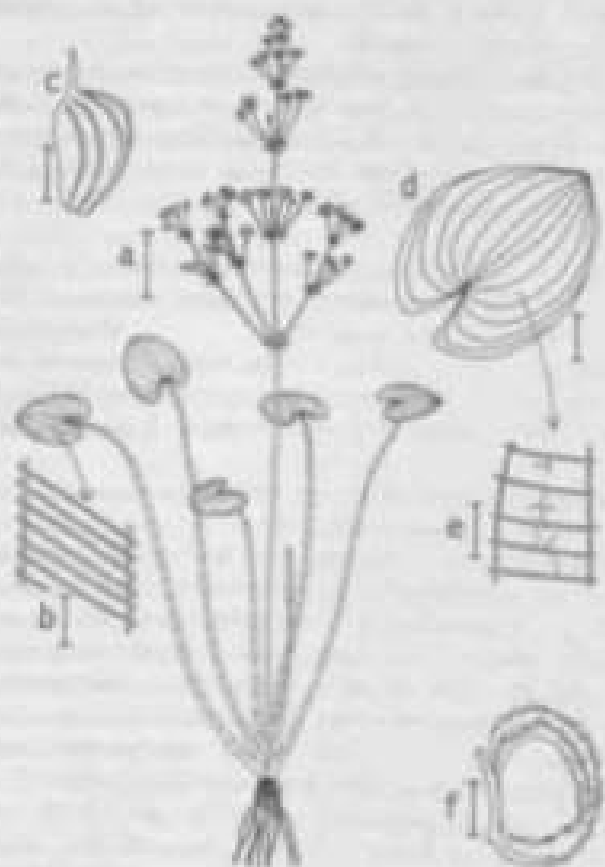


FIG. 18. *Callitriche parviflora* (L.) B.S.P. (var. *parviflora*) Parb var. *major* (Michx.) Btiffhriuu. a, leaf (2 mm); b, venation (2 mm); c, muutw {t mm; f, ttuUci (1 mm). I C

33-4 > mm long, erect or spreading m fruit. Petals ovate-lanceolate, 4-6 mm long. Nuclei 5-8, ellipsoid, weakly flattened, 2-4 mm long, 1.5-2.5 u wide, dorsally 5- to 5-lobed, the ribs, mucous, pale subventral, persistent forming an axis, fruit.

Perennial. neni shallow water, particularly in lakes, on river banks and in *Jp». Uort 1,, diam outflow have recognized.

species but on a world-wide merge with (perennial).

(Eph/Ilp). Warm and tropical Old World. Inf. Sep: Bh, K, Ms, (Up, Wh, 9-1988)

Limnophyton: 4 species: tropical Africa, SE Asia and Australia

Limnophyton alatum (Linnaeus) Miqun: Fig. 19

Plants with milky latex. Leaves erect; petioles up to 1 m long; leaf 4-20 (-) cm long, 1-2 cm wide, glandular, with 1-2 lateral lobes, venation pinnate, base cordate.

* ~7. * «* ««• «« II* lit* who* with up to 15 fl. bearing female or bisexual flowers. Petals white, obovate, larger than the sepals. Stamens 5-7.

a relatively small receptacle, short pedicel, short beak. Nuclei reticulately striate, 1 mm Lm. with 2 lateral gas (1 1 1)

lit>M.II Of perennial, juvenile, submerged, emergent or seasonally terrestrial, shallow water in tanks, ponds, d sometimes near, hr

disseminates or modifies nucleus chambers, probably dispersed in water. Economic impor-Ian* > inkno,,11

(Eph/Ilp). Old World tropics: Ind, K, M, (Up, Wh, 9-1988)

Sagittaria: - t / in the most species in the (Hd World) species are spreading in the (Hd World)

Leaves submerged, floating or emergent. flai bul tomriimr* mfUtr.i JIMI >p. blades of the

cordate at, hr K tri! sometimes floating, with >-18 whofV r* h

h«r»u»] or IIMW m a purp^ an, (11r base. Stamens 7 to numerous. Carpels very numerous, spirally

long U anthesis. the lower pan elongating in fnni. Flowers sessile or subsessile. in whorls of 5-8. the towrr 2 or 3 whorls female (3rd whorl sometimes w.th b.sexual (lower*), upper whorls male (sometimes sterile at <he tip). Sepals ± S mm long. ± 2 mm wide, cream-coloured. Petals shorter and narrower than the sepals, crearrwcoloured. Stamens 3. Carpels 3-4 (-6); styles terminal. Nutlets ovoid to globose, swollen, ± 5 mm long. ± S mm in diameter, with 2 lateral gas-filled chambers inside.

Annual. Often gregarious on flooded land, in temporary pool* and marshes. The juveniles are sulv merged, the adults are partly submerged with emergent leaves. The (lowers are mostly unisexual and prohahly pollinated by inserts, although pollination by wind is possible. The diMeminules arc ven hard, moid nutlets with 2 ga.vl.lled chambers, dispersal probably by waier or perhaps endo/oothor. Flowering and fruiting after the SW monsoon. Sivadasa... M- WTmna tnandra, eine sehr seliene und wenig brftan"» Alismatacee au. indien. Aqua-Planta *» '•'-'>' (1986)

iO Hyp), Endemic to SW India: •In* H, Mh: records from NE India nerd confirmation.

AMARANTHACEAE: 70 genera

Herbs. I«avn< opposite, eniirr. without stipules^ Flowers inrnnpicuous. in axils of thin bracts, each subtended by 2 membranous bracteoles. Penanth of 3-5. free or nearly so. dry and membranous segments. Siamens (2-) 5. usually alternating with short pseudostaminodes; filaments united at the base into a thor. tube. <varv superior. Monitor; ovule solitary. pendulous from a long funirfe: fn.il 1 ^ d e d capsule

Excluded: the following are not wetland planu but may be found in places after the flood water has receded or in dry rice fields: *ABmama nod.fon*, (Unnaeu.) R. Brown ex Wighi [*A Umg*p<i>*»««<<<> (Trimen) CUmble. <J*m»** *aibida* Moquin-Tandon. C « ^ , MoquinTandon. C *duhotomo* Moquim-Twdonl not to br otrfwrđ with *AUmumth** nodfna* R. Brown; *Otm* -rr ^ « Unmm* D.«rro m«n«ta (Unnaeus) M.r.ius V. *aU^oUn* (Linnaeus) Ascherson et S. hwnnfurt. I) *rv*nm Forskall]; *d sphernu orleu W n Mliiu. : S A»)r r r r a. <Ind; Nethosarum Linnaeus) WiBht; Pndotrichum Arringhaus (Roxburgh) Moquin*

I. Rnwrn in Hr<r <*»®*. axillary heads; stems not ribbed; ... with 1, Flower. ... clunK-tr. pelun* tilair spikes base nowm wd fmiu incmwingK dirtani towards the of the inflorescence; item, ribbed Cwfcw

Ahrnanthera [*ArhyranthS* pro pane, *Oomphrrna* pro pi>itc, *Trlanthrrra*]: ± 80 species: tropical to warm regions of thr world, most in tropical S America

Stems not grooved. Leaves lanceolate, ovate or obovate. Inflorescences axillary or rarely terminal, sessile or stalked heads or short spikes. Perianth segments 5, glabrous or hairy, equal or unequal, the outer one not terminating in a subulate tip. Stamens 2-5; anthers 2-locular.

Herbs. Probably cntomophilom. Diwminules are seeds or stem fragments

Excluded: noi considered u> i»- »> u.uid plants: *Atternanthera ficoidea* (Linnaeus) R. Brown ex (irischat ti: America, <Inrt 19S9: *A. pungtns* Klinth; *A. teneUa* Colla: <?Ind; *A. nodiflora* R. Brown: Australia <?Ind.

1. Flower heads distinctly pedunculate, ritlu-i KI m'tml or single at nodes; stems hollow with ag<

A. phduxcrmdn

1. Flower heads sessile or nearly so. either in < ItiMcrs ui pairs; stems not hollow

2. [x-aves and (lower licads (lusiered; perianth scgnirnts unrqiiia. each 'i-ncr>fd; fertile siamens 5

A paronychiouta

2. Ijrvr* .Hid lli)v\ti heads paired; perianth %cgmciiLi equal, each 1-nerved; fertile stamens 3

A. rrrridu

Alternanthera parxmychioidn A. St. Hiiiire: Fig. 22

Steins reddish, prostrate, creeping, branched, mat-forming, ± wliiic-villous when young. 1-caves clustered, subseuile or peiiolate; blades oblanceolate-elliptical to ol>ovate-rhoinboid, (0.5-) 1-1.5 (-4) cm long, 0.2-1.2rm wide, white hairy when young, base attenuate, tip obtuse to subacute. Flower heads sessile, solitary or 2-3 in clusters, nihghhcMe to oblong, someiim<-s to 1.5 cm long. 0.5 cm in diameter. Brads ovaic-a<uminate, mucronate with the excurrent midrib, ± 2.5 mm long; braneolrs like bracts but narrower, deciduous. Perianth obloug-lan* rotate, 3-nerved, pilose' on back, unequal, the outer 2 larger, 4-4.5 mm long, the inner 3.5-4 mm long. Stamens 5, all fertile, alternating with short, subulate pst-iidoslaminodes. Capsule (onipressed orhirular-ftlx ordate. ± 2 mm in diameter; seeds discoid, ± 1.2 mm in diameter.

Perennial with a stout vertical routock. It is not confined lo we I lands but is found in sandy places subjected to periodical inundation, such as rice fields, river banks, irrigation ditches. It also found in brackish water Often mistaken (or *A. VuitA*.

(Hel]. tropical America, naturalized in N America and the Old World: <Oy, <Ind. <Pak: <An, <Ap. <DI. <C'j <Kt, <Mg, <Mh, <Mp. <Pj. <Rj, <Tn, <Up. <Wb 1961.

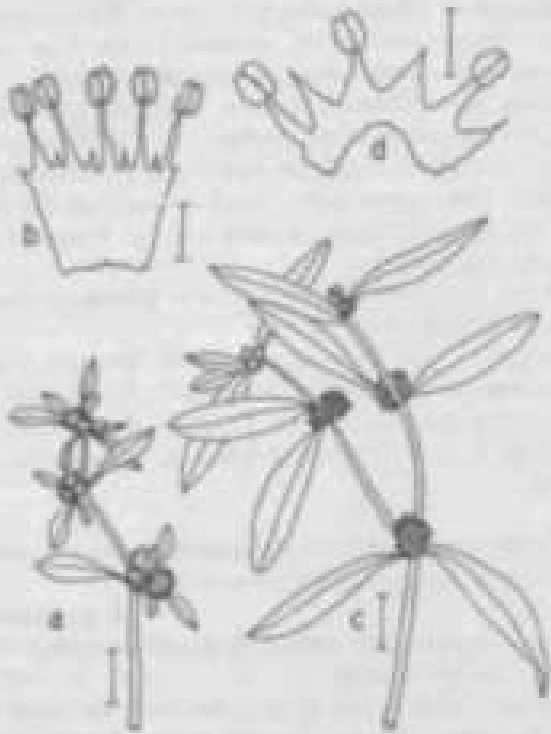


Fig. 24. *Amaranthus phoeniceus*: a, put of fkn>n n.* that* (1 cm); b, lumirul luhr (0.3 mm). A tuiki i. p* i of Mo*..

Amaranthus phoeniceus (Mvtiut) GnM-Viurti Vtg. W
Stems decumbent, up '•• 1ft m of tiw>ir k<ni(up KI
 a 5 nun ihii I, beguiling hullia* .irul llalfurd with
 age, usually l>>ll« It fnjiuln" <l below, liiminn 1114U.
 g. lalanaa rcr rp< for a tttf> or t ol imilw Titular
 hain <ithm ihr kal tuwv Leaves pairrd, UtdM
 base n<rti[>t' al. 2-7 (-9) cm i kmg and 1-2 cm wide,
 •r »t tl* tip*. Ki^M-d wilt a unn »pir>e. Uprhng at
 the base to form a shoot period 4 h b w hh day p
 the srtt. • FWr^tt hev k ttntflr in kaT axib w (cttnnal.
 whltr. xlohov. i I tin Hi dumrtrt. pntti>
 |K.I r irwirr UH^%. up W J I f i nun
 tUd Kiwv and brattrolr* 1-2 mm U>n^ Perianth
 trgmnu t rqual, t 4 mm Lung, fjlabrthHis, acute.
 Stamrn* h. » rJMMI Mamin-
 ubes filaments united below base < »liori tub<
 "Mflf try pacttdo-OVMto. Maturr fruit and »red%
 not seen in India.

Perennial. The rrw oAcm farm tangled
 (ofien pviK H*.ni>n) <f alfHig the th*mf. Seeds
 have IKM been reported mittide ii> naiivr rang*. It b
 often contidrrrd in he a *ry common weed. I*o
 insects | Vtmhi fc^i^aifiii. l'«ffH H 4 <> rerd n
 liwrlv (M ihia fwtie* 4ml we uaed Rw ha tottitot In
 Ch Ins, hMwrt. n u regarded at a taluable fowl

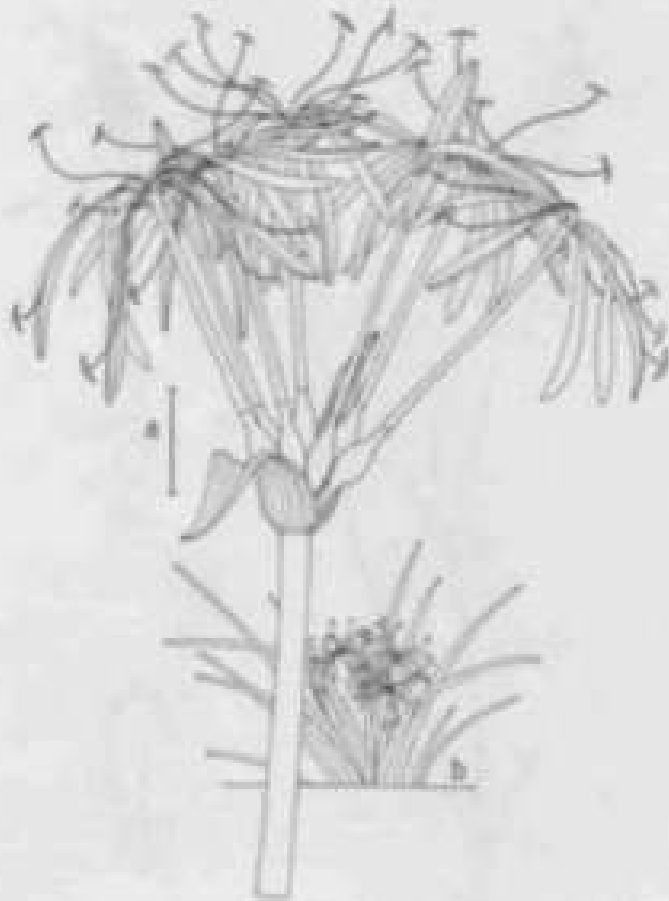
MOck parm obit) p>K^ *» « **WW iued • a green
 manure it H JW, ami Ill tnrdrkine. in WrU Be gal is is
 *old in itM markets *» n wrgruble. Mjptniibt, N *
 and BarifijTC. R. V The dutribuion Bftd n.piii>ii><<
 - U AKFTMiUMA ^ub<n<HtnL ftul- of *h*
 BOM^ial Society «!BcT^alJO(1-J): H7-1 «ny76> -
 Hlvji t(10) Natter in V AmerKA. rutttalurd in
 N AIJH Ik a. Aata and An-1.-t^<Ban, <Buf 1922, dad
 1940, <Ch, <Cl, <E, <G, <H, <I, <J, <K, <L, <M, <N
 1961, <Op 1970, <Ox, <P, <Wb 1940.

Amaranthus amarus (lifMMaa) it rUnwn cm A. P. dr
 Caudille (Amaranth m (ntwln Lamock, A. imn(*#
 protata D. Don): 1: 22

Mrmt ptmnair. MOaJh miwh b <l. forming
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 roou M notlen. with a iiunn. I uimli
 iikwtw r>rh tide *W ttw << - vjB^m
 paiml. K<*ik- or nrrtv *»: bUdt* lanceotaK la
 Uie or oval, US (-13) cm long, 1.2-2 (-3) m
 ided lo am at the np<. CUM-JK aj ihe
 ire<<brad* pkirryj CM tarry in clusters of up to 5.
 ^hlte, gtuhok and *+*i^r jt jnthna, t 7 mm <* diaflK^
 ter. t*i owing fihnditr A) in IrvtH. Bf J



Fig. 25. *Amaranthus phoeniceus*: a,)kM1 "4 a floating shoot
 with inflarnrcctct (1 *») b, longitudinal section of a
 Ann (2 mm).



He. ti. *Otm mvmfmm* *. tnfW**crticc i *nn(, b, tuhit

lrrwuiW-. t 1.3 cm long. <Kary inirrfc*. *tadk* or wib-
 •ruitr. !H*KUUI: fruit a capmlr v.nli irir^ttiu (-
 Milet lrw Style* purple. C>p*il<^ up M>±S
 in <li*mr |er.

BOMKNM (H-Miinial. Lmrs «ufemcigcd or rmtrjertu
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 but also mcardwl from m*mp* *nd nan

ftnuin permanriih •ibmrrKrH m mAV «In -
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 at right and see fragment. in <he muo

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 unkiKmti hni (trnhwMy by tnarr.

I Hyp 1'ii! I' <rhapa endemic to the Indian HtU
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 Hi

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 pou»H or umplr, (nlkMnrrmrt - 1 or
 •topic umbrb. toMetlMr* in bc«d« m

prodim •utc UIUIKI. 10114W Mibrnded by bracti.
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 r«tully n-mnirirkaJ Scptli 5, *tauapkwui* muMr
 U«Mu or abarnt. Pruk S. u>ualh with mlir\|nl tip
 micnnl on ihe dwk abtMr the »**<»>;
 Mtthrti vn«Mik-. Uwy t-kvulw. 1 mukr in web
 lurtdiu; **k*i. M b^e unimt and alkn wot m
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 oO-cofiutimtig tubci l. dpumt hrfwrcn thr rib*
 on bMh the dcrwl and the convoiwmI sides.

Mukherjee. P ft. «nd limnjii''' I. I'uchelliterat
 (A Sacce) of India. Oxford and IBM Publishing, New
 Delhi: 1-111, 1-279 (1993).

Excluded: Himalayas but not
 extending south. **hk** : *Besla crata* (Hudaon) Coville;
Gnaphalium Linnæus; *Stem* *latijugum* C. ft. Q
 Found in damp ground but not a wet
Kalambha *sanchari* P. K. Mukherjee et Constant.

1. "wma stout, cre > »f JMrendttiit; leaf blades l'''
 tuirlv divitrd; *tUmr*% in ciMnpound timbel»
 ibe lot bUd«; lmiu crtrlr M nr*rh W

t. Sirm* lilUuttn. «f4utt-lIsj>. rthHing at *ttodr**.
 bbdV* rnure or palnuirK lobed; lkmrn tn
 umhrlt ur ctiuien, irKonapytMiu*, *bt*nr* heluw
 »**
 .ilened

2. Lr««t in tltwrri t* l-6 cm thoti •b«*ttU al
 leaf blade* rnitr to d
 ihe baw. Mipuln ab*et. br*...o«p*C«

2. Leaves with <MT% IM trtrtrtmm pafcrd M DodM
 Made* palmalrh lobnt pcliulr* IKM ihrtttiin* »*
 Haar; uipulr* pinmi. kmuh* ri) he* t* *mt tm**l''.

Gentle 1 20 species pantropical
Gentle *mitia* (Linnæus) Urban, Fig. 20

SH f. M.i+m ltr. wMialK rrdctnh. fa
 i.wum.jj-*tr,*ttrweti-
 UHWU al rath node, dMiocdp prlWilaar: prtMiln l
 (MO) cm long, *fer*tbcd bcknr. Made* *imp*
 hm to orbtruW, QS-9 (-7) caa loo^, 1-3 (-4) cm
 btoad; mafp>. rfttirr of *trnMt* to cwnale-a*
 Uwbek borne opfHMa* b m , titnptr. aD*MT* *
 together; unilocal bract 2, 2, 2
 peduncles '-» (-4) cat fang (much *mnrtti* than «hr
 •—*)• n«wrf» urn art) 3, (be aaidde
 •mile. prdkrU O.VI mm *Umg*. Prtal* *
 Finn mold m HWaaajlr. fl«itrnd. K3 mm
 V4 mm broad; merMarn* V tu IVtinbnl,
 netted In uwhrn r %4n.. »| mIm *b«-nl

Perennial. Floating, emergent 01 terrestrial. Polli-
 ru.nl bi
 flattened m r r k m H » prol UF:KA:IWA p w y by
 water M anfan* l < » often #PBFtrd * a *rrH b* h
 prohahrv n. a very troublesome. 1* » WWrtifflei RTO<<l

botdfan «rth * <i> » at erate...
 hrtb ami 4, m< »
 throughout the year.

(Holl. Paotropica: F... Blau, Gey, Ind, Nep, Pak
 <An. Aft \r, As, Bl.. "l - t Go, Hp, Kl, K, Mg, Md,
 Mp, Or, Pj, Rj, Ts, Up, Wh, 9-2500 m.

Hydrocotyle 75 species almost co«iH>po!iUii
Hydrocotyle alkarpoides Lamark L. *renouletii*
 Roxburgh, *H. tenella* * Hamilton ex B. Don,
H. verticillata \ Weh<fd, *H. renouletii* var. *minor*
 Bhome, // *colligata* Molkenboer, *H. peruviana* Hance,
velata Miquel; Fig. 27

Stem* m.fc*mp creeping, branching, rooting *
 nodes, sparsely hairy or glabrous. L. on alternate,
 borne singly or in pairs, distinctly pcriobrite
 with stipules, at - in cross or obovate, 0.5-1.5 mm | long, acum-
 -ate, (0.3-1) mm diam. (0.3-1) mm diam.

IMM <-4) enfant bl*W-IDHM ort*utai
 0.2- |J 1-2 M ,n l long, B*4J <S>

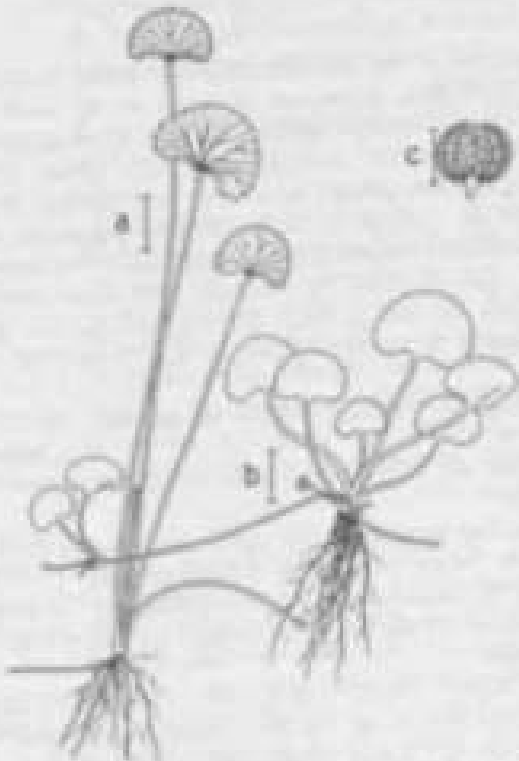


FIG. 26. *Hydrocotyle renouletii*: a, aquatic shoot (2 cm); b, stem with
 terminal umbel (2 cm); c, fruit (2 mm).

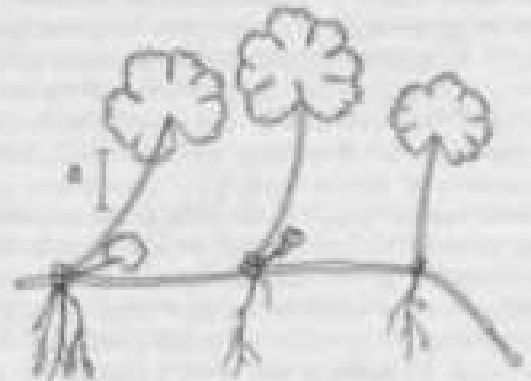
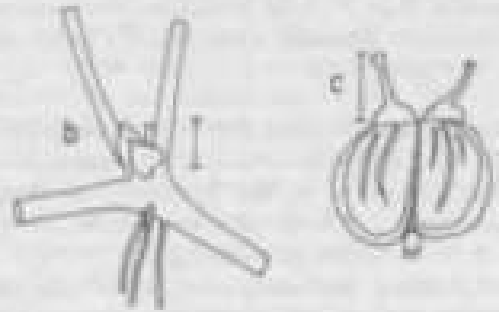


FIG. 27- *Hydrocotyle renouletii* (2 cm); a, flowering stem (2 cm); b, stem with
 terminal umbel (2 cm); c, fruit (2 mm).

l> iliiui. \ i Irit halfway dowi into 5 or 7 l*)IK->; lobes
 brruit. in COttMt b^M SOL >nrlflappinn, gtabrrKJ* and
 ihtntng ibovt. **ith «<4ttcrvd conr<r hail> l> with
 margint rrruiif, lip* «Innv l'Inbrli
 solitary 9t node*, timpir. A M H- U> 15)-duwrml,
 i ompori, giohnl M ; nnoltu /A\ hi * l* inuitr. |K^IUIH U>
 0-1 (-3) cm l'''K (iiuulh »hi.nii-i ill nt ih<
).
 nowm tnailr m nearly »». Prtab grenrnbh-whiir. him
 *uborbkubf, wnn>nlv (latimrtt. 0.7-1.3 mm long,
 1.3-1.5* Htm lnrtrjt; ntfiii *r11» ^IJ)M>Hl», ril» 3, tube-
 I, dliliii, nil mhrial»» IM

Pwriiiii.il M |«i1up» WMit limn uinu.IL In damp,
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 |§ OBCHKtnalh r,(trn iv .i w yi t.il.lc- .irul uird In lirdk-
 cinr PopBosdon l« bunuiit prrlup* Miu^arnmn lhr
 dppvminulc* ,m il.iUin.il nun. mpt pmtnlitj ilitpi-nnt
 in imvA, ln WMr t>t |*11UJJ« In .iinm.iK li \ \rn \arwl>lr
 and fil,*in in tutin DUffitlIMU pooch drfitwd ^MTITS
 haw l-<n .l.wnbrd. 1 hvM J«plit<i<1 .i luiti|n(iif j> .luy
 tO? HeJt. Warm antt U qical Vwt, inrrntutrd in lhr
 New World: Ran. III. a, Gey, Ind, Nep, Pak; Ar, Ah jk.
 W, Kt. Mg. Mp. Sk. 11. (p, \1» »i * <Kl m

Occurrence: C±40 ifwcin: tmmh icmprair wid tmpkal
 S Hemo. A-^ j wetland pperWtn fndu

Exdurird luund ID ilic Himalayas but nui extruding luutlmjfrtv OrwmAr AooJwn C B. CURkr O. ... IV (I.irkf

... {Roxburgh) Wrfilu-h eK A. P dr " ^ V H V . O. in ... WsJBcti . v \ [' de * ..liil'.ilf a hnifainuu ... s K-II/, O *.6^fA («j Wnlff. O. ...

I hum. *Stum lanwatum* Bluitu'l Ftg. 28

strm* ll*M(iti«. *»ccrnljv n or <n-t t, 10-1*10 run long, intemmtc* often Mvullrn. i-miing at to^rr no ... Leave* bane ringl) M node*, petiobur. pctloki up to Ll) cm long, ulirjthinji .11 ili. bue; «tiputri jlitcni: blifuWi l-, *. or rarctjr nuirc-ptniMic. trgmmlH ami" ... n.immlv oMixif;. *cir.i" <- tit pinmiiAd l mix 1^ OCCC cum pound, trrminil inM lateral; pChiiinclr* 1^20 OB lunn: ri>s 5-15. 0.5-3 cm kiriR; fvtlktU 10-25.2-5 tm long: inwiliHul bract* incofuptcuotm, lunim. rnriu <r KMBM St jui* up ifi ll.l mm long, xi iir, nm.*] Mtttrit in FruU, Frun elltpvokl (< tltnoH qrttiMbkil, trrrlc «r tit-ark »>, 2-3 mm Umg. fl.f»-! mrti wwr. not oooofetcd <i iv n- ... «. »n(r baar nmkaL ... >«piciHMu^ ipil ittbn solitary brtwrn rib*.

PrrrimLil. In o^mpfr, wri tniKkhr pbcci, urn g n » di MM) iloi^g ... ad Mam <hjmrU ... by iuciti. I hr itmriinutn Uf crurky mcr- ... ftnpctrtii n MM i » (Krtutpt «H> by anhnk, ... ti>hvjir<l H J unrtjftlc (meat other tpecic* u r podootMI. It > w n ijuuhtc and |4A*J in ... miurroiu poork-drfinni »pr,rt haw lwn drartibrd. Ih*w f<4Ui*««i J 'ltiin|Mi^ j-.i

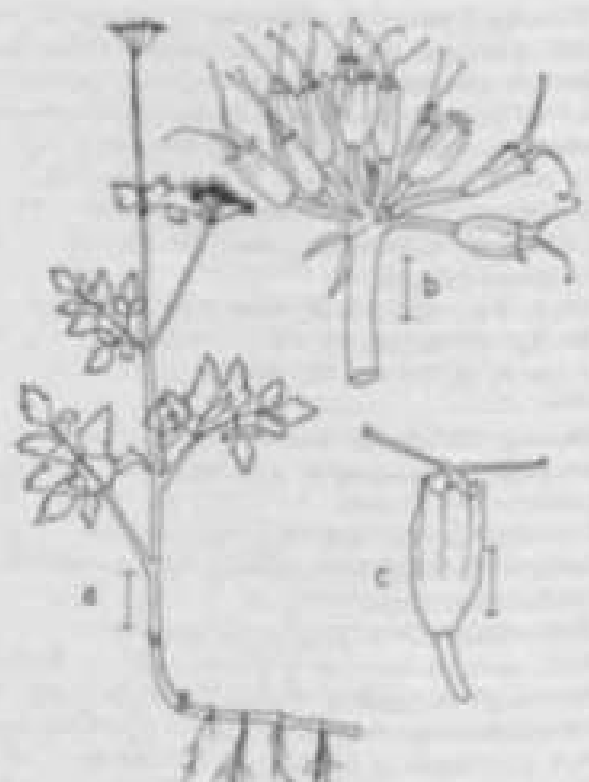
Il lv> MrI U^rm III trufikal SE «nd K A»u and Vn-lrJIA: KJti. W»u. Huf, tod, Ncp. P>Jt; A*. DI. Mg. Ng. P. R. Sk.1 j.. VI, 200-2500 to

V* »N<iCtTONAf IAXi | genus

Aponogeton: 43 species; tropical to warm regions of the Old W., 1.1

SICfIU tubcfOttt OfitismiTiji<iii> I i . . . radical, lq tuu>l r<wtm. lifirji >r jH-ti.ijif. tilulrt line, ... amr: nuux<*r rntirt, KMnrtimn crkfrd . . . «r Fbwrr* unimual «r Uaniul. tcwUr, borne in ^ika. Sptkct tudkrd, usually dongue, totiu? of tm . . . more, cmctir^ -bow the w i n turfKf. whoi n. out eowloped by a cadutuus oc prftmrm nfuihr Pcf UMI) icfiiimli (0-> J (-6), prumtkr *ir b- m^MK prrMurm Sun tu 6 cw nwrr . . . iprnw, carprb 3. 4 << r-riy fc h** . » «u> inul' each ovary MfTowrd tauo a n>k with an adrabl «%tnMk n*nk» t - U ta Cfch rupeL FruU* f.41.

PWl >uO. Jmrnilr pUm* «iilM>crx<d. ih. . . ItMiutfj or . . . j . . . in l-. ihuMn PolknMkin by . . . or prHup* «am>



ltaMtt (1 cm)

b,umbri<itih>.MMikfiunm<?mm>.«.lruH (1 mm)

tod. Tht TIBiwiniilli *.r trnb. bulhiU <f small plant vi», diipnrd m WJ¹ . . . I nun! Tlw irrd* do not mrvtr tlniiraurjn . . . n rrrmu . . . %ill on thr nioihr pLuti Tb« piunu m***1x1 survive ihr dry prn<l » a ruforT or rhUt-> . . . Several specie i air . . . i|«xur>ltw pulp*. . . Ul ha-m<it (um hern m* <lr The tubrn ** .prt Kl rjirn In hununa MM) ihnr hvr*liM k Bruggen, H. H. E. van. !<NK>r>oh nj thr sm«» Aponogeton, Bibliotheca Botanica, 137: 1-20 (1985).

1. Plant* developing bulbth or pUi . . . inJJ

1* fUiit not developing bulbth or planuro m*ir*d

2. Leaves semi-erect, ovate f : lraT Uadn thick and brtltlr im<ie to cniitr. * -7.5 cm bCH, I K-S S

t. UM wfamrTfttl or floallnit tr<T bUIn ' . . . a.

> InHt. . . j ipdu-s. fkff>nt uni" . . . pblt*d Mn VHH. MX drrrkiotnf iufararT|rd W * « . . . ung leam UiicrolMr. S.S-M tm long. 0.5-1.1 cm -MW U Ihdi*, Uah<f*Mr*>

V Intl.rrtcencr I tinjlc ifiikc; (lower* bitcxu.i!
 pUnu motionmut, **developing** MJHIM-TRCII lcaurt
 C Sjmthr perutimi; tlm m((untlirth: jwrianth **Kg-**
menu firifing oil jii-t Bowming A. wKhdbiw
4. S|Mthi- IJIIHK < >) before jmhrii*; perianth

5. Mwtfifjnd lena uiaagubu bo owe plumule
 »n.u **bed Jt ihe middle** irf ihe embryo (Vi IJUVAJ

5. Nuhmriged kjtVri **narrowly** write to linejr.
 plumule **bawl or let** rrrnai

6. Plumule trmiKuL genatttMta| embxyo
 warty t vtivwufil **Midi** • vliof 1 < > t >mi> tinjr
 i i a], ± 1 cm lngg appriutign (bf* IIOI
 bk: • a*uil S anil K Intlu i

S, IMnmuk* tuul. **yataluiinf** nnil.i><i **nnootfa**
 or il run^! linn b>M <M>mnil mill irittimiil

»|H-mi>.

7. Rlnj;omc< ivtindrki] tircpinx. up <>
 l'< < iv long, up la 1 ini in dumrtn; **nb**
 inri^nl **lcava** ">?". lutid-<hApcl. with Hal
 margin*; floating Iran-* abriit (Sri I L)

7. Rltuonwr* tuber-like. **nel> longer than
 wide; **wbuwrfBd kiiw** n*n mjui. **umtotAf**
 orate lu linear, with tnniubn M itwped
 margin*, floating lea* << often present
 1L Perianth tegi. ><, turn lew than
 4 mm limy; anihery yelki* (MI Initial
 A *Lt. m*

(L Perianth MTfnueni* vtliitr. nml vHiki or
pBrpk • Mi-ui 4 mm lon^L .inihru
dole)

t. IbBkki with 1' ieed>. up K> IS
 (-1H> mm Umg, up in '• (-7) mm <H
 smooth or with ineguUr **WCTOCX**
 witli • Uiori terminal beak; seedi with a
 simple coa[(Sri **Lank***) **A.tritpm**

f. FoUklrtwith t K <eeii>. up to 4 mm **ltMg,**
 up to **US** Him wide, unocrth, with a
IQO| <>|) n 1 Dm)) triinmj] beak:
 with 4 litMibr i tui (Imiu atitt Sri Ui
 A.

Apmmftam m^nnUunIMMv a, tnllldmnmrr (6 cm);

TuU-i iri,|> iti, u> known, up to 1 cm in
Sttbmergi < li-4. 4 ; peristome, peristome 1.5-2.5
more long; hladn mnmrij ettppicai, lft-iti cm M
 n»ore kiriK. up i- 3 cm wide, base and **dp aMettC,**
 (rMrgint (Ut Ule, nndnb wiile with 2-1 parallel
 » **rMrch tkle.** H-WIHIK **kIIM** ahwm **[aflOK]**
 <c * trngle tpibr. up 10 ITuni hmj. <|Mi)ir
 caducous, 1.5-6 cm Uni({ fmm **blvtual.** num.l >n

all directions Perianth segment* '1, white, pri.il Itki
 obovatr. **0.7^t3fi {-%** mm lon£ 0.75-1.5 (-l> mm
 wide. often **Wfckl** t|>4n J>»m " * * * * * * * * * * , niungly
 wilewud **tiiKJiiU** the lwv; **Mtuher*** pale velUnv. **Ovarie***
a-4. Poffldei I "t l^edad, t **11.5 BUM I*M**. I ' . nan
 wide, witli -1 >ln>ii, K-nutnal beak. SeetLi with a timpte
 caa: **geradiiating** • mlrwi t IOmm ImiR. ± ^ mm wide,
 wAtt\ ^inl cniwned with st **wtnri** <>* bent, linear or
OOM JI appcnda^ei: pliuinih- **ICWtinil**

Perenni.il Near the roa*t in **freth 01 bW UA** lakei
 and backwaien, in water up to 4 m deep rfiumii itir
 rains when thr hnvkiitli watrr it llU>hcd IUJl liv the
 mltwcon uiii- Ftoweruif; from Augmr (o **Dtcefldker.**
 The rhrrrtrmf ^tc rtravette< **lajHMBrt** JUCI !-January
 l,,it H MI 111 Lake Vembanad, KI.

|Rud Kndc-mir la S lmlt* <tnd: KI. Mh. Of? Tn,
 Wb?

Apmmftam bruggemii S. K Vktan M R. S. *Cowbat*

IJkr A. **uqur** hnt **U,u<i iir-uK** c i m. **g**
p rictoles acatch 3angh 1<Jl **blutir*** 4fhktUR >
 <nrdMte, ilm I. dtfk Kirn*, jrtul. Inmlc JI mwu
 •ad I IM » timet **M lmtg** At **WHIT;** avwie* blue;



FIG. 1f. *Apmmftam m^nnUunIMMv a, tnllldmnmrr* (6 cm);
h, habit (6 tn>>. **C** Kermln<iin[rnrbrjNi (6 mm).

nan ... ui \liuli ii .il, three lime\ M long ** ihit L, siiiKPIh. HrdKMI 4 lonniHidiii.il ffrMin

IVirtiilii.il, Hirvning ihr <tv period M tubcn Knt>wn only in rkr field*, II U dtscnbrd and illustratml b>v feawaadGoveiarinRhci ... 1^54-36 (1994) and Aqiu-rUiiLiKiill: V t l (1 990).

[Mvp/Ten?]. Endbnk tO W India: •In,I Mh

Aponogeton crispus Thunbrg M ... [redacted] TIR. 30

Tuber ntxuwwl, tip n> H fl in (tUiiwirt. Stihmrrgrd lcavrt peiioiaip; prtiolei *Ut-Vt em* lottff: Uadr* Until 10 narruwh/ cwsiu*, 10-2* tin long. 0.8-4.2 cm wide. Ufuallv mnrr ilun two and a half lime* as lung u 1 ... MrxiWe, baw «nd up runcafr or roiu'n'ed, margins unduUie. nud/ib wide with 2-4 parallel win* on rah tide, floating Iran* ocratiotulh aharni: bladn *Uv* ... Ulr tn inwr, up 10 JO cm long, up 10 5 mi w«k. hate funded or cotdatr. tip rounded ur cunrate, midrib KMIC. v.nh 7-11 wtuiMLu> *lnti* batkwemaa* * wnlr «plk; up 10 IS mi long, fpathr t aducout, up lo 25 mm long. Howrtv IIIWXIJJ, turned in all dbtctiout. Perianth *cgmcnt* 2, peul-hLr, white, pink M pale violet, up t.. SJS HUH bag, up t'' l 7". mm wide.

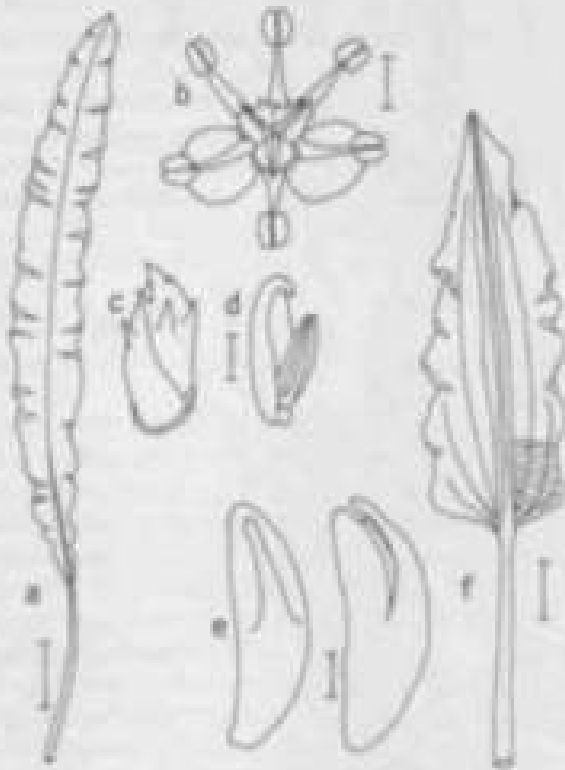


FIG. 30. *Aponogeton crispus*: A, submerged leaf (2 cm); B, flower (2 mm); C, fruit (2 mm); D, germinating embryo (2 mm). A. *jacobsonii*: A, submerged leaf (1 cm); B, germinating embryos viewed from back and side (1 mm).

Filluncnu whiir; snihrn ... Owrio 3 ... Speeded, up m ll | -IN, n long up ... mm ... J> 1.mg «* w ... smooth or with irregular ... Mth a thort irrrmmAl beak. Srr*!> will ... !.** coal; Kenninaiinit enbqn ... ai ... two timn M long a* ihu l «.ith a wtrtc, longitudinal ...

Prtrimijl |n prrmiinriil ami irmpor«r> wain in pomlv tjiilLx ind bk ... Other ... { bufc 1M.pui*-tiooik Thr tubct* are h*m*!rd tot faod it (.H!<V». p*g» dig ihm out; they may reach brgr ... Bruggm (19B5) JtttnUi ilui mr«HimIH(m KSt m andwctitbrd lu'tfj li differs from *A. acubatus* in havinx Ili4tinn k->n Mlbw cordate ... merged lr.,vr | *,t>, . ri^trd nuifina. caducou ... and does not ... proWamt JI ilir tnnv>ri ...

[Rot/Eph], Endemic to S India and Sri Lanka: #Cey. #Ind: Ap, Sl, Kz, Mb, Pj, Ts, ...

Aponogeton jacobsonii K- IWuggen: F%. SO

Like *A. crispus*, but ... of submerged leaves are triangular to Wi< ... up to 20 cm l4in^ up to ... wide; floating g (cam WTT nut^ dmlp bui »hr» *«J do M dwa ihc bur of the btedr foundrd or l ... ihc [-luttiilli- dnelop* Ultrally M tbt tiAe oi thr rmbntu aUnr tlir middle.

Retcmdd In .1^11..^ ,,(fc«p ^Jiri m lugi' ... (H-ti<^* ,,i in (lowing wmm. Si,mv ... (jcnl on hiinU or «hor» Locally rrrqurm R i n g abtKHl Ihroughtwul ihc n ...

IR*« (Kph) | Fndrim. m Sri UnL. M >> and CrtfnIPM (>) # ... 1660M(X) ...

Aponogeton jacobsonii A. Carrin: Fig. 31

Like *A. crispus*, bui priiamh ... f ... yellow and ... e; *UAjicW*» »nh • ^h-in hrtic <lr« iban ... »o««>; the tram wuIK UI^T., «ub»»r.Kr<i blado MP i« 2S im long and fi cm wide, tkwtm* hbdr« >> «' IT cm lonit WKl 4 cm wwtr

Pr rniiaat In tkfwty fltiwtnf ... and rioddrtt rkr fkkt Huwrrin«. M ... from Febr 1970 to ... i»] ami IT.Kit Aiajuw to ...

IRot/EphJ. Jndothfcu rw ... and ... tnd: Aai 9MM00 m

Aponogeton satsum (Linnæus) ... Krause

[A. ... Linnæus fl. A. :4mivtiM Roth C ... r « SthukM. non ftonburghl ^ 11

T-tier up to 1 en in dluwirf Submcigr-t l ... prtbOiar. priiotn up K> t 51 a k <|; bbdn IMM r- - ... up ID ^ cm long, up b, ... 1.5 cm side, as hMranddp ... miF. midrib widr w>th 2-5 pvdBrl wkn* on <-* »' wdr FkMtifHf lr<%n up h. 11 ' . . m tariff and 11 m dr M bar ininW. M lap iunrair. wMh S Of 7 ...



FIG. II. *A. agrostoides*: a. plant with c*wm and tor (2 cm); b. leaf (2 cm); c. two male flowers (2 mm); d. anther (2 mm); e. ovary (2 mm); f. lower (2 mm).

lung. Flown* binrxual, turned in all <lireturn*. l'riuiih MfIMntI (I-> If (~*h petam*ke. %hitr «M pin* 3-5 (-12) mm U>n«, 1-7.5 (-4J rum wide, tailing jfMT Hrmriinn POMMM whiir. ta tellow («t w.ini-iii., blue?). I hrari** 3 or 4, pale pfall fattfcfc* L'M-cilrd. #nio*>th, 5-7 mm long. ± 4 nun vide v.nh . . . minaJ curved h-er W . tmiple cual.

Pipissual. Found in nptfarv poodi, iliuhr* «ml gaska. It lItMMT* hum |uh 10 Xovrmcbf but fmwlh the flowers : and by buffals >.hMli nwy. Ui turn, pro liferate into m«fc fmlfreh Bn^ggen, H. W. ¥. van, *Agrostis mmdutMtn RnK>Mt>gh AqtJ^Piitiu lft(S): 20-24 (19M)*

[Bot. Ip] h.L.S .! St A*u, lWn, Btir. lIKl: 1%, Hh. P, R, Up, Wb 0-300 m.

ARACEAE (including ACORACEAE): 107 g
MOMH prrrntai hcrbt. l^«>e* mmlh in txiMI or apical r*rtm. with * iwmbR JIKMI* •hoih M the tkMr oTthepcbch Intlcwwci «>»h» «pik* (i») mostly enclosed in a large bract (spathe) h. Flowers small so minute. .Miatlv den-ly crowded on the spathe,

biennial, uniirxuiil cw «tnilr; fcnuhr fkwun confined i-ki il>r b&e of ihe ifNKIU: male lBWBW ai«W thr ffnalri. tcltilr INract whrn jKriint In*CHrpn ifcB frmalr* and thr iuuie* M M ihr aptc^l ("" "" thr ifwiit. Prrianlh abwrii or of 1-4 (-4), free or iimtrij vrgnx-nd *Suioin** J-«. fujnujpfwHU, frcr or united intti a Ktumt< (-.mitr itir prriaoUI *S* menb, itiminodn oftrn p>**cn(in Mrritr o> female (lon-rr. Ovary superior or mm^riecI in the ip««1^{IV} fruii 4 ipotigy, rinhy or lRmhcrt b«

1,1^{IV} n. uinj!, t*-jtr» uiWwUr AIM)
ro* hairy; inflorescence with a single female and a frw nulr Oowcn *Fit***

L Plann l. or the King and p
teairi linr^T «« iUffrr«-ntij'«-.l Into prttrtr «nd Wade. IKVCT r«tM-«r. uually glafarou» BC* *l(h
•rvcm) Erauk and matr *ihmr»* or lli^t-M lwwual

l. UAW, *mtitm*
jtcd IIIU» |M-th4r ami bl*k. tjuflix appor b
.lur* it* iioj *Wf* (MJII finrd tit thr leaf)
l. l « m h 4 U i i l ! rredttc, dWcrndsted
petiole and btadr; ipadtx bnrrr on its own U
f tawd tu ihr leaf

S. tYtioin. kwn lraf win* and prdurv lo
Afmrrn Manual, tpathr OpM MMI^
» rVibOni lo*rr leaf urtm and pedm»*W*«*
ipintr: flowrct* unlwxual or Mr tile: »|Mthr
abuwlhr haw

« I cai trfjdn prlutr « ihr t w ; frmalr and
nulr Dotwr* ire«ra|rd, man* ttrrik il
crowkd on a nirum p-in u* ihr upadu. . . .
•urroundn! by a l t t r tpjihr: thr *p»^{lb*}
fcith i* <t bpf>ititf(bttt Fro* ttatflm hrlnw

4. Leaf blades
and mak flowers separated b* a JrwU-f.
U M of tbt ilw
(fontiinn thr H H J M tmtri

5. (>nr half of thr wlvial «ur«kc« ol ihr
hUrir (vOnt mh. ihr other liatt In hud '
lut) fruii united. lomunf « wTirtpi
tifirtiin^ Irom (he a) GT***1****

5. AbftalaJ nlrfacei of the leal h*
umjfiU tmjuHk thr midnb in htti
liu»« Ur*. <>yr%|tn%(rooi ih*

Araceae and *Asa*, introduced in
E ipramis Amrnri
Lutudrrl *Atmmfi* a i a m n SoUwirt it uad in the
HmuivnM btH don not nimrf tropical India; it is
like *A.* «la«Mu bul smaller; thinnex relatively tough
and wiry; leav mostly arched, without a mkb*h. b««

»i, MU * » • the *mm+m* transition zone between narrowed and then widened jl mvr.

Arenas culmas Lm^{nar}* Fig. 55

Rhizomes creeping, 1-2 cm thick, relatively soft, aromatic. Leaves equitant (in 2 rows, ... 'riding' the others), unifacial, erect, (50-) 60-120 (-185) cm long, (KL5) Ja (^) a, with . Wftfa a 2 prominent midrib, but without rib* *1<ig the •miltv .hortrr ih*n blades; transition zone between riiatfa ,,d bLnr mm suddenly narrowed or widened •bmr Sp>di* .MM— •> be base laterally on a Wim 2,1 I hr »Ua i» (used (O I hr ... in diameter, slightly curved, will. 7IKMKM) HuMH. S»»<br rii-> ... the ferr. i r i a som timr* interpreted as the spathe j Flowers like iMa. Sessile. Perianth of 6 segments (2 whocfa of S). • each ± 1 mm long, yellowish-



Fig. 55. *Arenas culmas*, whole pUnt (10 cm).

Perianth fc<Hlfc. emergent or temporarily terrestrial. In marshes, swamps etc. 0 * It is pollinated by insects. The disseminules are gelatinous, fire-walled berries, presumably dispersed by animals and perhaps also by water; it is also dispersed by rhizome means. In the warm to hot regions of India a doe. i * and some cultivars exist if they do flow probably not native or even naturalized in Penins. India but is cultivated fnr medicine, as an insecticide and for perfume.

There are good grounds for recognizing the *Arenaceae* as a distinct family but I prefer to follow the fcunrt in most Floras. Rie ' "g' M. Botany systematic investigations with *Arenas*. 4. synthetic up reach lo the classification of the genus. Plants 17: 286-307 (1979). For evidence and arguments supporting the removal of *Arenas* from the Araceae see Gramine, M. *Taxon* 36: 725-729 (1987); Begger j and Nicolson, D. H. *Willdenowia* 21: 35-50 (1991).

(Hyp. (Heli) ... and Asia, naturalized in Europe and SA ... (Ap. An. <Ga. Hp. J. ... Mu. St. Up. Wb. 7-2300 m.

55

Colombia: 2-6 specie. plus ... n<HJ> fi illustrated rwr*: pentropic I boa IC ... 6' litril, AFUB ... (Hufucaird In ... m ttr tKiuinrni It » (Hufucaird In ... mil Ivan whkh lty in w/r.

in I i-2) in IHUK. hljulr< pdOKC fee S cm or more. ... v<itlibtC hair (n Mfptair in oullinr. up (n 40 <m liii){ and Me m trtdr. lit lion- < ... irtci then ilir jK-ruJi-*. Spain*-* matr-Lm< i. ... ird below the mwldlr, up to 35 cm kmg,)(r<-n below, bright vt-Um (0 oi*ii)((r vbovt. Spadii up ta ... ^m long. iimalr BoMtnOM ttie^w<tT 23—ltm, »iriilr (•• 1-1.5 cm and made for 3-4 cm, with an apical appendix, 2-4 tn> IM>k lahvni in KMDC »ultivaint IMM»), Peruvians absent ^uinen< itmtrd ima J pHuir nun (Demandrium). Ovary I-IK MLI OMHM nunum<u, with ••ricttl p\sucl\MHtn: MVU- ihorL nVirbrt oh4onlf to chronic, vesicle (I in the peniateni ml*1 <1 hr »fM" Prirmtul, M*nh> |>l<r*. hut fifien »undir>g in M ji<. it. ureamt, rh*rn *mt potitk. In deep tn in h may rinrlujj (Jcjtinn U-Jv* It u puUinalrd hv imall ... i IMH tit India ii 4(f(Mn nils <<m n< i *ri fiuui It b ... li U i tilnvjirri Un iu *urt In rhizomei (Umi *nd ... 1r**r» m ttr tKiuinrni It » (Hufucaird In ... mil Ivan whkh lty in w/r.



FIG. 34. *Calceolaria amlrmt* a, whole plant; b, leaf (20 cm); c, flower (4 cm).

th*pe and colour l« H tow* times recorded to be *
 «. l nt in»jt*»' in districts. A. * rowiirmU-
 tare of Taw* nd n« vjuirtic*- Bounkal Miwim
 leaflet, (Harvard University) 7- 11W18
 (Het/Ephl Native in tropical Asia, widely com.***.
 in iinihri. Shu, C*T, Intl. Nep J'jl An, At,
 <M,Go kl, K. ML.. Mn Ma. &). Sk.Wh ft-IPNU.

Qjjjjiwjpgi ± SOipecict uopkaJ ABU

Khuome* erecpiitf, th k or m« 'niferow, irfiri,
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 llllCM Oi ilhlilirtl) j>rtt>J*tr, htadn OOO' -me
 half of jdaviaj *uil-. rolled into '« tithri half in
 bud, Mibmrtrgd w cn*rtK«-nt. line*/-UmrnUu- i«.
 CMMi tunex »ir ** thr bate, w r U a m
 bulkur; catMj «V Irw *hr«fhrU Uri homcriu-
 gous to prophylis develop U the upper
 lobes. Spathe* rub, both oval or elliptical in dis-
 gate-lanceolate. sometimes spirally twisted.
 %hortrt than llw tube Spathe wry ihoti, mctMnt »n

ihir <itl4ird hoM- tKtiilf} iff the •pailir. ilir lruwlr part
 bctow, tparurt! tiv j similar aatttrai is of the <p«di*;
 male port OOOa . wrapped in J\l kawotuiC t>Vl or H'l of
 the apAthr Mile BOWCTI »WJ »in» . reduced to st*^tC
 matters. Female flowers few, united in a single whorl.
 O a n flul-ahaped, l UH uUi. omlei moarnMli Fruit
 capKuk-tikc, of K-irr*), oniin) ltrmn |>n» ii|>iii<l
 irliid open from thctjfm.Srr< usually numerous.

..... usually terrestrial.
 Followed)
 united t*ftiic» »Jn. h i.|trn lioni ihc tip*; <»**
 icininuln arr Mvtb <* wrdlinft. diiprrM-d In . 'nt
 «icl poril i;^ JI- . b) JMttmak. Many n>r*w» w*¹ rui*⁻
 val 'l * . d aquarium pbuii* J»<-iib**n.
 N < nf>twi«Ynrn, lirrix-n VrrlaK 1 1 1- (1982) <> *
 Wit, It (D, AquviutnpJMtm (H. fl. <u.h.
 t^ias (dated 1981 pubbnl 19H) ftcobatn. S. Die
 •a(Utal|n. Cypariss iwn tW* »»»< attached
 FcuUnde*, A<|.u-PIJIUJ U»|: 2-35 (1991. Most
 liRiirir* Mr burd lml trjwiitfi FROM (k WH (1985).

l. limb ol upatlw cilulc ^k»nt(ihr nurfti the tlllt
 tmntv more ihin ^ mm l...g, simple or branched
 (h k k b
 l l mil. of t|uiti*- m (**ftv or ft then
 < ilia less than 5 nun kmf *itd
 1. Iral ht«k gradually raising into ht pTI
 iini-ji taithoui a tlr kon between
 burif and prtioir

l- ->OIM- mtiwut a tube, opming by * longitudinal
 slit 4*n_R 4m to the U uk. ibr Unl> e U ^ * * *
 and remains <jf fMvtK(t>MC(t *nd tutling below but

l. Spathe hmb r«rh hHt«rr lb«n 13
 ihr limb oprninj and tpr.r.tdiq(or if remaining
 wiK f knrd thru tfiw *Uv nrutrd jhmr

he lube it * «VAV
 •AfaDM 4«WaiH d r t w t i M) tin lml bct*crn ihrm.
 ihr ipHhr lM) »fMTJlh nrwr « l r«rt nl thf- tip
 S. SfMthr limb afMtitnf
 t «rnh ifMnJ tttm b*»r u. t>p, ihr
 ind t found. mtrnm bamt
 (In C

S. Spunc hmb apm and <ttmrhai tfrtrwhnf ^
 Ihr ba«r. thr b «r Urm, r^Uih t(Mnl than ll>
 •h* nuik.np hfown t(* purplr. r<.....<i in
 longitudinal seg. gous base vertically to
 almost horizontal)

Spathe hmb r«rh hHt«rr lb«n 13
 base open, widened and
 Ihr tip bCM bM
 •hori u briMm IP •aror*h*|
 r*ddWI; kaf btadn nd
 (Miwnur)

6. *Spathes tab martf* «ore^{ttw11 s tm} *
die bMe opening by • *lit, not widen.-! i.u.
•omedmei ipreading, ^ «* >|'''(llmf
...,warri» |ikr«|ork«-.rw...al mos.1..».«.Mrd.
the marUngi red to purple; led blades
margins Rat. undulate or buBate. n je o r
rmely toothed <NE India) C cr, ^f«to

4. Spathe tube abruptly < banging into a limb, with
a dearly demarcated throai between them; the
lowei ,M,. ohho,,,:!:- l-n.b spwadi^ not spi-
ralh .Lu-.t: the upper pan of fpathe Bat or
•onetime* spiral at the up

7. Rhi«.,m«-,kn.,m.p..ih.-l'»'R««<'-. ««l|»"«>
mUr. male flower. 100 « i > .."-»»
utd Indu. noi in Sri lanka)

B-SpatheHmbwithaaaTOBOi mo, <. long,
kettle wuiei than ».<! lomewh* longer
than the tube (SWIndia) Ccognat*

8. Spathe limb with > »H h" than 6 an kn&
lattfem* wider than and shorter than the tube

9. Spathe tube i 1" <»' i(>11^ *TM
,,m jong, nbmerged bamWiaped
ih undulate margfew (S ted«

C amiobma

... s.Mili.-iu^a.r-rum lon«: krtik ± I < ,,,
looj Submerged bancWiaped leaw wirt.
R«rnargin«{lly«niliar) CaudAuuma

7. Rhiiomw i ewsn, elongat* and -
m-tt(• ,,,1>ut,s KMM) («small phati wuh .
n leavet Sri Lanka)

16. Spathe «-20 p long « . limb 2-3 cm
|(m; collar between ^Mthe tube and ttmfcipro
truding 0.5-1 mm above the -,,(,«<• m the
limb; leal btad« (03-) 1-2 «" wide C MriH
10 Soatfw imiaB) teai the I cm rarelj n,, to
i .,.,.,.,. >Mil- limtMiMiMK'lesstlun ! CM
hang <()iK! between •pathe tube wd limb
never protruding more than 0.5 mm &*&*&
MT&Ke oi dbe itmb; u-if bladei tMuaByconrid-

«p>K km than 1 <'m will< c , >onw

2. Led wade kbraptlj nmntag mtt the PTM * ^ * *
demarcation between blade <nd petiok ihort <nd * h

II, Spadw mnb without MI abruptih dil
coli.ii it ihr basic t *»e »ei wfch adttftuecam**

RHK

12. Spathe taw with an apfa ai taU, white to pin* w
red, with «i wWwui red ipoti

IS. Spathe Umb white ot rarelj ptok «
d, trithoni ^b^»lv ipathe tube osualri lew
than i cm long; led blades ovate to narrowh;

IS. Bpacbe lii«>> whhe wha i • ^athe tube
usually more dun I < • tangs !«*(bb* - llip-

(thwaiterii

12. Sp.uhf limb witlimit an apical tail, yellow to
greenish, without any spots

14. Inner surface of the ipathe timb rough

14. Innci sintare of the spalhc limb KBOoth or
very nearly so C. wadteri

11. Spathe timb with an abruptly differentiated and
prominent collar at the base

15. Collar between spathe tube and limb protruding
-I mm above the nuiaice oi the limb; upper pan
oi the sp.ithe ihioai with hvge and dis. jctc purple
•pott C.nevilHi

15. CoBai between ipath€ tube and)iml> not protrud-
ing mere than 0.3 mm> above the surface oi th<- limb;
upper pan ot the ipathe diroai witboul spots or ii
•potted then spots tsmall and Irregular

16. Collar between apache tube and Bmb in own to
blackish-purple; spathe limb UCUaBy paler than tin-
collar

17. Spathe limb wberect, ttrkted bo recurved,
tpk a! point short, never tali-like C. bftttetii

17. Spathe Umb i obliquely twisted, apical point
soinrnius Liil-like C u>endHi

16. CoQai between ipathe tube and limb green to
yeUow or cream lomethnei becoming brownish;
ipathe limb the aune i oloui at dw Millar

18. Spathe Bmb yeliow to green, i flatoi recurved

18. Spathe limb yellowiab to cream or lomettan
brownish, I obtquer) twisted C. undulata

Cryptomryne alba de WIC Wg. 55

I like C *thwaitnii* bui spadie limb white or occasion-
.Oh pinl or red. ipathe tnbe thortei (0J-15 cm long);
1. ii blades nibovate, almost smooth, with • Sal M
tawl* wav; margin.

Pfrennial Itoog <" In small ttreans in the forest It
is perhaps only a \.inam ot C. *tkmtittii*, haMineijer.
I n. Chrisu BBdJacobsen, N *Cryptomryne* afta
uad Ihre Viariarionabrehe. Aqua-Planta 84(1); I^v
(1)*4).

III demit u> touthwesiei n Brl I anktc

(*typtocorynt albida* I\uk<r [< » » » IIIHtir VM
(Parker) Rataj, C *etttmU* Gagnepain, C *kmtkamtm*
Rat (1) Fig. 35

Like C *ntmpimlil* but apathe Hmb rarefy more than
t * . • m long; baas ot the tpadie Bmb open and i<«>s<l\
s|»ir.ii. towards the dp u is more tightly spiral and
uMially bends back on itself, iii< margins usual!) have
*n ot reddisfa stripes, stigmas are rertical; leaf
blades tneen, green mottled with brawn m brown;
male flower* 80-120.



Fig. 25. *Cryptocoryne hololepis*: a, whole plant (4 cm); b, ligule (2 mm); c, leaf sheath (1 cm); d, leaf sheath (1 cm); e, leaf sheath (1 cm); f, leaf sheath (1 cm).

Perennial. In small and Ufgr mounted in forest, m<thr • uhm*r(<l illvp Iri>| Endemk to towhm Mrm Sri Lanka <17.

Cryptocoryne hololepis (Schott) Schott, Fig. 25

Like *C. hololepis* but ^jkiUt< limb twkUKI ami ii io totncwhii rrt>tnr.| and n*iuK|. th< inner surface %ri)ir*rith tubrt>wii>h*«<tl a rhoc -LMr Ut- in qiuLuty black ••flor; spathe tcfOM ».hMi>i in purple pj I*~f Nadf nirrn MHI maihinl -with iHb^wmt n 'HI ihr uppert piriite, ihr lower «uf* r mostly violet Of al Ir*« unprit (nl. >f*0- outer surface purplestems n wHh minuir »| •

Perennial. Along and tn Mtfkh Wnrhig «rrwui «MI rivrn, ltrqucniK wbaBCf«rd. FrqtM • dy culmase I in «quaru. It ik vuTiabir mi m* sometimes call a UmiUr ID C. nJtu anti (. mm4utat4- (IUM/frnl Eiutrmk «) central and southwest Sri Lanka • Gey

Cryptocoryne hololepis (Schott) Schott, Fig. 25

Khiaoonh up k» 7 tnn thick, tufch. wub runm-r* 3-10 cm > long. Ir**mittpfif>

leaf bhdn owe-, 3-R tm long, 'i-4 an .ile. * inKHilh. upper *Uf1*rr nrrrn to pmptr-ft**r' or mtdbh, tower %uitM< piW oAca irddkh. vein* <<*>* spirans, margin entire 4iu1 wmcUinrtw»v baf <u> ror lair, tip -> etc. Spathe (2-) 4-8 <n kmg. outside velkmnh hrtoti htYoming rrdHh-puftlr »bw»* krltk up •• I i in l. tig, tligfh warn; tm the uprr wall; t>H 1-3 int lung; luiUr <h*rm >«i ih>-..JI*» HW amoot the thr>>ji >rlUpw>*h to almuw vtiile; limb run< wmt, (I-J I-B mi Uw>g. i' 3-1 cm m-k at thr base, gaping in d wide ed lw-U»*i. [MMiirfl but not tided above, the inner surface rough, wmiHf, \eLU** Male flowers 20-30. Charles < (t; ndftnuw tin ular. Source: unfiled.

I'rrennial. In small and Ufgr mounted in forest, m<thr • uhm*r(<l

illvp Iri>| Endemk to towhm Mrm Sri Lanka <17.

Cryptocoryne elliptica (Blanchard) Schott, Fig. 26

Whitener, runrr-iikr, 40 cm o» more long Leaves rrrri: pctiolr* up to 20 l-* n .in h>>(t, gw*0. *tl!1 wMk thnth; Ira/ btarln ckmgMr"hn. spathe to elliptic art. 12-; (80) cm long, 6-10 (-13) cm wide, l_rth mri ces uniformly pale gren. Itur cuncitK of



Fig. 26. *Cryptocoryne elliptica*: a, leaf (1 cm); b, spathe (2 cm); c, leaf (2 cm); d, spathe (1 cm); e, spathe (2 cm).

probably cum» < m • M*tr recorded hahiuit It n in
 tivabun l hiring the montoan it a sulmwrfwl and devel
 opt km«. ^uuMriiLr tr « n It H<nnr» in the HirHrr from
 |>r>riiilwi in March after thr water ha* receded. Thr
 pUrn« mem Calkut new teem todewlop Immitulr leaf
 IAJAC* (t t n during the dry K M H I they i n g n »)
 (he*c plant* may thin, per hap*, be httrcr ret ugimrri as
 C *i**rt« but metre hrki obtervatkmt wr nrcded.
 Sr*adaa»n, M. *Qyptoarjm muobrima*, «nr iritrne An MI
 SOdmiea. Aqu*Pbnu H&m: 3-7 11965); jacobtcn N.
 Luut. M- and Bagncr, j »Ingcw6tmMcltc i-TKrumf
 Verzeelving *Cyrtosperma Aquo-Planta*
 89(3): 83-88, (4): 127-132 (1969).

IB. *C. muobrima* (Engl.) Merr. E. Ind. m. to S India: •Iml. KJ.
 prrhap* rxtfaict in Kl 4tui Tn.

Cyrtosperma muobrima Engli iar. *Acrostichum*
 \ jacobten [C nfraiNm/ii * *muobrima* (Engler) de
 W. C. «nun Merrill, C Wan Gagerpala,
 C tott*iwui*Giiiaicpwn]: K« 38

Likr C *itntfimtii* but «pathr limh gr» to KW
 tni h pmphr ko purp)r-M*ck ipou *nd J»on mid nuhn
 iii-iKiil-ti tthpr»: Migma* wttkal m h.m/r.nul leaf
 bladn tomriimc* bnwni*h, unulty umlntair m India
 but Mmrumn flat ur butbir. Mnrtimn Urgci (rrw li-
 R 70 cm long anil 4 cm wnlr. hut mottljr In* iKait
 1.2 m »rtdr m Indu), with more distinct latrral
 male flowers 90-130.

ft inuiul tinj«« in twifth fl<r*mg m m. It h v
 variabk in *hxm* <W ihr h x t ; wwral tvirlin nr nco^
 nurd. In tadta « i ^ **JUm*j+m N. j*cohnw - found.

[K«/Ten] M tn *muobrima*, Myanmar, India D4 and
 S China: Bon' Htu. Intl A» IS b / b* n «nd fr-m Hh t*
 jirob«bh <»

Cyrtosperma muobrima Prati i (C *muobrima* [Li])
 Fig. 28

Like C *muobrima* (mi krillr t l fin kittg, wn tUghth
 consistnd M ibr mNddl: ifwlhr lube tAS cm lan|;
 •patbr ttnb * 41 m kmg, HJ itnrn twitird. with irregu-
 lar *trmtuneent* ritt* and J ihun apical tad, frddth iratdr
 •MI I * • ! itwoit; mair lloveti 100-rjo, tulmx-rgrd
 hMid-4uiprdlra «aX&-»cmldtic. OA-l •mwklr. with
 ttM tnwgina.

Pcrni ial *muobrima* (pr unkmwm, prrMinu)^ m iAr •,
 IK«/Ten/ Hsp. Efl >< ••» io Upper Ifyna
 *Rur

Cyrtosperma muobrima Trimen ex J l> Hi-Art t-if. 38

Khufnnc* up io H mm thick and kTMHiv. *muobrima*
 and runners undown. Leaves 2 upright, prtakilri
 5-10 (-15) • m kjnf^ trji hUdn rllt) «ical in >UT«M>1\
 uv>Cr, 2-K OB ^»>R. (03-) |.Z < m trtdr, «»
 WOJt*hat nHajjh. both uuti «m uniformly green, not

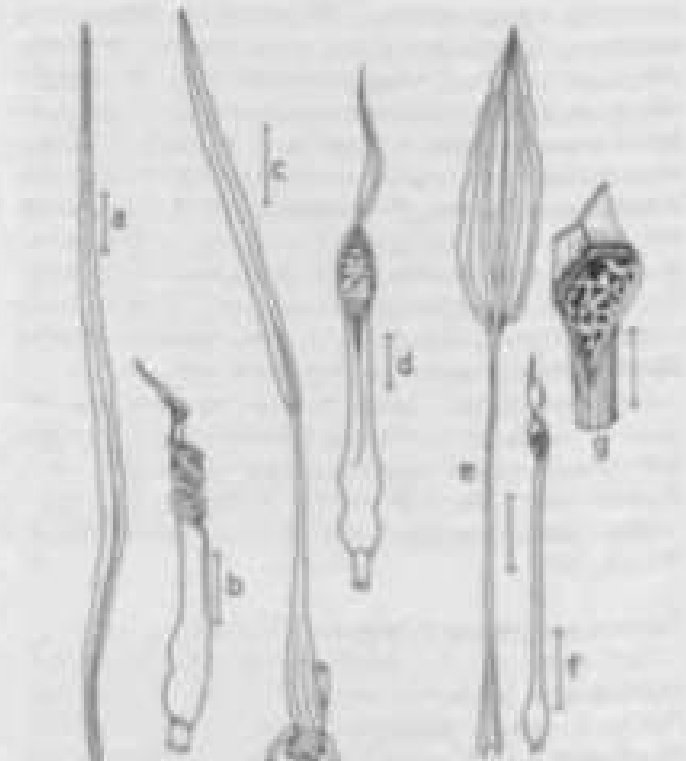


FIG. 28. *Cyrtosperma muobrima* var. *muobrima*: a, leaf (2 cm);
 b, spathe (2 cm); c, male f. (1 cm); d, female f. (1 cm); e, fruit (1 cm).

ly, *rini compkuaua, manpn enurr, O«*K cnnr»tr
 running from thl pritnlr ur liuiHair up
 Spathe 10x30 cat Jwm, •itutMlr Mhttiih. becoming
 brownish-green totwda ihr tip; kriillr n H I • - m long
 inside somewhat ottttn. red below b»e ntlr lk
 upprr pati i red^our->1 tub* t-15 tm long collar
 twhrorn apathr tulv *nd limb pmmtduift 0 VI «'''
 above <hr w surface of the limb. < uppri pairt *' hf
 throw MA l ap end dtetrtr purp^ V* hmb l ur
 frdly «m * 2 cm long, 2-3 cm wide at the base,
 gaping and %ik< red below, with an erect M
 var 1^ bmt and apu. by rednd tail, «m ih. ine n
 surface rnarotm Uak l «m trfMtt. Ovaries 4-6
 »Ultma* iircubr. *him nrvrnkal*.

Per'nnul In aeaturh muiHlaid areas, marshes
 «*d mwnpt and vimrtiiiii AM% ibr IU «l 1(gr''' «
 the dn, region nf Sri LattU fa* Ir «w die *<*!!?»<«*
 durmg thr cti> «ra«n A» ihr rain» rTMnr it « « *
 flow« brfwe thr tr«r» arr luh dtwAuotd.
 (Tcnl hnkniM *tactwm* Mmin Sri ljjfito •')

Cyrtosperma muobrima (Engl.) Merr. E. Ind. m. to S India: •Iml. KJ.
 prrhap* rxtfaict in Kl 4tui Tn.

Cyrtosperma muobrima Prati i (C *muobrima* [Li])
 Fig. 28
 Like C *muobrima* (mi krillr t l fin kittg, wn tUghth
 consistnd M ibr mNddl: ifwlhr lube tAS cm lan|;
 •patbr ttnb * 41 m kmg, HJ itnrn twitird. with irregu-
 lar *trmtuneent* ritt* and J ihun apical tad, frddth iratdr
 •MI I * • ! itwoit; mair lloveti 100-rjo, tulmx-rgrd
 hMid-4uiprdlra «aX&-»cmldtic. OA-l •mwklr. with
 ttM tnwgina.

shorter ones somewhat rough. Leaves 2 upright; petioles 1-1.5 cm long; leaf blades narrowly ovate-elliptic 0.2-0.5 cm wide, smooth, both sides glabrous. **ik>t EB-IJ m I<<J**

... .. **bm MWIW** **petfete, dsacuM Spiibf* I * w V" ^**

cmlot^peUbi " 2-1.5 cm long; **rubr MK\ limb purple 10 dw^ puriilf.**

flowers purple to magenta; sepals 3, 0.4-0.5 (-1.2) cm long; petals 3, 0.3-0.5 cm long; ovary 3-lobed, 0.3-0.5 cm long; stigma 3-lobed. **ban iapiaf im** **Peirnnul. Aloft* <n**

l,ew hybrid* ex* lrttik* **hyhtkt *iHimi-** **r ^ r l ^ ^ . 1 .**

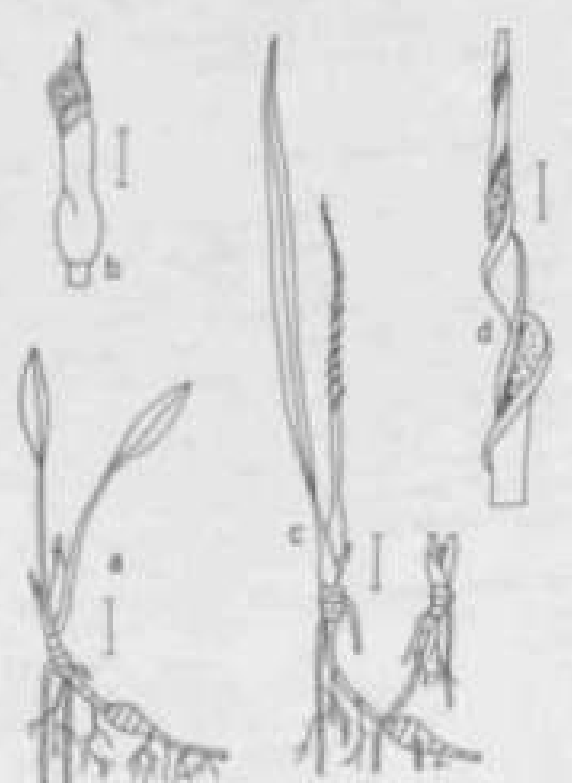


FIG. 38. *Cyrtosperme javanica*: a, whole plant (1 cm); b, spathe (1 cm); c, upright leaf (1 cm); d, lower part of spathe (1 cm).

Cyrtosperme ^drt^ffl prohibit al<<. fonnS liybr<t> with (Bot/Teol. Endemic to central Sri Lank* •(>?.

OjfrftMirywr nftni>irnfir p--i....t.t. Kiintli [C. ... (Kunth, C. *TitxhtTwtuui** VI>K I (...) V0 *g

RI)iioMe*0.5-l. 'i an ihi' k ,mi(knotty, wltli Kotam beuink l>ng thick MMHm 'il<- W>Ott wWdl <<ni>rUfiwi form corn-like .inuluiTt alxltT ihc |TOUad dnii ihin absorbing Kt% l.ravr^ no i f^ HKfdmf pctiala ibann d>n the bhdfatt die kwu >*tC i" WNMhWh with a roOcd >hr.>ili, gradmlj widrtttf .txnr and ... mm tilt h.l.u.U . Irj| Itl.ulei llii.il l., tl-uy.*T.- |Jit-,].irin.iii#U[iin.il tO-40antoof,QL5-1 (-1.5) im Huic, l|41 in waw. h>th Mttfctti uniformly Ktrrn of HWBCdloei linmimlv Kirti .i iliu t -nd : addnerM ind s<lj ifcta, indiuUici i.*irul nerves, margin MMnrtime* hi>K toothed. b**e ttincWr roanfag btio the petiole, tip ac inn in air. becoming tejilit-r^ >>>heti uilMIlfIBt mWCHH l< HM .twl-like, ±trrrtr 10-15 << l-mii SpethcttT,*^ tO-SOonlong, Umrtr than (He leaves, with up U> 2% cm long stalk; ketdc 11-) L5-4J em 1<>it. < vlindrkJ, with iniuu UJll contracted about batfw*) IM more upi iiii<> coned ^pii i">ib [-l 5-8 cm loa| ttMuD) .U ^iitAllfd null up ln 7 HI ... m ii» (...) IIIUK *cotfceuCT ., care ibori aumi <>pm. ottve n ylcfiwhh wtn red ipott noi Nveiha the n —umli Male owert 100-140, ONkrtes 4-7; stigmas ... ilji,*Dm<wltafuniwUh*p<i. boi ... or nearly <. vrdt 12-10.

PcftnnhL miwk in aitfl alunx mrr>, where it Qlkef form niti Hkc com....ini>i< li b umiaty m >w'd b i ^ ... l; ihr j ... ihemltt MMJ l<<.n (van <>l the ... lie* Jur iiJtrn hiutril l%nl !-> n in medicine ti ha* often Ytrrn < ... l with otbei species, in this Wort H it i imwlctd tn be dwincl Ironi C *thida AMA C .')t^atuU Itt SW lmiu rt n the IMIII BjMCiC lonfotbc (Ros/Teol. Mi.iimi. i.. India ami petriaaa Ran^U<< 'li in the K-uili (iii iii)(liri bad) •B^r •Ind; \p. Vs 111. << . KL KL MA, I .- hi. Wl 9-1000 n.

Cyrtosperme spiralis (Retz) Foc j ... Wfdtt n [C. ... SchoiU (C. ... BULLer n Mi (MM, C. ... Natter et McCaus); Fig. 40

... up M> t em ihuk, \ip to t> < m long, bearing kmn tin. L ... u i i * tik- roM <ld ihin >>*-<! ... iv lrjwc*cir< t tifxrarimK- |wtn>W S-H (-lfii ... srrn. with *i<ir <hrjih; leal bUdr* rtanfW rUpticml lo ltnrar. f7-) H>Wl <-<>* f>i >^" <(1. ^) l-l (-5) cm ^We, biMh <iif>t e> uniformly p^V- gi l

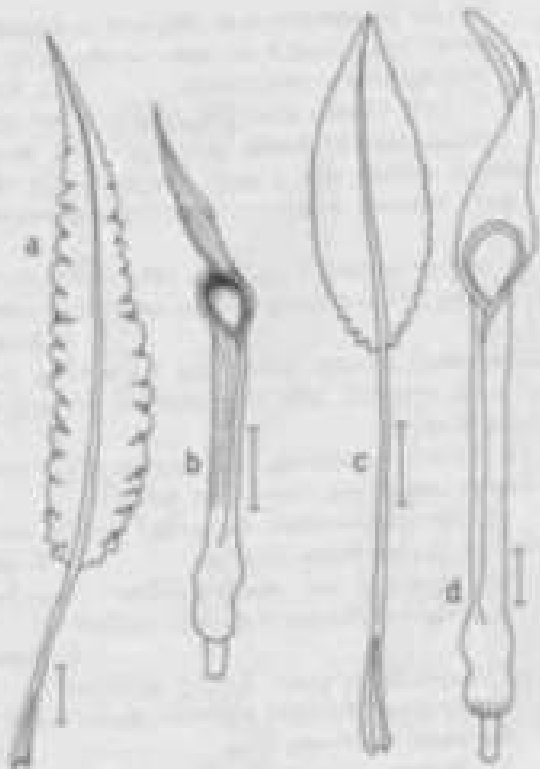


FIG. 41. *Cyrtosperma nodosum*: a, leaf (1 cm); b, spathe (1 cm); c, another leaf (2 cm); d, spathe (1 cm).

Perennial, base submerged. Leaves usually 15-50 cm long, 1-1.5 cm wide, all spots, keels up to a midrib, or rather about tube!t-IO <*> cm K>pk; coll. Or p. brown and green in the base, yellowish. 1 M (-ft) • M. kMg. O.B-1 cm << * >1 ib

Ueinn. Surface smooth, rough, green to yellow or .1 b.r with. Chances 1-7k>ujtnuw<fciiUf, vertical.

Perennial. Along or in streams and nun M t K m ^ 1 WI<I. The collar is well-developed it is sometimes difficult to distinguish from *C. lobata*, *C. ...*

Cyrtosperma nodosum like *C. nodosum* but M>ih* liinbMibJJi^ twisted, elongated into ... surface ... brown or purple; end chocolate brown to ... the

up|M-i tnrlatr given to fcro*rni>h-f<l and slightly marbkds wTjcUtiw paj i* tmally hn k^m (i lu/omr up lo t cm Lhkk, jwtfolct ii|> to E9 I MI IOIK. lral ltU.li up i<> :*i)(in long)*

Perennial in .ind lloag ^<<^llh Hirt<<iii|f rivnt and in dli rhfl. "lii ri ^towing uibiort^rd ti ii vrry vatuble in leaf colour and form. h tomba rinflai to C *Muitii* JIHI C ttululala.

IK.* ImJ. hmlfifix i> (muni. wr*1 JIKI m<ii ... Sri Lanka: ...)

Leguminosae. M >pccke<<: all mdrtnir ID ihc lrti in >ub< ... in

Rhliomnrir.ij. l^ejfrtveergreen, up 10 IWftti hi tin; »hr: thing at thr tuue; {wtiolr* UMMIK luinn ihui iiii blades. W. "tct liiriii-l^iit<*ii4i< ... onte, acute *t thr apex, involute (margina rullrd towards towards the abaxUI midrili) in ihwi < SuaphBI (transfolding blade olrM fhrathi, honM>higou» to pr< ... phylls) develop Ni>i'ii DOC OI thr upfKT k ... utualK with 2 ktrI* »> riral InBoitttetKCi uitmU) •hiitn-i rtuti the leaves. Spalhct luMilai Midi «Hge* united at the bur, the limb u*u*Jh aboui rqiul H tK.



FIG. 42. *Cyrtosperma nodosum*: a, whole plant; b, spathe (1 cm).

tube, usually twisted, tometiinei inflated. Srndli MM •holt, esdated within the inflated (*iw- oj the *p,uhr (kettle); the in air paa wrapped is in knob flap it fold of tii<- ipathe Stamens 1 • 2. Female Bam tk aaany, free, M the ktv QJ the »}Mrfi\ separated horn thr in.) rieufel Iterife (Kaiv lkn ul.it, wtdf>(, u the «-IJI Dutkj 'ron, spending from \Uv husr, l- m mertl wtdn d

ivtnmul All aparici are ecological!) *n nanfa alike; tlu" an- iHltafl) found in and •loOf ✕ rivers in joicisid .Hid pl.inc.iitons bttd it!" m bTWatkMi ditches around rice fields. in the VMH leauori tl be nibtnerged. Ron rting takes place as ;c mttei Its (lining the winter. I'ollination is emofkStam. The dimea^n are berries, dispers, i h\ animaii and ;tln by w.tici M are cultivated for decoration Natural tnd artfricial hybi M,,st tt^urt s .(!• baaed on drawings from «- Wn (1985).

1. FcmaW M> row MTound the ipadfa

2. PcUolrs and teal blades glabrous; spathes j* long gei iun ilti-1

2. i' articles and under surface • < t the ir.it bladi h spal has much shorter than in tti<- ; articles; ovaries covered in warts /.. Mini

i. female Howew afraaged one .I(KI(- d .flon^ the apsd b

3. Spathes w-ill .1 pak green HUT Mi:'

4. I <,ti blades ova lanceolate, up to 3 times as long as broad; leaf margins entire; spathes long-stalked (8-18.5 cm long); lower surface of spathe pale greenish-white, without flecks I .lagari

4. i' blades narrowh lanceolate to almost linear, 2-10 times loafei itt.ui bro.) leaf margins crispate-

ae»*iir; urn* i mrface < t ipail pale green with pu b L .tl-a

3. (Mtlws with .*d<ui greenish purple to purple pinkish < water surface

5. Spathet widely &ftoši ihc lunt. very mu* h wid than tto -article

6. Limb IA »path< strong M< <| t« <>IH ndc and opening ihon/oni ally L .jandani

* » • h of spathe erect • nearlj n L mrtbotdn

5. Sp.ithei openii^ by J lonj; iti never gaping, the Intii) MM oi wwtten jln>f- tñai

2.2 cm long L .aafafcai

7. Ovar > wiid H partly outgrowing; itttbet it more than 2.2 cm long

8. Spathes elongate, with a smooth Man

9. lid bladM narrowt) eSiptii *! to Itniinhfti rareh more than 2 en wide ipathe with ii

9. ITAi blad s wide, 7-10 cm wide; .jtiu- atooai wiootfi tnahli / ?<>««««

8. v spathes MvoBefl, wui,, mny, kn^tudhuOl) rt>bed or rarely smooth outer surface; s i-in.1* borne on

lu . Spathes up to 3.5 cm long; .- (ijtrn \Mth an up 10 2 cm long ng uil, thv (Mitci ami ice smooth irwartj

10. Spathes usually more than 3 cm long, with a 3-25 <m long t.nl. 0 water surface bearing warts "l p.lpttl.ir

"• Leaves spreading, the blades t horizon atal: pfauti uoall less than 50 cm uH

U*. Spathei iwollen above ilir keak, bearto| w.*rt> on ihr outrr I surface ^ rf with

12. Spathei not **ohYti .^^.v, the kettle, bearing papillae on the uici milae

13. Spathes w-ill .1 pak green HUT Mi:'

IS. Spathei abrupt!) gl above above the kettle, the warts 1,2-3 MBhMg /

15 Spathes mbqrUndfii . g

Molten ^t" Hta up to 1 / prmtumm

UffWMDn bagnm .1. W: Fig. 43 Khttomea up i 1.5 cm thkk 11

^reading; p articles 4-10 (1-20) cm long; leaf blades ovate to narrowly ovate, 6.5-15 cm long, 1-6.5 * itt wide. Cataphylls up to 10 *) long Pedw

8-18.5 cm long. Spathes 8-15 cm long. Itmb up to 1.2 cm long, slightly beited and swollen above the kettle, opening by a narrow slit; outer surface light green or yellowish, minutely papillate on the vertical sides; inner wrinkled; tail 3-7 cm long. Ovaries with protuberances below the stigma; stigma dome-shaped.

(Hol/Ten). Endemic to SW Sri Lanka. • Cry.

Lagowanda dewd i Cronis et de Graaf; Fig. 43 Like L. ovata d l fnaeitrmnutbm leaves of i trailing

**tti subhor toniaJ b up • 25 cm long and 8 cm wide, the margins silvery or reddish-brown and wavy; spathes very shortly stalked, up to 12 cm long, beited and somewhat swollen above the kettle, wavy on the inside. Seeds elongate ovate,

2.8 cm long and 1.2 cm wide, 1/2 cm long and 1/4 cm wide.

Cronis, W. and de Graaf, A. Lagowanda dewd Cronis et di Graaf, eine neue Art aus Sri Lanka. Aqu, Planta 11(2): 56-59 (1984).



FIG. 43. *Laguncularia leucomi*: a, habit (2 cm); b, ovary (0.5 mm); c, leaf (2 cm); d, spathe (2 cm); e, seed (2 mm).

„iM, r«H»d«fc » 5W ari unto

(Kannella)

Elan... 29.

Fig. 44

Urinmin lip t» «.» thick. Leaves spreading; petioles M (. i a) 1-2 cm long; leaf 1-2 cm wide.

surface bearing very small margins crisp ^ ^ h.»rhrd out^hv up.

(•») tt«3 he km, Un,upard « *.

mulkn above the leaflets; 20 cm long, somewhat twisted by a relatively narrow slit.

openi — ta tHisvic', nine* surface

purple, spring, irregularly 5-10 cm long. Ovaries with warty outgrowths below.

«h_t rtifn* M«Rn_a —Oft d.....!"

endemic to Sri Lanka, exact locality not known.

Laguncularia in fS*Mitt) Begner et N. Jacobson [Ophiocaryx p. in Schrad.] Fig. 44

Rhizomus up K) B mm ilmK. Lcavo erect; petioles fr-lon knK leai l.lj.Irt orate, cardaitr u ihi l> 5-7 < in long, 'J '>:vi cm wide Cwphytti u p t o ± 4 o n li)ng, ivdiiii it- tip 0 ± 2.5 cm long. Spttbei tip ui ± (it m long, iltgthly contrjurd ami it. . . xpanded abovr «hr kettle; limit up in H i m lon^ . MM Wlrt pmbjihh (.xmm; wuli Jt wide K^pr: OUttn Ktff .ih, inn. t with hi-Htfr-hkr hain UrvsuU); [Al up u> t * <in knK Owrki 7-* at t level, *«tii smooth • <KHMCI . Sertb unknown.

Hoj;n. i | ^itd Jacobuen N D>> qtctiMttrfac Stelliittg VN lagrnanJnf gnMit (SdlOU) tbitgnt n Jacob-en, «mib. i m, AqturFlimu IS(S): 48-50 (1987).

[H]> /Tm) Emtefak io Bun «nd/of NI Indut (colcted in SvIhet' in 1828 and re-collected): •Bwi/lnd Mg'

Laguncularia jacobsonii de Wit: Fig. 45

RhizmOMi Up i« 1 "» (In, L l«-«i-« nr<i; pctioleci 15-SOan tang; tad b»dr* omie to tuuwly owue, 1 >—3i on tiniK. 7-W > in H..e. Cataq. J^11^ 12-17 mi Umj; Prdiiw k> 4-51 m lon|> Sjpatbn up tu SO • in long, much r\p.nn)(il .il«nr tt< I..''!... limb 4-ty tm I- with J pnoSHwmed twU iwfal Hud held b o r i O qe mnj: with a widr R-tpc. iui><mrnU'i'l In an almost



FIG. 44. *Laguncularia leucomi*: a, habit (2 cm); b, «|wrfK (I OB)* c, ovary (1 cm); d, habit (2 cm); e, wvwr * 1 mm >. (Othl)

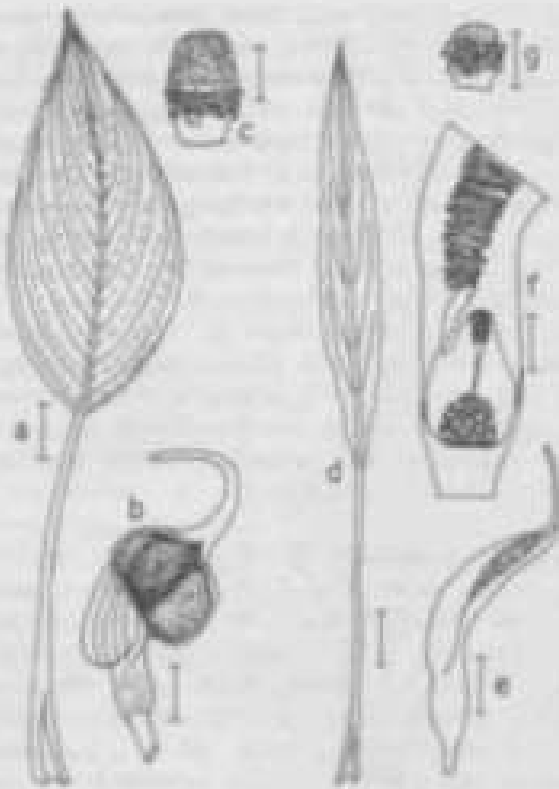


FIG. 43. *Laguncularia pedunculata*: a, leaf (3 cm); b, spathe (2 cm); c, cross (1 mm); d, longitudinal section through h (hr imlr (5 mm); e, cross (0.7 mm).

urbkuUr rxtm^OD of the limb; outer wirf.nr gruiular. [...] deep purple, irregularly [...] horizontally MMM-II tailh *. anther white-tipped and branched (muhri*jkrc*;tt* 3-9 cm long. Ovaries with elongate- w vary outgrowths brio* ihr stigma i4M-i*U >mif-«lu].

[Hyp./Tral. EiMfenm * IW Sri I Mia *]

Laguncularia lanifolia (Schofl) Thwaiin I/. Mrt > de Wj; Fig. 44
Rhizomes up to 2 cm thick. Leaves erect; petioles 12-35 tin ltnv(. kil hl* l narrow lanceol Utr. 17-57 i in loi»n. 1-to wide, marginal vein bearing wn wnal l> arched outgrowths, for X-taprm l il ihr tip. Gattfihvttt ih» <" ' 7 cm long. Petiole n 6-18 cm kK>f ^Mih« 6-12 m ktng. i' -sh, suberect to curved, m: «wollro d m r the l -sh; leaf 4-5 cm lift, not twisted. • ^KiiMif b* a rdM -shly narrow sh; outer surface «m«Hh. MM LitH-fwrplr u> |u). red; inner (tiHf»r fUti |mif4* horizontally ribbed; .1 ,m, u. 6 - W tuttR Ova <MJwrth* vary M -sh IK -sh tna small, dense.

[Hyp./Tral. Endemic to SW Sri Lanka. • Cr.]

Laguncularia lanifolia (Schofl) Thwaiin I/. Mrt > de Wj; Fig. 44

Rln/iHiir* | t tm ihitk. If«vn erp^i. jrtu 3-35 cm- Jong; lc*(lilj/tn onti to uai.ml« O t. 6-1 4 <m to«n, 4.i-5 cm *Uk C auphsUs up to 6 cm long. twisted uid tWoUm abOM ibr krtlr, oprntng by » narrow vlit, inJlrr uwijcr gcrnnh-ptirplr. lo ii4lh nMtril thr ribs unuilh * arn; inner surface finely striatlr. fUuk (Kifplr. fHtU f MjrtJ, i null whil -dippl bram ting prutubrnnn nrw ihr notlUr. Mil 03-1 cm long.

>U(M4. tligm* itmlr.fkii -shap! Vrtli ? CM 3. [Hyp. i (fill. K.fHlmth fn S\ S\ IJIIIJ 41 i.]

Laguncularia lanifolia 1 i < Ptadm ^ H Rhizomes Bp H ± 1 cm thick. Leaves erect; petioles 8-11 cm l«itn; lcjtf Mart. s. ovate. . orditr ai i b« b«r. 6.5-10 cm la

Cfdumlr n|* |o 12 i m l'HIR S> fth 8 JI im 'ang. mm t» r^pandrd abotv ihr iniU-. limb Vt> at Inf>K not tiKiktrd, Upright, opening »tih » wnk K*P«* l h r 4 not inotr than 2 S on tooR «n«t mfmmlrd l" >



FIG. 44. *Laguncularia lanifolia*: a, spathe (3 mm); b, leaf (3 cm); c, cross (0.3 mm); d, longitudinal section through t, krf 13 »); t. >HM> 40 (mm).

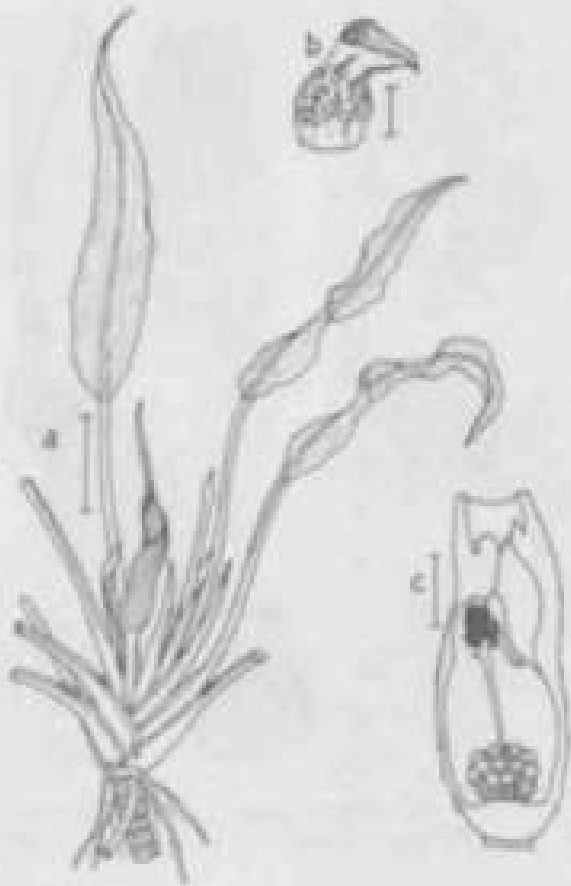


Fig. 47. *Lagotis umbellata* A. R. K. Savtr: 1 R 49
 (1.5 cm); c, ovary (0.5 cm); d, spathe (2 cm).

!, |>urptr. withixn «4it». at mort And)* roughened by
 vertical stries, inner orbit f-... purple.
 with whii«vtipcd br«mtmig)» ..EUIM-IAH- near the
 u; uO up to *im lutiK or occasionally absent.
 Oytin wjm IH'!»* the mtr: Mtgnii *ubwinmri4A.
 It 9 -', '... - tnm luan, 12 mm «Mtr
 11 /Tent. Ktwtrini. in SW Sri Lanka. •Cry.

Lagotis umbellata

Rhizomes up to 11 in ht. k U, ... |>rth4r* up
 «> in kmsi leaf bUit.. rHirtt< J««*» 12-20 cm
 long; !^lt ... up in 10 tin long
 PnliliDir u! <i Urn* Sp*tSc. tip « |M ,m l
 no* nnilrn ilmtr ihr VxXtW. (»pcni
 tlrT^i puipic: utl itp m M < m ("j«t On
 warty outgrowth; stigma subsessile, dome-shaped.
 Seeds 3-5.

< Him dbumUnl ui maUtri and mr«ttu, tuutIK *ub>
 dd d d h h i i

iHvp lcnl. t.firlriiuu («k S\ \ huh,! fttnd \i» t->>. Kl,
 ...

Lagotis umbellata A. R. K. Savtr: 1 R 49

Rhizomes tip la * 5 rtn (kick. L O M ... i>rtw»le»
 up in t 6 cm long: l»r hlnln elliptical-lanceol>lr.
 uwiirijir. IJMtcni baf 0.5-1 - rn HI.4. DmplifS>
 ± 2 cm long. Peduncle 2-3 cm long. Bpttbea • IOH
 long, m (r »ponded abtm- ib« lentic. lhnbtScmki
 omir * I CM wide, nyming bj a narrow slit, outer
 uufa^e MWKtih tnii with l longitudinal ribs, inner
 turftat drfp p«ifvk- flrrU. toil aUrn- or rudimentary.
 Owvfetl » in %4 rt)M. HDOMh but fkvU«1 WVm thr
 style of fp prltJtc.

!Hyp/ftnl.fmhiilr*oWWbwfa •iu-(w Ap.

Lagotis umbellata

Lagotis umbellata (Linnæus) Thwaites (1, *Asiatic Botany*
 Schoet, L *umbellata* Lessert; Fig. W

Rhizomes creeping and fohoal^ up m 4 i HI >'. »» and
 1.5-2 m long. *stipes spin. up ID l t, m loinpi''''''''1,
 blades sagittate, major bfawlt* utualh ptnnMiAd. »i
 no ihc mcin nerves ol ihr *IMVUI *surface. t l h *
 venies about equalling peduncles spin.

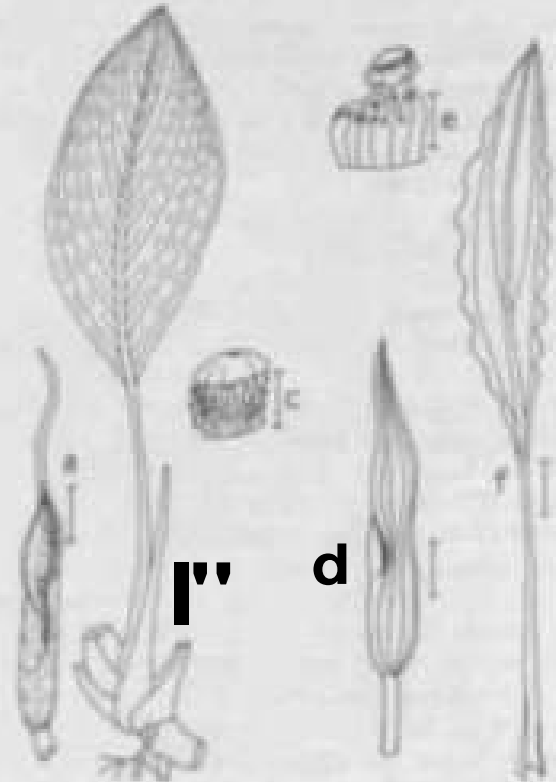


Fig. 48. *Lagotis umbellata* a, spathe (3 cm); b, leaf
 (1.5 cm); c, ovary (0.5 cm); d, spathe (2 cm);
 e, ovary (0.5 cm).



FIG. 50. *Linnæum* species: a, inflorescence (3 cm); b, leaf about 1 cm; c, longitudinal section of an inflorescence (3 cm).

Spikes slightly twisted, open only at the base, up to 50 cm long, greenish-brown to purple. Spikes completely covered in fertile flowers, at anthesis up to 7.5 cm long, in fruit up to 18 cm long, green and fleshy. Flowers bisexual. Perianth segments 4-6, ovate-lanceolate or rarely 6, 8-10 mm long, 4-6 mm broad. Ovary 1-locular, small, sessile. Berry 1-seeded, warty on the surface.

5ET
Berne*

unTM, rS, *iocm
itKFtH

Pete - Mostly areas, sometimes in brackish water. Pollinated by insects. The disseminules are warty (or rarely smooth) berries, dispersal unknown. It is very variable and is sometimes cultivated; the leaves of the stems and tender leaves are used as pot herbs. Ray, A. *Cytopogon* and its Old World allies. *Blumea* 33: 9 (1988).

^ (Hyp.) S and SE Asia: Ind. Bur. Ind. Cey. Ind. Nep. An. Ma. Mp. Or. S. Tr. Wb.

Pala - **Uiwfuhj] nm*ru»" 51**
Siokmil

Stems, free-floating rosettes with numerous roots. Leaves subsessile, obovate to ovate-cuneate, up to 12 cm long and 5 cm wide, with (5-) 5-9 (-12) parallel veins, densely pubescent on both surfaces. Inflorescences axillary, shortly stalked, much shorter

rius - E M M sp. niir <ti.7~) 2-4 <tn imt^ . gpaefcb-
ns hairy, conwlutr at litr 1MM-. «p«diim atmw,
uifh .i v*hnr • iltnljir (ii.ijjin. DOOMrkted bfttWfMf *hv
female anil malr paru. Sparfix ihortei ifi^n and jurtiv
. utujir to ihr »puihr rfi ilif I'JV, VMIII i female Bow
bdo* and J i-^i in.ilc RoHm .itnvt- Flower* uniacx-
ual. jMit.iiuli Sw in. ihr aala *uU 2 united itamcu.
(tv.u> OuktfiapAd, I.4eular. Berries many-seeded,
green, t nmrdr b\ ilir ff-i*fsi«-nt

Perenaki of BdHMI Braflrotiafi rwctirt with
IHIIHiy" li ..M - v.tn- linn > .uiiULil In tjtik>. litgtKMii
.nut in*' hrlfb l wtalh in itr^h v^tu i bui mnictimea tn
,t,M Lcli m i-nti vilt MKn IkaicSI rini«% during the-
[mi v,r,itt,rT tun mrit...illt tlifotighuiif ilir ir»r.
Pollinated b) toaect KtfconpaiftlB in'! praMUjr&v-
speculy w il pitlii.itnl lns-n iinnilli * |K-IM<V «CT«1l or
det., . It. il intflIn. IIRt(h III*|H'l«'d t» ujlr U«l ltlilr
may be eaten by man. •h \ •ctow pCM in many
regions I'm U«<1 i» iii«lit nif in IrKlu at .in latiM i
antidysenteric. buecckkb JIHI cure KM wthnn. li «
fed Bengal.



FIG. 51. *Pala* species: a, two floating rosettes (A cm); b, spike <4 mm); c, longitudinal section of an inflorescence (3 cm); d, seedling (1 »».)

{(O) E*Li Pmrapfci in, Bar, Gey. l"d, P*k. A*. Rh.Gf.Go, Kl Ki Mn. M> KJ Wh "- 000 in

ASCI.KIMADACEAE: MBgcncn

Mning CM MriggliitK licit** Jf>i *hml», with nutli late*. I « w * *ir»n»lc, t.h- to reduce <l uppuu, without opp-ir*. Howr* radwlk Hinmruu JI

Vmcruu*. PrUli t-arafMUtublr Sams M and aplc unilefl >> » x.luimi ioni»»trn!mti>. l'nllrn tini(rd • nu pollinia (each derived from the anther cells of 2 adjacent anthers); pollinia paired. ""•"if <m ipoOO-shaped. 14i»Uit(m- Fruit • JM of follicles. Seeds tufted l* arrtwm nl hi

Opuntia 4 vpecin. Old W*wk u<>pk«

Opuntia acuminata 11 inrucu* fil.| IL Bruwn ex

I v Si [<0 wrtHWJitrl. 1ml., two Linnaeus, Siamensis (linaacw BJ.) Itolm] Fig M

Bruit hn* •ifj<tlrt I j-ji*r* ohkm|t to tinry. 4-« cm long. 0.5-1 . • nldc F'lo»en uuulK (Hitni. ia Sr|uK cup-htur, the lnht-t I-S.S

PetaU puiplub pnk ... ptulk or «hkc, I - 2.5 cm JCTUM. Uwwr hall untied; (ohc* trlkngol • •ur «* double, ihr iliner »••. Cynosegium -7 nun I- Follicles rllipHtkkl, tntfeied. 5.8-7 rm kmK 22 cm

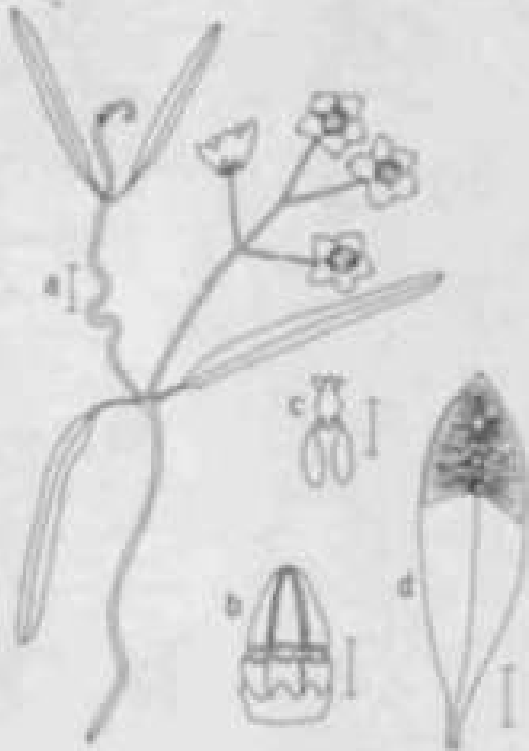


FIG. 22. Opuntia acuminata: A, habit (1 cm); B, transverse section (lamKCFiiMii (I B» . * In* mil tap pmn n^iritfff fl.thn. writ and hm* (1 cm).

diameter Scnb ± 3J mm lour bearing h*ir» up << I TI g

In ftrnmp. bkr* inr) pondv »frn nxHuiK in *jtn ,i ifn^dff <»» emergent aquatic plants such as I/^U and vwtuui »«<<<>) I" Oowrra *rr wn brautilul trni *l. »ilvrd; pollen ^ by insects. The seeds have tufts • bain md »*»

{aund

H« U. Extending from Egn [n „„! Iraq t.. Ae I Gey. Ind, Nep, Pak. Et, G, K, M, r, K, l., i, Wh

Annual or perennial. Fl» »rtr* MTMter.l m A * -in i p** Wr in hrctk; •vrM* turTUuiulnl Ir an involution of leaves. N t«kahwnt. rrpUrri Ks • ptpuftd h J ^ hnnlr* or tain or <bvnr P, »als S, unid, either radi- *lh ftnimtrk*! (IUUUJI (VM to) as bilaterally symmet- %ul (several) Stamens S, joined MXMMM

>,,, a species (a specialist » Ol|t> mMDt »henrj

tmfck, ti K rkt umih \Mn^.^ tn Had iVadnh. Imfu >M»ni*J ef U<mamk »•• Tansu "IK Botany 6(2): 375-418 (1 « 0)

r • hndit main »r "I"«<<<» «r wrnV win in pl.n r, v,hcif w^iri MWMI <turnm 0>r monsoon but • dried out. The*r p » are INK wetland species bttl are « sometimes found growing together, with wetland species shortly after the monsoon, dry areas they then replace the wetland species in

AhWUi

The following species come into this cat- A. P. de Candolle: « J IB] •

- rut Hdtm hiftmmtm i ... Urritll n Sherr #, jilua l mi' ... B. radiata Thunberg [B. jilua Willden ... B. acuminata (Linnaeus) Philipson 1JI «4M«B^A<' ... B. ... Vltiti ... I tMM t ... Pitmdtmmt

Hill ««rti |C ... Y v r a t

Spergularia (L.) **0 B** *Spaldella*
modifera (Unruwui) ti*crtrrt. *Budala chinensis*
 (Osbeck) M. (Linnaeus) Lessing;
Euthamia ^__1 G K.miii i \ *arvensis* Linnaeus).
 Th« **lolkming** species are found in the
 do not extend south; *Bidens cernua*
 Linnaeus; *B. bipartita* | Linnaeus; *Cotula coronopifolia*
 Linnacu*. <l p>

1. Leaves alternate, mostly entire but sometimes
 ..lining IMUI k>"

l. ton, bn» h< . "d PC** .**"**

MM cnwdrd on - ...-'»'•
 7 timi Jll <lunww*

h l ' n ' l - . . . u.

na ..%ar|WT

lmlouai tip; stem
 « With - .h-rF»y pu<l<l

4. Involucres of many more than 3 bracts, the bracts
 never orbicular or broadly ovate; stems spreading
 from a single tap root

3. Leaves spatulate and tapering at the base,
 never pinnately lobed, glabrous or nearly so;
 flmrniK hradur

5. Leaves not spatulate, pinnately divided or pin-
 nately lobed, densely clothed in soft, multicul-
 lar hairs; flowering heads mostly pedunculate

6. Flowering heads
 (2) together, most opening.....
 without a papery receptacle convex or conical

4. Flowering heads in terminal clusters, borne
 above the leaves; cypselis with tubular pappus
 with a fimbriate mouth; receptacle concave,
 sometimes with a conical projection at the
 centre

5. Leaves opposite pairs, seven fertile ones
 enclosing the heads
 7. Involucral bracts more
 4. scale-like, not

8. Stems
 appressed,
 2 flat, not c

and corky or blackish, cylindrical and
 petals cream or white

ta*
 with
Elytra

H. Stem*, lcavr* **MUI** | « * I * **gjabrmu** oi ittghth pu
 m i l ; rrtcpt*ck>ctonnaic, am« **MUK MI** limit. <v|>wlu
 i l l alike nr tli^hdv <llllKUpkh wiihiit ræ h linul. **m**
 ..i 1,; |« **lah** > **lhj****

Camelia 1 t|wd*
Camelia luillarw Rusburgh [*Alyce* **anentaln** A Don]:
 Fig. 55

Glabrous, sometimes **viiitrwliilt** <|k (ulrul 'nemi
 >mu.. J« I-III. |*>-M) **t-4S** cm tjil, with
Vtold 10 t« («ni kHigiimlnul iiiijirn, r^tlirr **Mrolkm** J«
 ihr lunlv **LjWWi** alirni4(r. nrwir, **hmCCOfetJ**
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 ex p tud>.! .iml **iheaUi**

the stem **B PloHM** bcadl **MBilc**« J* .i1jr%. up li. l >S < in in
 diameter; involucre •A 2 1.1) biiniv .- l« **OfUculW** io
 hn.jnlly ovate, crenate i •!• niMiilau. with A ihupK
 pointed **ckx^ati** tip i **lgolMC** itiwrt* nbK-nt; iut>
 fls <W ± 1.5 mm kmn **^400tbd<** pale IIIJUVc lo b
 ,, uln . the outer fls **nibtcn4cd b** | - **jb->**, the
 miiK wiili..iii **Kaloi** \iilin* djik **violet U** > **blncL**
 Cyp-W-LM obuvo*d. 2-3 mm IOMK, IUurrml >IMI **B**



Fig. 55. Flowering brad flntn ndr wd 'ack (1 m); d. **rnwrh** (t mm).
 Cypselis **^**. r. tin** widi nm rhwntnf hrwb (4 mini,
 l. whole plant (1 cm); g. cypselis (0.3 mm).



FIG. 54. *Equisetum pergamum*: a, whole plant (1.5 cm); b, involucre (1 mm); c, capsule (0.2 mm). *Equisetum alba*: d, plant (1 cm); e, flowering head (1 mm); f, capsule, left smooth, right curly (1 mm).

S r
 Annual or occasionally perennial. Found in water-logged soil, places subject to seasonal inundation and along water courses. Pollinated by insects. *Equisetum tovm** used in medicine as haemolysics. (C) Herb. India to Indochina and S. China. Bur. I., i Nep. Pak. ta, MK Vih.Mn.Mp.i" . n I p, W». MWO ...

Equisetum: 4 species cosmopolitan in tropical to warm regions.
Equisetum alba (Linnæus) Hooker [E. pergamum (Linnæus) Linnæus, *Verbena alba* Linnæus]. Fig. 54
 Stems, leaves and bracts clothed in white, appressed, almost bristle-like hairs. Stems creeping, ascending or erect, 20-30 (-35) cm long, often reddish, rather hard, usually branched, swollen when submerged, often rooting at internodes. Leaves opposite, sessile or nearly so, lanceolate or narrowly ovate-lanceolate, 1-6 (-8) cm long, 0.3-; on side, margins entire to serrate. Flower heads pedunculate, most solitary, up to 1 cm in diameter; peduncles 4-7 cm long; involucre bracts in 2 rows, few, ovate-lanceolate, overlapping. Ligulate bracts white to cream; tubular florets white to cream, 4-toothed. Capsules 2-3.5 mm long, dimorphic but

alike in the IK-MI, NMM btOHll v*.rl, ttmw-colouird, iu>>t(iii.ii< •UgbUy Bauened <\inrl>; other headi with dark grey in Mark, MMMlh qrp<fau i P*PP™ reduced m 'J. minute and uniicd Mraln. wiilt or vnthdui afrwhairt.

Unaiiv mnuual bui to tttt wtt eo<MIUk>u ic may peicnn Ur b) iixin.iH 41 ihr turtles It ix >.timmh in and alone the edfJCI d pOolt, tjnk>, IIIJ^JIMMI OH and din he*, WIH-IHHC* foimi floating in auttl, llw n i, HIM) m m< iiri.iv boi raret) totniclered io or i Wftou* wrrd. Pnl&IUtlMI COtomaphBoOI "i Di thap* mnatdmea ratoguiKMti HM dlfmtituln air i)IM'LS v*nt j ininou- p.ippu-. iXiuarpbic:rittief . | Run ned 0td Oauin| a '»•' i yUndrt •! cm) linking. J (k<M tame dhptflicd In train li i* uwd l<r i\ medical purpose* in bidbi md " ta i n m • libaiOi dye t" U ilw -• wouxct d ihlopiwne l vfa ch are H rtW againM neman>dr». l.lm* with OOH |> l are sometimes diiy t o/Ai while Owe with marginal mberdc* »rf <atlr d £ piuthn/o; ihrie *crm in Dr nu> intttgrtdtag ptanrt i

1(0) Htl{f'1. Ms|O|. CUMmo(x)hun in MMD and II.>|<K.II nindinom Bar, (<v. Ind, Nrp: -An, Ap. At, Bh. ni,(-, Go 1l|i. W. Ki. II. M>. M/. ih. P|. K., m Tn.Up, Wb. 0-mlOm.

Equisetum [Equisetum orth. muL]: ± 10 tfx ipott-un in *ann regiiiii». mmi m Ain^rka Fjtythm flmrtmm* I OUtndM V>< 35

iMMerrvptngand odotoi jwciid-irtg, up m !W rm ull. [MM •" u|>p*niic juuft. «ih<*- ale, linear to lanceolate, long, 0.5-1 cm wide. glaiKoiiv ncMdMci *">• M FK* t>.w. nuiKim »li(rüih toothed Mi>*rr lirjwb •raal' or Mt, in one of t |,JU ..f U-jvt-t. t H mm in dlamru •, mvoliM-u! hu. i> 4, »m wUc and U-al-ttkr, rm }> ihr head*. <<' 00*M JMK ohiuw, T U inn long, ihr IMKi j. Ird ai the aprn. 1 6 mm Umg. Flores JII liguUtr. nrhh wn thon inncim. inuMh itihuUi CypwIM t I mm Um%. lwt*m d in it<lt->; <t<In prnbtrnt iifid and hanleiv, with glandubr hain ai li>- ttp, pppm '•<< <<

Atiiti.0 IH wdtwtmr* (*rirnnul Efeci hel< joitit in ntJl<liv fil^i'n. lanks, ditchei Of «...uran mln> tliutmt; PoUaand by insects. the dtecminttlrv *rr rparlaft rtu-kwnl in (urdenrd viln, I Itr du)>ctul b unknown. Almrída. S. M. and IUniwalU, A K M—inr cHxiirtmrr of t.*y4t* fiu.tumm In a df) («uui h'Mtial o| thr IWimhin' Njiiuuat tli>tot-468 taa(we7).

H< 1/I4fp?| S Jb><1 St: A>*. prTh>p< HM . in W r.i.h i IUII. Bui. Iml, P<k- >Vi, IMi, HI. |k, --Mh. >, VM



FIG. 57. *Euphorbia* sp. a. «h»tr ptnti (t cm). h, *Qtmrtw** beat) Cl 4" (1); c, stem |HJ.«LIT **lr il IKI,, *hfimi***, *Uvmt* (1 m) > e, *Uvmt* (1 m) > f, *Uvmt* (1 m) >

EfimMm 9-15 species, **panirapin**

Euphorbia diarrhoda (Linnaeus) Cassini [*Euphorbia diarrhoda* Linnaeus]: Fig. 58

Stems p i e, muth hcarrhett. 3!W (-50> i • ull. gbroua. ^ ot 4witiged; winjf* drrwn from leaf bwn, rnlfir <r drnuir Ijtnet altrmMr, m m w ^ oblanerata or ipalhubttr, 0 -10 cm h og, |^|J *mR* side, some h IIUiv. ifUbroiM. tuac *n*nr<rfu(>i iialc, mar^uw miMür U looOted or rnim-. tip uuir w obcuw but UHuU mm KNiMr. Hrndl gk4»»r, t | in diawcirf. I MT mure at bin c b r n * % , peril mi 5 i i n loo(, Emolmtal bntt* tn 5 UnceoUte, S-5 BUB tun*. 1-1.5 mm MJ.., canOap- ttoui. acuminate, rrcurtd M thr tip, lottfjn Uun thr Ilimri* *titmri** aJt (uhubr. *itV to purple; (mule fkn.r» numerpiM. tubular. Ihr pclab V m Vlobrd 1.2-1.5 m kMif; bferxuul llown |c*r»r (t JO-M>. thr peuh 54<Ac>*. 2-S ran Ions, the mm tmulH •bot (see C) -n-U* <f it uulr Aewrn c4>totd_F ± 1 mm loos brown, with 10 *ptitt* vinglikr ttl»; MUMM •MK

Annual. tJ<i*n * <> abuncL. It is not used nrrf i. (HH) «-« n i»un.l ,, *ri VA*r_K Ot in standing Mali in dthbr. manhn and rkr lirltdt 11K-

roots are bitter and astringent and: u»rd n» a tonic. A second species, *E. diarrhoda*, de Candolle, is sometimes found in rice fields. It differs from *E. diarrhoda* in that its flowers (2-4 mm in dia- ^ (rv); l. 1.5-2 mm) are small, long, smooth and

tonyhJ «k. (0 Hcl). S junt St Aafat I (see Cay, Ind: G. i, kl hi Ch. To.

Group: 10 tpr< tropical aيتد ram Aftca and Madagascar. 1 species extending into Asia.

Ferd. A. Knwton der Grängislar (Australien-AMfrj*-i VII' «ilungen dt, Botanischen Si**t» sammlung München 15: 425-576 (1979).

Group madagascariensis (Linnaeus) Poiret, Fig. 56

Stems, leaves and bracts clothed in white, soft, multi-cell 'W Kalri, aho braffi^ a, glandular hairs. Some arising from a side <> t»p root, ribbed, crev ptaf. ascending m rrcv, wMnrtime irrriufll to a single ttr..rnulK bntwhed. IIM-faraiMrhr* 5 - » • in long [roc* •iirnutr. tmim-Kiiv. mallr. ., in 10 cm F*<t» 1 4 cm side, oblong-ovate to obovate, usually

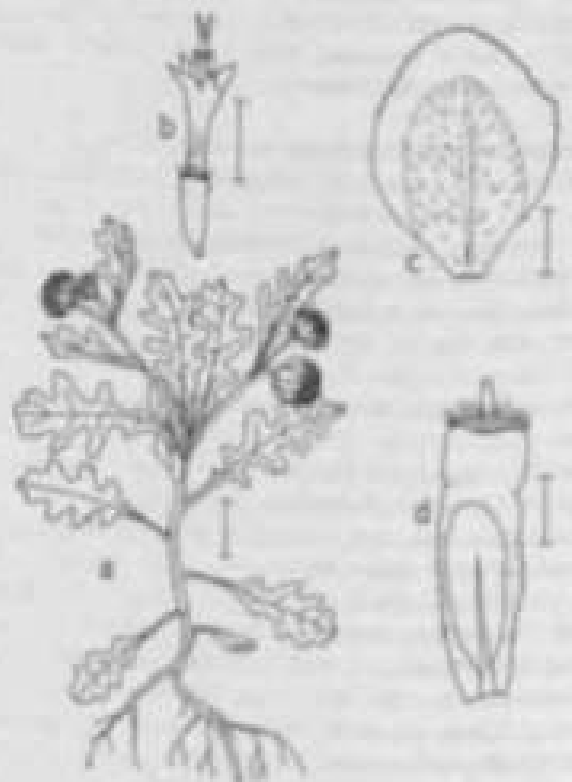


FIG. 56. *Group madagascariensis*: a. iriMtar plaiM 0 « • * b. Internal flower (1 mm); c. stem (1 mm); d. *Uvmt* (0.5 mm).

... lobed, the lobes oppo- site or nearly so, in 2-4 pairs, smaller towards the base, each entire, toothed or the larger, ...

or iomcumei 2 « S tofiedier, globoae, "< -1 •< <" '» diameter, peduncle. 1. '»'«: mu> ^

... receptacle convex, glabrous. Ligulate flowers yellow, in 2-3 rows, the limbs 2- to 4-toothed; tubular flowers more than ligulate ones, yellow, 4- or 5-toothed. C.

pappus * i lip. Ltlin.i. 1.mK, tuiitMia n,r dt>rminute< are imall cyp<*. UM

nd mcu*truf>l di>ordm. II, butnowvride iy, i> Up, w

7. Muck bnactod berbi &emi numrrous *r Jilr. «...*d on J J 2 J inio 1 Rlobow IT....nalcom..... 'f / ' HH.r.<hlK<.-U.-m..wlKo...l<-1..... ^U involueme bn<:u ol ike «.<<,,.,, .< u lite, tu

cotnpre<rtl: pappus ab<ent. H U H «' » ^ herb. !...-» ctae Ro^CnuR.

1. Subtending covering the base of the flowering compound heads stalked, 3 spherical not resembling slender cones

2. Margins of the k-ii bladei ind the wingt <si the stems, branches and pedundet entre < Mndetimei simply toothed but m-vci tpittyoi sjiDy-dentale S. africattut

2. Margins ai the leal bladei ami the Mingl <l tile Menu, brutchea and peduodea spiny, tfAay^ent^t o! spiny-double deaoue

S. Leal bladei villoua <sj hirtute, bearing (talked Rwanda on both nir&ces; margini of lesl bladei HMI,ik doubk dentate; peduncle wing* ttrong and 1 uimn up to the compound beads v. IHKCM

3. Leaf bladei penbtentl) wlmr m tawny wood; 01 tomentoae, not bearing Malted gland*; margina ol leal btadea uauall (Unpty dentate; pedunck wingt tape) itit; ofl ami redw ed 10 iptnei a shot 1 diata bdow ihe compound bead* S. \$meffaUnri*

1, Subtending bracts viaible throughout the compound bead*, < loael) overlapping and hiding the flowering headsat antheaii; compound beadh teaaile 01 nearl) 10, i conical, resembling < oniffej conea

4, Stems and leaves glabroua 01 puberulous when subtending bracts glabroua 01 tparaeh puberulous S amaranthoidn

1. Stems ar>i leaves htspdulous, villous when younc subtending bra ts htspdulous and < liate S. jagensis

Sphattitnthn africattw 1 inn.mis [V microphalus WUldenow]: Fig, *7

Sienu uwallj one arising from the I ting nuraerotu Mcending on spreading braechca throughout ha length, up to i 80 (-90) cm tall. Wiogi on stems and brain hes entire <si «nh bete and there giabrotMOi pubescent l eaveaol dsfl main atein obotate to oblanceouite, '2-10 cm t<>g, ft.7>5,3 tin wide. jmbtMini fi sowsctfastea ahxoM riabrous, flu- margins subentire 01 denticulate, the iip rounded so nrtmntr. the ddsttji tiarroi and and decurrent, forming tin snflfa ol uV leaves <(ttif branches generally ssaaHei and n.u- rower. lometimei elliptical 01 linear4anceolaM Compound heads globose 01 somewhat ellipaotd, 7-15 mm kmg, 6-ISmm ho iHainftfr; peduncetes up to I , ttj long, winged below and tapering <l towards the MJ). ili. wings entire Subtending bracts)UM visihlr btl oal) covering tin- bate <si ribe Dowering heads at ai oblong-spatulate, apical, r 01 nmmit (I at the I

Annual In wd placet, swamp*, rice Reids, often in brackish water, sometimes temporarily sub- merged

Helj. Old World tropic* Baa, lw Ind. Au. Co. Kl. Kt, K], In. Wli

Annual. ft. R " ^ " " wetlands, occasionally temporarily submerged. ... and around irrigation ditches and rice fields. ... considered to be a serious weed. The plant is highly aromatic and a range of medicinal uses has been ascribed to this

pU»i Matbcteimto ... aphiwdttiac, cuter i<< UwUuchc. dlurctk, laxaitvr »iwl ti*li pobttl.

11.1 IVoph.ii s JIHI s* \MJ Atvi \m<ralb: Ran, Bhii. But.Gejr.Ind, Nrp An, V, \i. \ Bh. <-u. Kl. Kl Mh, Mp, Or, Rj, Sk, Tn, Up, Wb 0-800 m.

ti G

I ik< s itmiimnftwuU* \v\ Menu JIHI Icsrea hhpido- lous, iflow when foont; <' ' ' acts his ... ptduknu JIKI ttluir, up lo 10 mm fong i ... h to tip.

Amuul Ei'olop' uuiluwwn, |0HH>| Endemic to lower Myanmar; + Bir.

pha^m+mMmmf^ A l" .1. C tedpUe Tig. S8 like S. mdirt >ui imully tall and mi<r robust, stems branched, up to 65 cm tall; leaf blades persistently white or tawny-woolly or tomentose, not beufni •talfrd glands thr mat_Rm UMttU) singly dentate; peduncle reduces ... spines a short distance below ihc coo pound ht j.

AIIIKUI. Wn pi- Africa *nd Asia; Ind. Nrp. An, Bh, Pj, Up, Wb, 500-1000 m.

43 species; the ... ur drcumbmi, bram hin_R, leafy, wc>k. at lower nodes. Leaves ... qa term

or axillm prdunt-lu. wUh llgutalr »n< ".hub. « tubMbi Bowm only. lwwtawd bm u b l •* a remv AiiTJ.rr. funmlrd W ihr aprfc mmttrh

ligulate at the base. Receptacle covers at first, becoming oval-circular at maturity, with scales enfoldng the tubular flowers. Cypselas of the ligulate flowers 3-angled; pappus of 2 weak beakles or absent.

Annuals. **S** *Splendora* is sometimes included in the genus *Aster*; there has also been confusion with the genus *Aster*. Sreenivas, V. V. and Remman, C. The genus *Aster* in India. *Journal of Economic and Taxonomic Botany* 10(1): 141-147 (dated 1967, published 1968).

Excluded: *Splendora alvosa* Linnaeus and *S. rubra* Jacquin; not bund in wetlands.

I. Hi *rU •..It ... Houri• 3L Cypselas without ciliate margins and without a pappus; involucre 1-ovate

1. QpJebM with cfita cm OOC or both nurv;m> and vuih • papput => vsuk lr.i^lc bri*iln, mv.ilmrc 2*rf UIR & fwttukitn

I. Hodtwltli UfubM Bowwa

S, Hrafb R-10 mm m iluim*tri; ia> llortl% B- 12, the

S. VlrwW V^ mm m ttHM I ... ray florets 4-5 An limb 1-2 mm long

Sp*tanA*t mini A T iK' « iBUIdk [V «-»/& MHI Ind. ... (Linn. cut) MtriAV MM • ' ^ (-V P. Ur O ... 4 B *Luk. . S pseudo-umbell linnarut, *Arnica mont* (A. P. (k Candolle) R. K Janvrn. *Cerele tanita Wtik* Fig. 59

Sirtnt it ... 15-40 cm till, teatrrly branched. Petioles p to 15 i m long, <>(m pobe••• the bi ... leaf blades ovate, 2-4 (-9) ' in long, 1-2.5 (-4) cut wide, iir-ttuLurty mini, or sometimes entire, glabrous tr nearly so. KUTC <i obIUM »i tip. Flower q hewl* long |M* < luiHiUr. loitiuy, it first 15 mm in diameter, lain- mining 7-8 (-10) mm in «tijiirif-r jini 8-1* mm \ntl%. peril nches 4-10 n long; IDVOUCFR] b acts 1-ovate, ovul. 5.^4.* nun l. eg. I iguUW ROWOI riMCHt; niltuUr !!*>*.<> >riUm. / 7-2 (-Si nun long. Cypselas oblong or slightly subovoid.

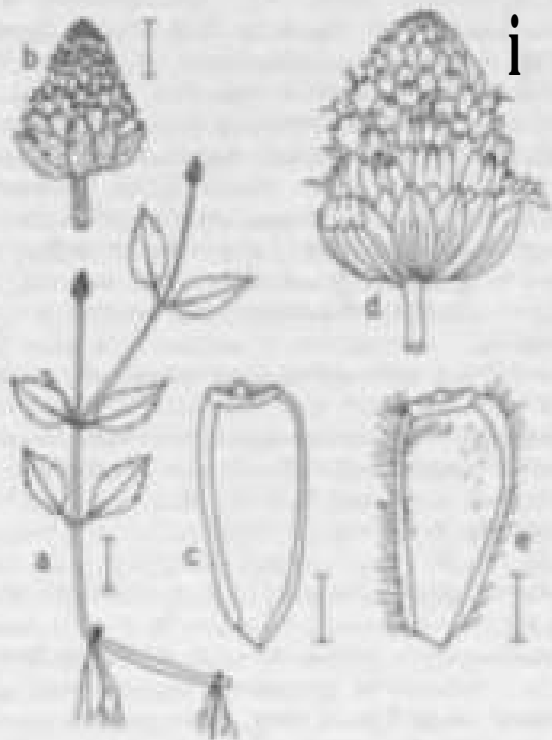


FIG. W- ytbalfcn f«A« A. plant (t CMfc fc t*%ar ri«n lirjil (3 mm); c. < vparli {O.ft miiiV A na««K *. flowering head

leaves -ll* *iUtiraed*, t 2 mm long, almost black nearly
gibif <>u v pjpui* <!*.

Annual, li it <... wftncd to wrttand* but is fre-
ijunctJv found in boggy pound, mji^iit* -it (> vils,
manna, along • i ... Mid in *rk t* fields. In ihr
south il u mclMty found at higher elevation*. It *n t*>ed
locally to core bushbark.

© Ikli. s and SI AM* Ban, But, Cry. tnd, Srp: Ap.
As, Kl, Rl, Nlg, Mp, Ri 1M.0-2.101> m.

Splachnaceae vilata Hum hold i, *Brongpland* , t kmiih
-50

I ikr V *uhghtmm* but Menu imutl) | prostrate; leaf
HLwrt anir, up to 7 cm long, up to 4 cm wide, with
margin trnatf: tkmrring hrjrit 1-3, ft-10 mm indum
rtef; prdunrlt* 5-6 cm In>i{; limb <ol Ugularr
t 2r> mm lonfl, t 2 mm wulr (v r s, b) t X mm k

ligublr flinnrrs ^awi>cil ton niNnUi Hu^rr* mill
7 unrquj] bri<irv

Anntijil li >| not UIUrHld to >*rtUnd> but it •
qurntlv ft mud in wet tw iunlw pti

fO Hell- Ttujmjl AmrrKj, ii.i ... I in India;
<Ind <Kl, <Mp.

Splachnaceae paniculata WalBch ta A. f. da CandoUr
[S ... JULi In<l BCM (IJnnM-ui) Murray %w.
paniculata (A. P. <lr CamMtr) C B. <1H'1<| - F> - 50

I ikr V n&ii but utu-ilk Ui^Kri. u r n erect, 2i' 50
(-?5> <nt ull and (BOW bniKhed; (Ki* <ing ht
I or '1 in k-al 4\iN. ulmiMtrh jppcarijw as (crmtiul
peni l. jl Am 7-9 mm in dkuncicr, |v ...
central, up io l cm in diameter and 1 | cm l
unilateral brach 2-arrang; cyp-la* diro>Hphic
inaiginal ooc* V<dr<i. ihr <rntral tmc* flbil, up t,,,
S mm long, ihr *nuu^iut tifiwh* i iltair. with loon hain
pippiuof 1-1. 1 ... km<, <tfff bnathri

,\ntui> Mtftacd l ... >di bu niim hmnd
to wet place ... tnoht ft MM* *ancm*, ditcbr* and ri-
ll >. often • uJthMea utd m<v irwapt. Tbr kavn amt
Bowrn havr a hot and pungent UMC and arc UM. | for
the ... imrnl of IOTMharhr and HMT thmat*.

HcQ. InCha and Malatiia: rV<, (>,. Ind: A* I
U. K>. Mb Ki si r p

Splachnaceae vilgata Swartz ... (Murray)
Fig. 40

Stems erect of difTiwr, npt.> *l--*4>. m fjli, branched
above, glabrous <c ipanriy pubrwul when young.
Petioles up to 1.5 ... rtV "Ppet ... leaves usually
ovate or *nntb* **, Iraf blanW n<urtoK m l c -v ellipti-
cat IJ- ... 2 <S> cm wide, margin
Hibrnlil- ... Ulbfr. •uhflahrMn rtr <panH> p<<
cent, subacute or obtuse ... me 4i up ! ... 4 heads

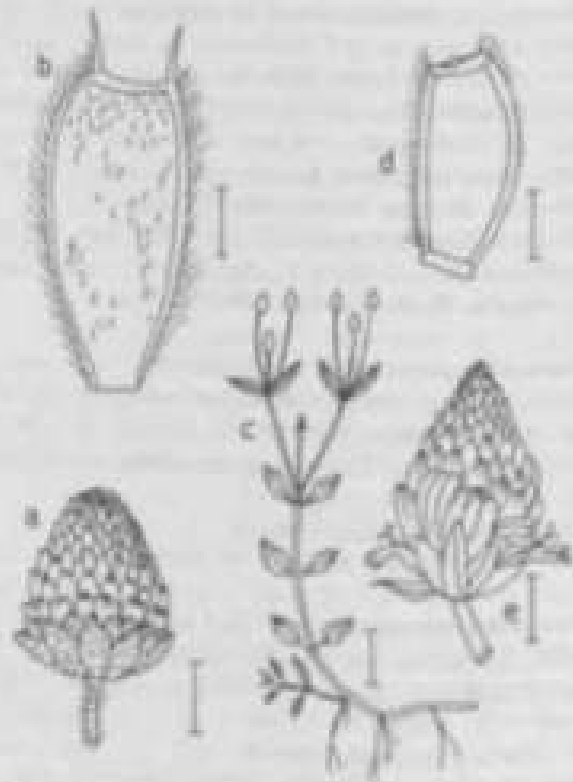


FIG. 40. *Splachnaceae paniculata*: a, Flowering head (2 mm);
b, capsule (0.5 mm); c, stamen (0.5 mm); d, Flowering head (2 mm).

paniculata in>>U solitary below ... ting |M>
J ... odlamtti ... at fir r. uigf lwujawi*
t 5 nun m dMmrin and i H mm km*, prtIm*
1.5-3 cm long, ... tmokMTai hnra l^tiair ovr-Un
... ri baaf ... wide. Ligulate flowers >-6,
yellow, petal tube 2.5 mm long, the limb 1-2 mm
<,, UL3 t>m Md <Uhd
hrd: n.bulv (Ur. >
wit ltmj. it.V-ii.b mm v.
tH both margin, fcPO*

Annual <H|rn al<mlani. mmdy fmm d tn <r<
ditch and rice fields.

© Hell, Tropica: nbtUr nathr in thr No. World
"..." found in Old W<l. <Cry. clud<As <Kl,
<Kl, <Kl.

BALSAMINACEAE: 2 genera
Excluded: *Asplenium* has many species in India <r<b*h
some are ... >i in wi p b m br ttart and ninftill •"
monunr fotcMa; nrmr an ronwdrrrd t* br ...
wetland plants.

Hydrocotyle t 4» ... /Mrftfvnr tnJUm l...MSWj Wgfc'

Ctabrom S i c i m ^ ^ " P » " - tfoho ^ l ^ n T . C H . B u a m i i . , . . .
long, usually branched below and simple above,
3-angled; internodes swollen and spongy when sub-
merged. or (kutinfl. bearing numcrou. root*. Leaves
obovate, sessile or with petiole up to 10-20 cm
ulr* afai ... blades linear » rlli[. ...
Ion* 4-57 mm wide, the h ...
paired glands leaf ... K ...
bilateral, ...
bilaterally symmetrical, mostly borne in ... kin, pistils
Sepals 5, free, petaloid;
the 2 outer larger.
ing, the abaxial one prolonged backwards into 4 *b ...
hollow apart. Petals 5, free, the 2 outer ... iter atesM MM
longer, concave, reddish. Stamens 5. II



FIG. 61. *Hydrocotyle* inflor. 1, inflorescence (2 cm); 2, sub-merged stem base (2 cm). *Callitriche procumbens*: 3, hairs on stem base (1 cm); 4, flower (2 mm); 5, fruit (2 mm).

united IMUnh tin Mmncctivr: itmhrnt whiloti. mnrirt
aru • ml ihr mvii l'arpelo 5, iini< ii itiprrkw; <nutf>
2ut S in rji li ijr|ki. MK hi HIT .1 purpl ...

Annial -! i«i.niri.il hnimd in Un.ilU.v. v.m i *i hr
rtigr b>f pmlt. in nuuil*- ...
ptlOM. flilWri^ >..llii,jri-il [* JMBCII Mu itutrininuict
am g r i d beniet, dwpri «< In inunah of ibe ir «ii
dispersed in wait Sfmwiitk^ pLuiifit l'' ...
Thr ticrrir* we uml u> dye liu(trii),1> in part* of
imiu. Kanwli-M 11 -i mi ttamyau l l.. Mm pin'l-^ tH
thr lliiwrr.in<lr tttt tA Hydrmtrm MJUMMWighl HMJ Ant
fid f<k(Vrttijtr MUI Htm — an ffafwfaiion
Proceedings of the Imiun t Mitnn of Sttrn*r (Tuni
Science) 1000) 43-49 1973.

1(0) Hrl l S ... SI A-'. Ban, Bur. Gty Ind: Ap. Kl.
i'i.t-p.Wb.

H\Hi j \ u 1 \ i [included in Nymphaeaceae]

BARRINCTONUCEAI [Lycythidaceae]
, v. I<iitil vr p 12

BOJtAGINACEAJ |Q >KDI\< AE,
EHRI M\ (> U | i'rf>k, *:

Le OMi *)J>rtit Mi>uln, uuuJly allcrn*lc, vmpir, g
nately several. Inlkn ... MMtU) J eaHnd
cinctus v *HII n wiiboul bract*. FVtwrt* brnu.il,
radially symm. ruj] Srp^li l lj V unili (l 1w k< |VtaU
Mi 3, sessile brknr Stamtn* (4) 5, rpipruknw. Ovmty
superior, rntirr or 2- or 4-lobed; style sessile n,1 a
basal, simple af bruRtirtl lintt -(4 McriarpBOf d
garenu with l-4 |>>T- 1

i-, i.it.<i. Minimi 11— im Ai ...
Iriimil MI ctawp (if niitkt pin r* hut m>

l, V<nicl* ± piountc >l rubr; fruits orange or red
dry.

l. Mi-tln. MKWititM v *iKnh at Itaac; liuiu dry,
mg into l-wrrttrd fiic-i« 4i|>>

t. l,r4vn<rt*fx ... 10 irnUr, oMHfur; flo*
solitary or in H-TV thurt, l-<idrd, lf*K

1. LTJIV ... (Uwrn
nimici ... ng tcarph^l

CaUmm. I m i 40 iprcn (cirpriwlinf im
delimitation)

Callitriche procumbens Linnaeus Fig. 61
.Sunrn jwi<uMr. trailing, while twtr; tVuok<VMim

long; blades obovate-oblong, <
t, thuM<mii ()ti_1 rm *rt4t. whlr-fuUrir. crtupnd «nd pin Mr. buc
tapering, margins crenate to coarsely serrate, tips
rounded. FVnim ...

T''1nl- IJ...iO—*.-

or nratlv *M**. flu- **SPVH** - HIM vjfrtrliinrs m (hurt, l-sidrd lcah npiluT. Srp*h 4 11), ±2.5 mm btng, dMrfed aJmoa unhrta*c: Wi«or»lc, very hairv. »!utr ..i moj^m. prr UMC-IK. Petal* 4 (5t. the tube±25 mm h.OR, kirn.>hinc or ptdc vrll(»w. iprr^ding. imwlh mm* than 1 mm long. O w v ilulkmtT 44obed: %t>ie irrmirul, btWi Fruit dry. HI flni brniting mm .! . 2->r«ied haKc*, |hnr imJh brvokiriff irii* • l-wrdrd mcriuipK.

Anntal. In ihauaw m m . on mola i4t<mi>l in tr » usually llo.xtwi BIOSV br<P% dnrl m>tr^in» ol dnitijt tanks »nd lunnrd IHT fold* I led ON ihrumjtM moflmg and as • fuppunhr for **.

|C Ili*I|, l'titpkal »(id »*nu (rgion* nt thr OM World Cay, Ind, Pal .II. \p. AV 111, (.) IK. Kl. K-M|. K|. I.t.I p.U-b.

Heliotropium 2 280 species; almost cosmopolitan

Stems herbaceous. Leaves alternate but sometimes opposite towards the stem base. iifuf^int miirr. IT<mrr> in & f y p Prial lobe <uostrktrd new fhr ihnwt. tobn tf vvarlitkg *IIIIIMH irfii II s<nficn* siifl win lfin i ijirnrri m rhi O w r 44ociiHr, Migf J* MMWtimn on * fl ring, r i mi <lr, iplHurm into 4. 1-tmfect tnetL him V, 2«rrdrri iwirk •

fa^p (priiii* with maM »prc»« fhrxwtrrmuJ^IIV found in tin v>mh or rm kv • imdiinwit, • In * «pv srr tiMUM) in WTl

|. ft mly -m Jll ibr ttir<ui: Mem* juid leaves glaucous.wHnnrhalMcoik'nt, wul>ur In

1. *temb* whin- to Wu* «w woki. H«a trllnv, M and trim* wiil lwn». not gbiM'out. not *u

2. f.nl . h h b l b -N L b >H It hairs *H. laevius*

2. IVtJ iuhr fkfehiwM or br« tn« mmmr w^i 1.

S. Sk-ni* MKMK > the hwr; b4T blarirt irojir th*ii «n long, i p v w h h**rr. mefkarpb bc*I

5. Sirtm not MCHMK at ihr bMr: lmf M^W> 'i i n, at lew lnift, i l-iiH-fl la »h»r |i«in; mnrurpi

1. Merit u*n wtdl ltatr^ run ttxky. w^nuu or nearly so; fruiting sepals spreading

4 " *Merit* glaucous, rocky; stigma hair n on a side. fruiting wpal* enclosing thr fruit

H. ...

Heliotropium ... r,h hi

Stems ltrtiMnUr. «urndin|] of ... branched,II. Klaucotw hra» he*H-ruir in suboppouhr, whirv

bladr* abonir m obJan. r.»|ji, or ... p ... (QA-) 1-43 cm kmu. 0,S-| an wide, ftnlir. g

glaucous,DdwL FVurnn m | 2-3.5 cm long

«ptl«- Sepak* |J mm long; lobes subequal.

Petals rtkim »| thr dmM with white lobes; lobes obscure. Sto. ... i hi,ivrd it ,h r, , , , , Stigmat

emile. Mnii up l-l mm long, flbbrou*. roundrt) cm thr fasck. hiu, «n*tu,nj,uh«r.|iJehroirti.

Vmn> al or x n n w m uinuaL UcmK in etMUAl •real b* be J ... Uu «K. in and**!

lininn pcwK riot IM-Ui. wwrUm k and r«lk«w Be* . HH|. Trop*rj»i AinriKj, njttir*h/rd i>. Africa and A»ia; <ind. <pi«Jt; <Di, <ki r, R,

Heliotropium ... PIK 62

Stem* littp*) ... ^mi4> al haw. up tn MI (-75) <ni tall lt ... alternat .benr: prfMtlr*

partially win^rd. up loHtm W-.B bbdn maf ... *TM *W(« 5~fi cm •toe, liiwrtt.

akmjt llir nrrrvv baw imd>tr or iwnimd, d «wo«* ">« ... nlpriHhW-. Op.«c,ir ^mcri trmlw! m

.><mK>ted, tip it. S t e r n a . terminal or leaf-opposit



FIG. 62. *Heliotropium ...*: 1, flowering dwn« i' (10); 2, ... (* ...); 3, ... m.tHii|_M (10 ...); 4, ... h4tt« •miktrd (8 cm); 5, ... r. trpafa (1 ...); 6, ... ft MM)

p s|»kr> St pal* 2-3 mm long, divided almost to the base, finely hairy. Md t»bo ?M nun king, .vl.n<lrwl.l. km** tha.. IBC TH«pcl«l W w IH-M-1K
Stems, ± 1.5 mm long. M,ir*l..»- (0 MI violet
Sumrm no! Joined *(*C -!
Frun* «icri>h bifid, r* h lube ± 0.7 mm U»nB .»..J
broken, sometimes remaining IHniirlu»n>-<|TM-

Kamui Pound ta wi » M % Hoc**;) pbc«. in rtcr
fields, on a
Until*. «1» found on roadside, and in
water places. It i* >Mcd k> ... n «nd *yr enmptataa
© Herb. Pantropica Bur. Ind. <An. ... G. G. G.
K1.KI.M,.. In I I-

Heliotropium javanicum V. v. Strachan et K. & \U' (lab
Fig. 62
Like *H. indicum* but sepals and petal tube clothed in
bristly-hair L bristle-like hairs; petal ... ± 2.5 mm
hini. ... I.Miii... the sep. .Ui
Pound ta Qooded and MM t.cckU d.....^
thr utnv WAWMI
• Ikli End ... it* •lfid: w

Heliotropium multifidum Forst. (H. ... IMHtJ.
G.K«fU|irikrixixu*rFI*
Stems ... herbaceous from a
fruticose base, bran...
-11, D* white hairs. Pedicel ... M-lra t.,
1.3 cm long, dorsu r «««!• l>X Up
S. * »«* * * * S * ;
at the
(0.24-) 0.5 cm ...
line rounded, margins narrow ...
with a mucos. Flowers 2-ranked, in 2-5 cm long, scape-
oid spikes. Sepals divided almost to the base, 1-2.5 mm
long at anthesis, persistent, enlarging and spreading in
fruit, with appressed hairs; sepal lobes densely ciliate,
very unequal, 1 almost twice as wide as the others.
Petal tubes ± 1.5 mm long, cylindrical; petal lobes
ovate, obtuse, acute, white, hairy, 0.5-1 mm long.
Stigma white. Mericarps exceeding 1 mm long,
det. ««» appressed-hairy with white silky hairs on the
convex back, obtuse.
Perennial perhaps occasionally annual. Drying
pinks, dries, common in fallow rice fields and along
... Africa, Arabia, India, Indo-China and
Australia. In ... Nep. Pak G. G. G. K. K. Mh. Mp. Rj.
In I ... Wh.

Heliotropium ... [H ...
Revised) Fig. 63
Stems herbaceous, up ... 50 cm long, much
branched, prostrate or ascending, thickly clothed with

soft «hitr Inn- l < tm «Mi.ilv wlirnmtr, rairh p
dic. i« tloh i < hwhD ... *iiri long, VIUCMJ
«««««, l-2.i» cm II.l»K. l-l 9 cnmiidr, mfUv vftout, tb«
base ii«*mb jiiicimaifit hui uiim-iiim-v nmmdwl,
... very slightly undulate, tips obtuse.
miilr in IMI.IK minplr l rndrd ... cm long, usually
... r*. Scpah 4-^ mm bag, *M«lh label nun
... riic diviMiiri tomtwi tbt i«w» mwhed t\ -«thbi
and ii".n4Mr mrtitl>tjnr, tin- mln¹ ultrn Utin to lhr
hair. Prul niltci t 15 mm innR. p«MI htIm t Jmrn
lon|. whitr, ltanlly r%»tr<1 bcyood tllir wpal*.
...in. imi; i.impttttom, uirmnucrl In A tunical
... Fruit of 2 of * mericarps, when 8 'li<
margin lai|(r and ... whni 4 (lir nwii
dMdl 'l md ritguw ... upt up Ui J mm long.
^IJ) ... and ...
Ani> ... Found in the dried ... lir«U*rf lank*, edges
..t n t n hotel irtii DOOb, in rUr lirltdt. |M»(nil.it lv
IKfili rjl>k- in itw cold tJJKKt.
: i: ... tmpe, Cunrr Ufasda v -u.i ^ u
... u..... ..l V»*J: Cey, tnd. Pak tH <| Ki Mh.
Mp. Rj. Rj. To. Up



Fttt. *S. Htituttipmm m-*Uf+*m. a. lknvrnt >*. -M wdh hum
.Anitu^l (l cm)-, b. tiMinf (urn witb H^ii* «*»> and linn <Hr
mcrKsrp* (l mini, C, nttc- «4 N» UWIHAIJ- Ht *. aim).
// u^itii it. ttir^rrtnit UMHM with h*M» <HHit(rd (t *m).
r. Iturtng Kf «k < l M M }, l, tmriil « | M V OC * ...

Rhizophora | *Rhizophora* pro pane J: 1 species

Rhizophora pT"- L...") [*fUtmkdid tfnoda* Martiui, *WkdWu ftm-Mttkx Edffnrortbl*: Kg. (H

Strmt wood*, brim bed: lw*n. (uaD) gflk moilk proMralr, trfirt looting. I miplr, natc <ci in iluutci, MMTOid) *J> up to 2 cm long. UP ¹⁰ H mt^n wide, itv ifnttrt initgim rntirr ut nl*< "Jthcd. apk ubtr.

•rail, in the av dinning lam ivmct Scpab 3-4 mm hut^, *> ubr hrlw, lubes 5. faoKCObr. M UMfaMtt, ia W t n t Prtal* |m>L to purple, prul luhr tatiipanuUtc, ± 1 mm long: k 5< 2..V* mm lonf. obtot^, owrbppinit in bud. SUMrii* c^rrrti Don cwokL T-iortiUr but < lotulr alinfM tompLfUrK 24<KU1. n>lr irtminal, umplr. S-5 mm *Um. penm>m* ln liuii; uj^nu opi. i.tic. fruit 4 nrri or ocxif^r. {Utbo*r drupe, 1 3 miti m diamen.f. birr l>rrjViiiK in in 4, turd, l-<rrdrd

Pcrrnnul. fanning null, usually (ijlirfKii l'uund on KM L* utrf bu i i i w d Jtmong pebbln o> the b<fb of nrnt> uiid nrratm: utuatK <<utmirt|{r<l during the nrt tra* ufl.

f!lri-Rhrti|hMr| ItopHiX'M Wffld Htd / Brazil Bai Oy, bid \n. V G, G, KJ kt M(, R, i n, Up.



Fig. 84. *Rhizophora* species: A, flowering shoot (1 cm); B, shoot (2 cm); C, seed (0.3 mm); D, seed (0.5 mm).

RA.SSICACEAE (< KI (ItkKU | 290 genera

HctIM. l < W J alirmair, without Mtptilm |nlk>

a rraplr tir bnrhed f» mm biUin.iIK mciTK4I, h^an^wrai. Srp>l* 4. lirr in l <lrti< |wn> PnjJt abirni nr 4 i. Sumcro 6 or nrri

|I HIM, JT4ocukr thrtMifih thr (<wm^ 4 J iJH-mrMjuimi> UW trpftun Ituit a <l capttilr (i^ri >^h^>

Gir^Uwrr — *rvrts] tpreln in 'hr Th f.>IUmm_K M <irtrd to (ilwiii b- i,M-d p>^<<<

Jikmim n lln mJii (IM [< r, i h Hunt if on rx H^>

Jt db^M (A f <W Caodotk) M M Han * mdtem (Linnar)

II" >n. A, .UIBBAB : i i i | ff tmdft, <f~"~" J. D. L. (Thomson) J. D. L. (Thomson) J. D. L. (Thomson)

QKMilrrv rt K It. K4>

Nasturtium | *Rorippa* pro |>4itr | 6 species

Nasturtium officinale K Brown |ft~tpf IUvrk.) tig M

Stems creeping or erect, 10-60 cm long, usually much hrd ROCCaf lirkiw. RUIMIH* I' 1-12cm Um((. |> IDWH b<w1 team %iih Nnelr wtxM&nato bUi

bfaHin piniuiu- kH tutnidt thr bur; lateral tr>ttr< S-XO mm l< 1-10 mm wwlr. trtmbul lrj <f I-W mm kMtg. nriMrr>

s* [Mb 3-S nun long. Fruit wtwr hecoonn with jgc,).V-6mm hHtl IVdhrI* In '<"11 man iWi <<tr with the in^><r^Arm<< l m* tadhc>>>>

pcott.ii.tr.) lidfn . *u%nl br nutnrfut* < lanfl. (I H-I 1-1.7 mm m diwnrf HI* i. nKr. *iih • nrt-ltkr |>MKfn Mi ."

t i* itxitHi^ mnm ihr btoaikti rtrf -- I * M HI f juh iwiRK flowing.

I -> ti fi n t lr^r Mrrwn tl 1* fcnomi M Md 4 ukktaird >.- uWtotIndwi bill ttaifcifU

and sweetener becoming naturalized. A second species of *Nasturtium* was reported from the Himalayas; it may be *Nasturtium* (16-24 tin hinf, I.S-* HUM It^h> V n k in t Mdi -itfc U-W cHh Austin Miow OW Hg. Mr> \ h>> <l hrirnn these two species is sometimes k btn

and sweetener becoming naturalized. A second species of *Nasturtium* was reported from the Himalayas; it may be *Nasturtium* (16-24 tin hinf, I.S-* HUM It^h> V n k in t Mdi -itfc U-W cHh Austin Miow OW Hg. Mr> \ h>> <l hrirnn these two species is sometimes k btn

... (Hyp.) Herb. Almon...
1872, (Sep., Pak: (G), (S),
7-2100 m.

BUTOM UZAE (excl. from LIMNOCHARITACEAE)
excluded %1- (> t l

HIRMANM \t I U 9 genera: pantropic

n H H t : W > aptf

... phlo or saprophytic herbs. Str j» trcci,
simple or occasionally sporing

nni||IIIMI altrrnai. green and grass-like or sc...
Flowers solitary or in terminal cymes. Perianth tube
cylind... or funnel-shaped, symmetric or

i ««lr. |. H Winded. , ^ «tati» !!»' fruit water i¹ TM * * *
lobes 1, K< (thai ihr irtnn w innci k>bcj ...

A., r ... 5 ... , imliKktl in Ihr pcrwth uAjc CM*
rective ... al crest. Ovary inferior, 3-angled,

SnlpylIrbnHi.hr' ... sessile sepals or on top of or
... of the ovary. Fruit a capsule, enclosed

L U , with the testarl<l mio
small

most species a ... stands.
... insects. The disseminules are seeds dis-
persed by wind. **Hi.....b m** used in med. * * .

... plant
up to 75 cm ... leaves
up to 1 I tin to* αM i ... y

1. Flowers solitary ... of 2 or 3, slender
plants usually le... without a

basal rosette of leaves, but leaves not more than 1 cm
long; outer perianth lobes ... double

2. Outer perianth lobes with a double margin;
capsule 4-5 mm long **B. caudata**

2. Outer perianth lobes with a single margin; capsule
1-2 mm long **B. pusilla**

Burmansia caudata D. Don [*caudata* orth. nom.,
Griffith) Fig. 45

B. inflata Roxburgh,
Stoma (2-) 10-20, (-») CB MIL **Jl**

Basal leaves a
reticulate 4-10 mm long,
nerved; stem leaves sub-

0.5-3 mm ww. A»»«
... ..

... ..
... ..

... ..
... ..

Mur Of ptirpUih with vrlUn* luhei. wingi icriiulljpi m jk\
or x-mi-iiKi-jir, up in '2 »» mm brad; outn pCfiMMh
lobe* tuiMilU iA-atr. ± l.' mm Um^ and wide, wth •
doable mar^iti. inner ttibn rin-miMjrnu, oMoay
lanceolate, ± 1 mm broad. < tmaet tfm cri«<t> h
basal »|>lll tnnnr)*h4(tr,t. Stv<* 4-5 pun k>it^ . Cip*.ulr
obovokJ. 4-S mm l^>n(t, rmncalr at ihr tnp. £ n U t<«ni-
gatr lowcdgp-ihaprd. * 0 S nnnUmg

Annual iouad in vaiunpy pUcrv ^>ringt. *.n nrkh
ami MHTttftim** in shajKn* waicr at the • dpn >' poob
IOHdJ.Saii.' St.Anc: Ban, Bur, Cey, Ind, Nep, I*V:
A*i li, Mg, Mp, Or, B R»V*

Burmansia liiAnW UaaMMi \Jtrta(h* orth. mm.,
MxjiM-l):FIR.6&

Strnii robUM; M-50 (-7 i >m. Haul k-ivn in a
... ;thmurto L>tn<<olair. * uminjlr. 5-15rn long.

0.5-1.5 . m wide. l- lo Viiri^rd: Urm l*J
... overlapping

below, ilinuiU «bo*r, Umrolair, appressed,
1.5-7 cm long, 4-7 mm wnl^1 HtJ^>rij» numrrou.

... borne on a i ... <iir; the luaiu 1M-> VA cm
long ... B Unrar-Un> ... 4-5 (-12) <m long,

... mbr up in 9 mm hMtg. MIK- t< pulpit often
mih ytXkm lippi <> grw nUi U>br» or ... entirely yellow;
bract; ovary

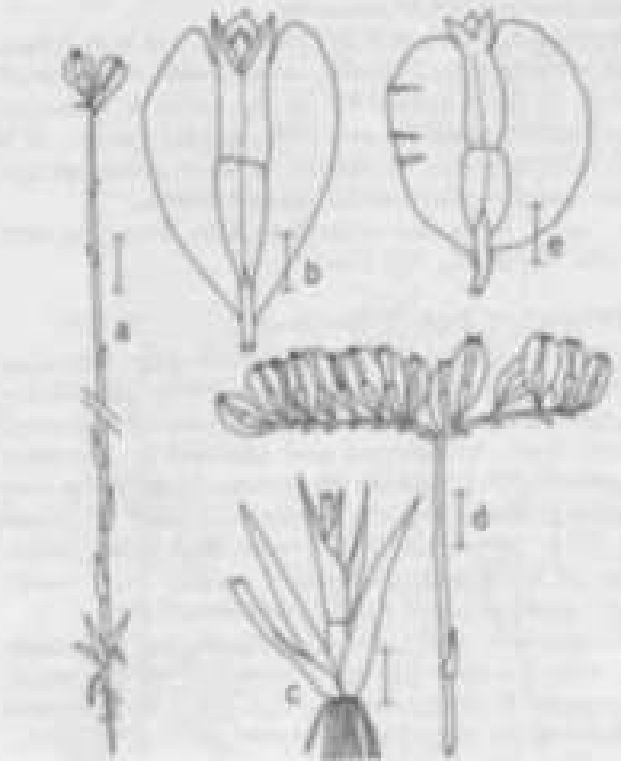


Fig. 1. *Burmansia caudata*: a, whole plant with short root (11 cm); b, flower (1 cm); c, distal part of stem (2 cm); d, pedicel with flower (1 cm).

prrunth lobe* broadly owe, up ld 2 5 nun la... ± U, ana * <> r . . * . → double IMUJ^HI. mini I'... hm-tr ijuihtibtf. 1-1,5 mm long. yrllor*... i ir>t» iaii-lttr; basal *pur utrtii*e or rounded- Swlr... i k n loriR. t jp*iilrv kb<no*d. 4-5 mm km*. V rd* fusiform, ± ft 7 mm kwif(

Annual Sol... fattd tn thallow watrt. but imulh in «wunip«, wrl lliuhr*. UoQfir pt»uit| or CM wrt rocks.

(O HHf. v and SI M i 10 U<H*J1 \u>tnl» Han. Bhii. Bur. ta. Ind. Hap Ap. Av M_K. Wh IMO-tfOQ m.

.1WwwwM jin i in (WWhdi a Wcct) I hwim fig... u tilmxm. 2-10 (-2*) &a »Jl TUM) Irnt... roKlir or m.H. IHCJJ in MibtUir up n> 53 nun liwif. ? I, ' mil) *ifiir, l- ix .Vococili iWlt kiW... dtM^nt. iftprw*!. 1-tS (-lt mm Wmg. Flowers solitary or in lax cl<tr> ut 2 <A A. tlx- Hm one *>... Bract. •Jlbublr 1-^' > miti k>rit IVrMinh tuhr (2-) 4-5 mm Utn%. bright Min- bo purptr-bhi?, *mt|{* < CTOMhaprd or •rtn*obw.iir. tip c< 2 mm broad; OotM per •nth bjtwi u%duibkmg U HUDKIIUI <... 0.5- 1 init) long, with J ihik utt^lr nufgin: mi>c> Id mtmbranotu. lndir-witHjbr, (i.i'V-OTi mm fcmn. dmnectn crwo •... liul «pur ubtu^-... |.5-2.li mm long. ' *|**>k i... 1-1 mm loi Swtb futiffm. ± U.24 rant tortf(

Annual. In damp and wet places, on wet rock ledges jnil around lining pool*, iuaa% with mhrt flwwf licTt** Ln num lmtun KUM4* 'be ruone & owlbt u ll><t illd... id intlmtc* lint tpri M • It 1< murh fftulk-r than 0- rmttrtt-... irli im1 ilu- hwithr itttvcu liardhdi*tuif{uH)uhl<> McII. IMIIM 4ml [ajdoi boia rVui, Bui. (W, tut! A, G, K, K, Mg, Mh. Tn

CABOMBAC: 2 grass

S<m> i tiutitiiAiiHUI or rrttt and... LMMI... iibrntrgci. jvilnuirK *rinr. either all perhae, undividrd, (ldHlnf and •hriMW or fulttuirt> ibw to the tuur. wbrneifrrf •<) whorVri or opp<> Fitntrn bbnivl. r#dulh •nmrtw *1, wl uilUn pedh>b, ill port* hvimpwmt «HI... pak (2) 3 (11 IVuh (X) 1 (4). white, yellow or... <p4r. mem W>. poUrti l-wiU^tr < atrpk 1-4: tliffnuttrimm.il FruiliUftri... tU k>

Prrtnnul or latrh antul. Cjbtlgaih «UM>... tbr U-j>*t inJ>mrfrnd or lleMIng. no. <ntf emergnt. K... rlnunn. tln t<tf l (cd)

The Family Cabombaceae: Aquaplanta, Sumbaha (1992)

1. DiwnNrtt hnr* atHrnt (all leaves prlutr). tub-merged parts covered with mucilaginous jelly

1. DWBCUd lrjvrt prtrnt (prltiir *a>... terminal, iuw x ijir<i with ll.i*rni. wbrhrr|(nl part* mil covered d... K... iL... lh

Brown I** I . perian... Braemia suberata j F. Gamelin % 60

S*ibmcTf<l p<m hea... r^i with much tf... (fl) ... uiUMt with rituiinn w crrrp" ng, leaf-brann|(ninnm Lrjn>n ahrmatr: j<n..l... up to ! in long. I-Uirt (while. Kru-iK... elliptical to subobovate... 2-) 4-10 (- 14) mm M rtm. Pruk lin. 1-2 on long-putpk, reflex. M Mthnk. bMMning O... to fruit. Stamens 18-20... UmenuH-litmju K... 4-18 elongovate. Seeds 2 (-4), elliptoid, 2-5 mm l: 1 * 0.2: 0.05.

Perennial. Found in still... r «Jm1t (Urt-Ktr ttJU- l * * J wide variety '4 MBMilr fajkikttk. Tkr utm4r nLuti* * * r submerged; the whole base i^rtwg lwir The flowers are strongly p... and pi41in*tnl '... wind. Th* diMrtmrniln arr... by water and perhaps also by animals. Specialized teeth (filiformarules or... produced. Young leaves are... •if> M lifMd a M a i«hi>hl food plant for ffUHI

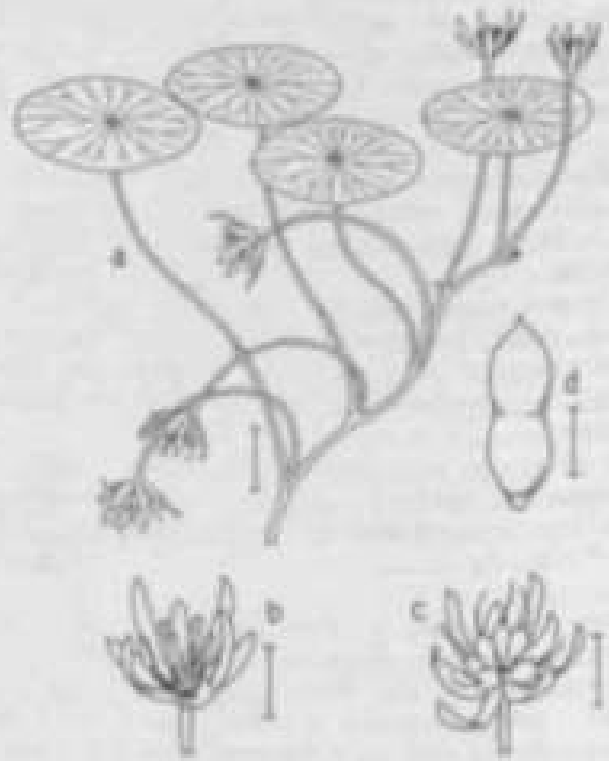


FIG. 66. Braemia suberata: a, flowering stem (2 cm); b, stem with 'float' leaf (2 cm); c, young fruiting head (2 cm); d, fruit (5 mm).

IKplil VYuin 10 MIL(I.)U .il N and (\meri(a. Africa, B Uia and Australia: Bhu. Iml: Mg. Mostly above 1400 m

Colombia »apa New World, introc lucedintheOld World

Siumilo/om... o, «<>... k-th l...v«vwilhdMded n entkc Hade* lubmerged km «*orfcd iljiiiiiiriii pmlmatch dissected mm man) capulai> menu; floating leaf* altern..ir. ...»...<< wWi BowutiM but loncdmesabMnt. pelwe with elliptical * broadly o u«c blades l-Wr* lmxual. radiaiu mmtrfrcBl soHtarj on loo| «>? I''1(000 intwuhypomooiaiidl

Hhbe.yettowoi puq* ..»''' :1'''' . I''MIM111 kldfate tin erennW r)

Pollinated tn MM... ^ecfcitelHnco.... •nd rareh .mini teed outside ibe a*** '''' cWmlnule „< indehfacni foUkle. or vegetative fragments dispensed bj i«w « »...«!I. perMpt rfowl rbry are poputa a.,M.

OrKaa rd.M.u,||. .h, «, n, W, W. mid) Nordic I.L...UI d Bouwi 11(2): 179-203 (1970) •it

I. V, MU ...! ,x-uU !...«>. • -I1 - M... I - -I -'•••- !;•«" >...„th eUipUcal. »-5 nun wide bhdetd dWded hv,».....r ..'''>< "ultM ul n T ^

I. Se pp. and . etal . .L white; mm wide; blade*l ded I axes with wginrnu spreading in one plane C. caroliniana var. caroliniana

Colombia * (V* Efa Mexico to) (art) b|K«i KI Good 11*ln* llwven.. been able t . . . rm this record, p«tepi It is a second incorrectly red record - un always for India.

India Spargani, C. aquatica var. h | MO \uh

Fig. 77 ... submerged, in opposite pairs or very rarely in whorls of 3, reddish brown - grass green to olive green; leaf sec in one lane.

Hi, ... 20mm|«njt. 1^ " • bdr, SepTiddl ... 4-12 mm long, with ... except for yellow class and bractlets of pet.

(3-) 6. Carpels (2) 3 (4). Seeds orate ta i Ittptaid oblong, 13-4 mm loiiy. I-Iji utin Mdi

; \n Eph). Tenpemeand wbtropcaJ America, nat. uit.U/fll HI India, Ilalajvia. New Gutoa and Japan: <Ind:<Kl 1977.

< \t LITSICHACEAE: 1 Renu*

(xiHttrieke I" ipecieK almoM <. nMnopolii.in tui>st in ,iinin irgioni

(kiOitriehe itagnaln ScopoU [C wightwtui WaUcfa Wighl it Aitioti]: Fig. 67

StenM fjongati* when nibmerged (up to I n kmg), contracted Hhen emened, braached Leaves without •uptles, opposite (often roaette-Hke a) dw dpi oi Ho.ninK Menu); wibnwrqed leavet without pi linrti to linen l.timol.tu- or liiu.ti ^p.Klml.iu . (8-) 1H-S0 (-40) mm Vmy. 1-5 (-7) mm widr, nun \snh t forked oi tpanef-niw apex; Roadng leave* fomling • roaette ✕ 6-8 lesvea, *p.tdmi.n nun loaf IL. tudng the ihoil petiole, (li.5-1 4-7,5 (-'ti mm wide; blade "\tl in altno<t nrlm nt.n l-lowen minute, unisexual, solitary oi rafdj I female ;tnd 1 male in the same leaf axil. NcjKtk ,md petaliabsent Male Rowei "i I, naked Mamen, 0.5-2 mm long; filament dead



FIG. 67. (ttittmba itu.Jinuinit *. Htmritiift Utont with rntur jltrl iuuilfd It>i - (1 cm); b. Rowi (2 cm). I aUlmhr flagnalti: t. ihrxlt (I rm);d. tml (I BH)

elongate; amlu-i itinlonn wth lougiudinal del
 cmcc »!»* becoming conlinuou*net theaprx. Female
 flower of l. naked, 4-ktfuU' ovary. \uir* l m • ach
 locale, JWWUJoub; «yl« 2, free, ch. ^ ir. oAcn p
 <Mr. Fruil 4-lobrd. OM It IdM wined M krrled. «pltt-
 IIIK into * IWITlrii rrrrirjrj>s lfum tUr suU- lit
 orbkutv. !.*>-! * BM '...in md wWV; mrrrirrpi with
 tharp angln ami an at least 0.1 wlr wing.

Alitnu) 01 pCWftnM fonllj *ubmciflrd. p^ily
 floating bi temporarily U rrrrirr l hound in »till and
 blowing. OUtrimnWl w*icr The diwrminulc^ are
 flatterd IIM-IH*ip». JkpciHJll by frMct <* hv niifatc
 adhesion to animals.

[(0) VU Rot Eph C rrrnJl. N'orih lirntuphrx of
 ihr (>M WwM, in iho HiinaUiMaiKi ihr numtiMn of
 5W IXKIH lld Sri l^nlLa whrrr it u prifup* inuiv
 flaxed; <Gry, Ind, Nep, JI, <Tr. 209-200)

< AMPAN1 I vi ^ ^ [inclodiogLO8EUACXA£,
 excluding JfHI MM | | M \H:87frtMn»

II. '! . ' rrrrirr alr ftwui 5MIKTOU> Srpals
 unIM d to the ovary below. Pr J» unitrcI h*k*fc
 UT 2IIJI|MII StatPcm frrr Initn ihe peuH. *Kan
 rrr 01 p4itU UK 2- or 1-ltHuLu, wulrt nn rrrrirr
 aale placr j

Ea Ittdcd Lmmmtit ttmgijfwm (ljntijri»> fmili> i
 tuctvr iii AmrrriM. r l j» kj wrrr l
 found in damp ptttn lmi Bd < hM^trrMcalh in *«-i-
 btndk; K«*feirf».jH * " «* 'KiM-n. rllrr
 et Tays. IT. nuryiti i lliuntKTg) .V P. cir (jtjwMlr
 [W -TOrtif-VP rfe<ind>IWI:lw*»i lit.
 m-i uWci * or *firr ihrv tlv uul but • .U.

Labellia [PtmQ*pro (wi(cj: 3G& ipecfes p
 M, rrrrirr or rarely dlc MH» S<rim turni-itl' or
 elongate, erect, cric; rrrrirr somewhat
 fleshy. jcmr* icwiU or perianth. HfiM 01 In
 r, tht bUtr^ In rrrrirr or ovary m <*/**.
 Flowers pedicellate or sessile, solitary or in terminal
 rraemm, vnwtr* i ktM<^uiKHi* *iwn Htb«aerfedL
 KUMtkmo unitcMul Srp*I» tubulr brlmr, tobrt
 & wibrqua). frtaJ lube* loafft lhan Uw irpak,
 2-lppr i tpii idaxtaUv to IIH IMOT, ahmul 10>
 spreading at nBeadi the wluul tobn 1, en
 Sflit rrrrirr filaments »> »n*rrc«J on thf prul i
 free bck«« lul Itillrtl < rrrrirr anthers united into a
 rrrrirr rrrrirr rrrrirr. Fruit
 • n < rrrrirr to ovary capsule opening by .! *pkal
 vjhr% < l rrrrirr. Seeds rrrrirr
 . rrrrirr or perianth. Pollinated by insects or anemog-

UHHU. N»r dmrmttiutn AIT trrd* oi l>rtnr*.
 uperkn iliipcrwd bi 4H)MMI*. mhriit
 M« tnn>. B jn<l l in n, r (lunpuutilaf car ID l lot*
 Malawana, series I, 6: 107-141 fl" 97).

1. Only the 2 anterior anthers with an apical tuft .
 bdn rriMpaoidl rpal lohr* miuulrv tPO
 I. rrrrirr
 an spiral tuft of hairs. Seeds Vv<

TpAl UAv (Iltlr
 Z. Smni Vtidfffi jrul)^ingcd, rrrr basal part of the
 X uucrKM Hiamrnu twkr *» brawl » ihc
 nbmrniA; ueim, kW bbde^ pfdkrb *nd wj*
 ghbroworncMti
 L. rrrrirr
 L. rrrrirr or indistinctly 2-lobed, not winged, at
 rrrrirr *»nli ridgn bchw the tf*>. baml jA*1
 all rUan rrrrirr, ulh wide; wrnv l « * bbrir*. prd»'H»
 and irpal tube dMnct tu: £.1 rrrrirr

Labellia almeidae Lamarrk [l. rrrrirr
 /- p(184) J. D. ii rrrrirr r' rrrrirr, L. at rrrrirr
 s. Inn. I rrrrirr I B < Uitr. L
 CL n ClatrkJ F%
 Stom proMratr. *» rrrrirr n nn • 3-20 (-40) cm
 long, ^a rrrrirr and 2-winged, often rooting at lower
 nodes. Petioles 1-9 cm. rrrrirr. rrrrirr;



FIG. 88. *Labellia almeidae*: a, flowering shoot (1 cm) with main
 rrrrirr section of stem (2mm); b, flower (2 mm);
 c, anther (1 mm); d, anthers (0.25 mm); e, anther
 rrrrirr, anthers (0.25 mm); f, anther (0.25 mm); g, flowering shoot
 (1 IMI kh rrrrirr of leaf
 h, flower (2 mm); i, seed (0.25 mm).

meat leaves UMMIK IMII W m... kmg, ...

ghbrousonboi ...

Rowers

Un iu lh< will -I U-aHrU brae* 01 "i> "I'

ike. Bracts nIMtett <p to * "'in 1< rVdiceb 1-3.5 an I- • •' mbe< onwhap<

. ,m> tang tea*) Wba uu<^ut.u. subulate,

2 i<_mR. entire. Petal tan ma loaf,

" \L.S.-I. (.I.I.M.. *fch

pih si lobe • jil> ipreadtag,

6-7 tnm acres*, bright blue with 'J whitr streaks M tht-

)>is< tii the middle lobe Sl.nm n jt.ii i <il

the t .ititeridi Rbutwntt i<j<e ,t\ bftMd as (he oth<-r

t).iniiiiit>. ,ill .uilht-is with ta tpk>l tUfl *)i IMIIV

< .ipMiSi s obOfotd 10 lu-imspt'iHa!. 'J!:-S mm Song.

•-3 nnn wkt mm lotig,

it;lr<l, vtiih thu kened netargfan

\ntiu,il Often WHJ .ilumdani in HCI me field*, n>.>l-

MIII- dill hea .m<i in othe ww >' (auncbtted)ii.>' •

(id S..M,I M \dat Bur, (ey, tad, Nep \p

<!*<*>. Kl Ki, Mg, Mli MJI. Fn.WI Im.

Lobrtia hrynana Rornur X* & huhes \m—tnaialA

Hamilton <\ 1) Don, l. tutimita W^IHK JI ex A P <<

c.HH),.lir, / mtketam* iiiqud): Pig

Uke / tfrinciit hut ttua ... n tail,

i>>! rooting >it nodes; upper lt.m% ^\<I^ (I and n.tt

Rwe I cm loaf, 1&-IJ6 (-4) aa

notd) cruncate m ittenuatc M d pedkeb

Him long; Hspd tube* bdMiap mm kmg;

Kpd lobes lan < thjnit.tl, SM oua kmg, ipanc\}

toothed; petal bibeat * tmm kmg, pale bhie 10 pinkish;

iti.vi.tl (Iowa i ltji DRM wiili .i purplish itreafe down ihr

ba>cofea<li lobr; rUtam >d* wkfc : mUJ 'I'- tnte

run p.m <[snthenwhh apical tufti ol hairs; capstdet

S-^ nun Ifnij;. U-^ mm widi ifip-uicit. tin imvrX,

ne<ei S^HRged, Minmili ,im! uhoiw .il em h end

Annti.it la moist and Mvampy pm es, akmg streams,

n> marshes and i>>< BeMs; ii tolerates ronsidn able

shadr

rk l| f ^fri • 5 sod i Mai ifaa I in Coy. in<i.

Nep. jI. Kl. ki. Mg. Up, Mp,Sk In

Lobelia tylahtica Linnaeus [l mcmlmM ftlunr.

L. affinis Wallich ex ^ Doe] nj

la. L. ... (sWbatl ... psagaad

n<thiik <si ... ihout

kiInm kttt imi tim H itifoi-d it'i' IM-|>M i'u

oks 1-20mm long; << bUdrs avaw im-uUr.

with bkmi 10

•daxtml (uppn • i>u*lh (IktincU) hair) on iht*

...

pedkeli ufttally hairy, 1-S.0 cm kmg; sepal tubes

A-r> mm lonjj. enlire; petal tubes (>il<- blue 01 It) •

lobes of .ifl;i<ci! liji lanceolate, 8 aun long, ctffa wfdi

l)ti<<tK hairs beneath; abaxial 5tp with brisd] d.iits

beneath; free basal pan >! all EUamentt equally wide;

Milt obconical i> obtong-ovabc, ^-7 nun long,

2-4 HUD wide Seeds 0.4-0.6 mm kmg.

Aww.w.V \>: <rt .iit\ <i\cv\ott^vA VIVAMS. V>VCA \t\

•hade

rid SandSE Ma Ban, Cey, In<l As. kl, hi. Mi;

sk. Tn,

(tNNACI hi i genui

CijwH. 25-30 nedes aad numerous hybrids: tropical

and Mibitti|> .ii America

id. taxonooq ol Cmma is inadequate!; known

(Uinna x gntmtitx. (. x m<htdoi<it<, Hxtili uauail) called

C. in Uot) md C. ... wktel) oilthrated m In<li.t.

the fbrmei two fin decoration the iatm for the edible

i hizomes. i be) tomedBMi < < .i|< > ulthnuion. The) ire

not wetland plants but maj occui m wetlands, iiu->

are, however, very variable m • I tsv!)i(ji/<- with each

othei .iixi v\mli <>ii)r-i species. I In- jiLnity Found in

Indian wetlands are, therefore, difficult n> determine

and J an \> no means sore thai the name ghwn below

V i OI

Ianna -Spftia%ea K<M<< Fig. 69

RhJ.somaoui herbs Stems erect, U-.v\ optoXm tafl.

Leaves alternate, tieadiing at rU< ban usually without

s distinct petiole; btadi • Itptical to oblong, up

to • um long, up to IS im *itl», pinnate!) nerved

Groat .i prominent midrib, wiiti parallel m-rw.

[nftorew en< e .>terminal panfa le, up >' SO i in OJ more

long. Flowers blue-ti.il. hilit< i.tlk s^amv ... Sepais

& free, wrlappteg, pak red, >D> to13< m limy; Petab

& sepallike, nited si tU IHM and adnate i" il> > sta-

min.il <oiinnn Stamens fanning die show) pan of the

(lower, tap to 6 cm l^l^A. iiri^hi led, [l]- S outei ones,

steril, lanceo •!!(• and petaloid, i)ie largeri rertemed

.md n>!!r<l *uV. on li^-. 2 of the inner t ones united

snd sterile, i inner use for die wirti .i *iiii.tr, 1-locular

anthei <m iu Mff(Omrj inferior, S-tocub; ovules

aunterous. Fruit i capsuk, 2-4 (ya lf>n^A. 1-1 cm m

diamete i, with wart) JWI^ •" \> Seedi globose, with werj

hard rndo<j>erm.

Pevi nniat. h is chai acronically found in r ...

nurshrk, in inundatrd \>\u • • that remain pccvntialh

set, sometimes g • awing \> shade. It is puffin <tl li\

insects. T^r dixwinmui are relatively large seeds, dis-

persil unknown: the -abundant varieties are usually

propagated t> i hicotne < tmin.



FIG. 68. *Carex* sp. a. Inflorescence (2 cm); b. *k*f bfawtr* (1.5 cm); c. *l* (1.5 cm); d. *l* (1.5 cm); e. *l* (1.5 cm); f. *l* (1.5 cm); g. *l* (1.5 cm).

in Ittitu jmi SJ VM< ... h

CA PPARID ACEAE excluded sep. lt.

CA1Y0PHYU M « if nurludcd «rr J> ll

< JK \ rOPHYLLAI I w Lfi

Carex 2-4 polymorphic species, almost cosmopolitan

Jtoott *b*rtm (nm in ihr «mbm>l but branches sometimes modified as 'thorns'. Some branches t but IKK ntrwr ih.in (M branch at a node. Leaves sheathed, (3-) 5-8 (-12) or Jimdr. hlihirm. l i times forked, with nirtit Upfr<J l< 'EIMMIW Fluwn esual wAui i in ihr .tvi! «x I Wat in a h*ttl. Pnun of 8-15 IIIK-*1 mrtitv in met I it ihc

orahw-iu l^,.U\MI|ITII*! IIKIILU I nut A l-4t-rtU-*\ nut. lipped »* fb# |jri* »irm «vlr *mt *t<-r* *.n>i A<lin>>>n' head and many leaf spines, sometimes also warty.

PrrrrnbJ or Kimninn anntttt, tou% •uhnrnr^{d*} ruotln*, (irr-<>unmiuf. P ilwuil J undrt «au"i 0< lpt- lmtioplilikKM). ibc tumnit wtr Uwmrd mnd «lchi tiH |UM blrow tbr «*irf fltldWc. Thr i1j<*rinn>>^ are relatively large and spiny mats or species of buds, dbprwd ln WMTT an. l i aba t» animals. Large populwt may be to ihlnntr. 1 n« mm « JUMIIXU WUmDew. M. f m-wetl. J Mudy in IrafMid (niit YUutiun. Krw B«ll*-lin 4) J4V271 <19W): ljrK D. H The i :hriir nuwfihukifc • tmt^kyttmrn

14: 254-262 (1989). Excluded *Cwm*pk*W^ irfi . . . linuat-M* •> *<>nhril tu F.utnfir with AIT * I.M jliitn U« All « *IMM " b d h» «nti >f^ than apical spine whn h

1. "• ••; . . . 1 r * m l tit 2 thlWt l part o* m4ti> uh *>mriiny 3 (or 4) ,am U* u««lh n* uK sod rigid. MMfnul i«-(h ftaB*** promitwnt utd i n o a i fam«d h*»r CM or mtulelv lu). tnotr th4H 10 tutiK l. llw nu^orify ul tbr S u* 4 uw tlrIk Mr and IU* <id, vmv UIMd h«tf of IW*. wU» few to num mull «4M^ tn a d*** to I 1^** malr tkwmm mvth I

Carex *diversa* Linnaeus Fig. 69 Short tips often with shortened internodes giving it a 'beetle-head' appearance. Leaves usually ferato or *' < ^ green, robust, rigid, brittle, leafing band «n ak< b i the margins 1 or 2 times forked (lower part of main axis sometimes 3 or rarely 4, times forked) wrth **** the margins sometimes, conspicuous, arising from a pad of tissue, present on lower and upper parts of the leaves. Matr ftamet* nwMttf «Mh note than 10 Unh 1-* i-rt| mm U** - 2-1 mm iririr. ihr *n1*r «nmMh tw d%htK l«c: mil owffirti *iftpl< l aj wir^lrw bm wtthiui ap a|Mnl ipMtr Mtaa] u. 2-7 -mi UM^ ba«ly < twif nr rrdurrd m mmiur itilir'tt Ir* i Man «trg4i MHn it» nutroptt wjin and

|(O) Pla-Vitj. Ati nopolitaa: Baa, Cej tnd, Pak \n Will, ... Hp.Jk. Kl, Ki.Mli.Mp I' . Rj. Tn.U-

Orntoffhylium muncatum Chami>O «b*P- mufiwalum m UnnaetM wbpap. m<n^t*m (Cfaamii

Wilmnt-lVar|: % Shoot lips usuaDj d » n e , Hem risible between d* Whoril I MLK light lii'-rn to w-lfc*mh-Si<- Bnc Racdd, feeling

a. ariatag direct from the edge noi sometimes absent from fawei pan uj the Erf Male Bowen moatlj wfc

Nut body *-3 (-*) «» kMg, 1-

wkhamd lip .i.^.'>*wiiiK<! :tl>'«'»K in m < (mgubrtj toothed or wptaf. ranging &om i

ranted. up to 8 nun lo adimenwy: ta<i **>• tin tl loiw Ol nuiijnent..

Tnipical and warm regions M \ d KL M:

CHENOPODIACEAE excluded

COMPOSI i \i m VMKAIHU

COM MI i INACI \i '***'

Herb, B or tuberous. Stem*erect I » W « K

Leaves alternate or radical, the base forming a sheath; blades sessile or shortly petiolate, with petioles

capaur* ihwormw tub, h hairs;] to ma M,h indehuci

nd rriadi pbx« but ibfoncnagi

ae4 local

I, Flown budi wad firuitt borne MUBBI m d hiddtow >> inflated leal riteathi cyanotu

I, Flower budi sad fruiu eKpoaed at boiwe wnhn folded ipathe-Uke bn

2. Pkwpei l>i>ls and B nits borne witlim folded ipad like bncts; one petal my much imaUei than Otfaci (WO Ommelina

2. Flown budi and fruki <JMS<d, the bcacu icafe-iike •nd tniiiiin M abaeat; aS three petak aearty aQw

S. iVitunclrs. pedfa eh and lepakidenaeJ>toched In brown hairs; fertile tfameoi 6 ti

%, Peduncles, pedkck and M pals giabroMi < u., irinic rtantrm 2-<S; naminodci (i-t. apes Wobed Murdamtia

Commetina 1170 tpecies; pantropii i and nbtropM i

StecDtereci «t proatrste, often lobfucculent, often rooting at tin Leaf blade* ICMUI orwithaahon 'petiole' between theatfa and blade, [nfloreacetic an .ivilary or i minal i yme, ew toted in ,i Folded ipathe* like brad Sepab J, Bree »! united u the baae, the axial (uppei) one often imaller. Pruli ' . tik aba (lowei > one oft« n reduced (o the .Kitxil pan ltmH< l;nsc<l. UMI.IIK blue, hctiil-

2 loculei with i'o 2 valves each. Fruita a pair with 3, uneqoal valves, hidden within the brai t

btmd m wedandi The Bow< rj delkate; thej open early in the morning and* wi'tfiei In ir

Excluded: found in damp oi moiai placet but wetland ipecie»: (lommrtina albncrm Hattkarl; C. attmuita | (. Kiting; C. errcta I imi.u • C. adav lain K Brown, (kunii < IV Qarki C eaaaai n u.ukt (!. Umgtfolta Lamarck i< Roxburgh); C paludma Biumi > Hamilton < x n Don).

1. Spatlit-llkr bnM U MTSsilf >tt He.il I

2, Spathe-like bracts erect, Funnel-shaped, with the margin* uniird below; leal btadi i<lh lan < hmghalewu

I. Spathe-tike bracta deflexed, aV;kle-<haped, folded with the margins her, leal blades linear to Hm lanceolate; petak yettowi C ajftaiafti

I. Spathe-lik i h[>i t* wnji peduiK let -ii leaM 1 (m long \$. Si ed i cylin<Uu ,il oi tubquai KtutiUK'iv pjiifd on the aide oppocte the bihjuu

3. Secda globose u> avoid, at 3 m iffl loag, wnoodi on both lid i

Pruhahb HNMD and perennial. In moist places, mmp< and N r<c ftddi S «J uif... of wairrwkhd* .hoot*.

.HHurtaM

... r ... K. Mh. B. To, Up. 0-1400 m.

Convolvulus subulata Roth: Fig. 71

Slender herb. Stems erect, simple or branching from the base, 10-40 (-60) cm tall, rooting at lower nodes. Leaf sheaths 0.5-1.5 cm long, with or without foln; bbrfr* line* to linear-lanceolate, 3-16 cm long. I 4 (-71 mn, *«k. ... frrr margin*. «w*e' ...

... 3-« nun long, ... seeds 2-2.5 mm long, with 2-5, rows, irregular ...

... Bned ID wrtbd ... and fUmu. V S. ...

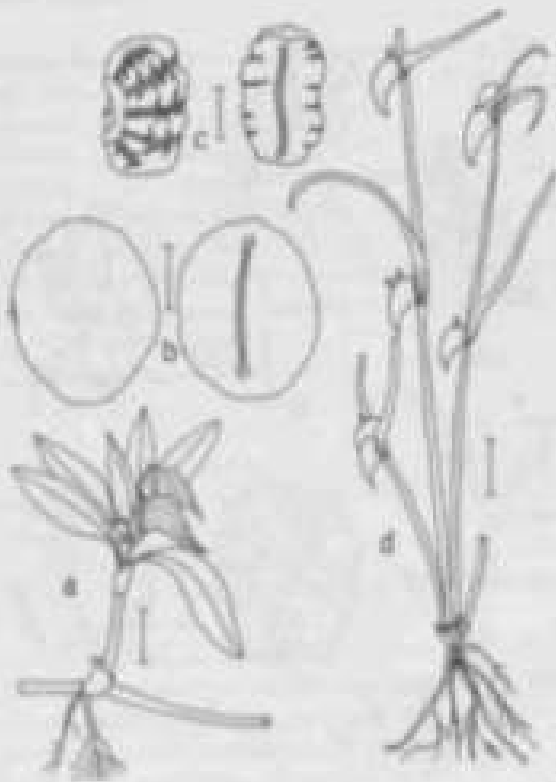


FIG. 71. Convolvulus subulata: a, flowering shoot (1 cm); b, seed, lateral view on the right (1 mm); c, subulate leaf sheath view on the right (1 mm); d, flowering shoot (1 cm).

acear Journal of the Bombay Natural History Society 70: 56-70 (1962).

[0 Hcl], Tropical Aim a ai< India ucnind I>cainJ: IncfcAp, Kt Mh

Cynodia [Austro] f ... Tomningia. Zy%ummm]: t » Kprciei pane |

PL, ... of wetland species ... leaf sheaths, | ...

StMOem ... equal, all fertile: Idittirn* dciiwhr abovr i)n- middle Chat] n.M ular. C*puiW !U with I KCda in cath d* uluv

Annul *x pcrfrnnwl. Km» - i dcwl- oplnR within IIM- Inflated InfbMO, IHwrninu¹ ... UIKr wriii. iliH(jri*n)it IULKOHltt

Excluded: ... ,1 ni mi. M Qwinrii rrimu (Lhtneus) D Dour; C. ... (Hrync n Roth) | A etj H SduOiei UL: #llu. #CZ. »Ind

1. CtfWIC »lhf<l noichoii <M iprx; cwptiikr ttlorr ,1,1= ... wth J viivjlr tpfcal pj ... i; «*ii» deeply pitted: f. ... i IIM.trl-^ gn ... n in friiii.li! ... CMIWU I. r flp<iU «dwir* i*arh Hiiii ' pointed, li<<niliLr un- ... dU- twin?*- dt'ttiM •-(l<' depressed in IiH centre »>>h 1 bom^iitc prufretfc ... seeds shallowly piitrd. Irn ... il-dw ... •wnlcti in liuit C

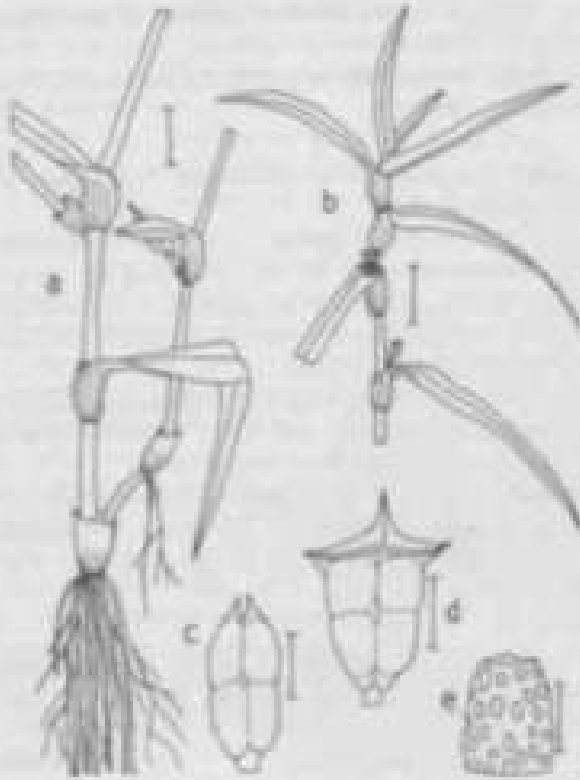
Convolvulus ... S*««t: Fig. 72

Sinn* i ... 1S-W cm long. Leaf sheaths •iit!.j<rtt₁ glabrmuTM *Mtr*ifur h. ... gin citfauc; trfadr*«FMik, *t^i ... ikmt. Km Uri< ... MS t-*) mi km* 03- ...

... iiminue, Irti) ... re * drn<r ryew with v-6 flowers, rmbra^Mrtl in ihr liolUnt BBB d J nrolka lr*1 sheath FUIwn* rtriinl 011K ai unihnti. Pcalt S, all alike, long-clawed, Wui\ pink « innplr. Friiilr ... IIIIIMHI* flrtiv ... hairy «bii<r ilw rnkhtlc, Ovary 3-locular, glabrous; style filiform, glabrous, ... at ibr Up. t upHila t!» mm hmf*, ac inc. U I ... drt> ... with a ligh -<}>' jl j«<< i mm; »*»'»'» < ... with a i ... dp Seed* whtTrlmdfM JI, 14-^4 mm lotig, d< ... pitted.

AnnuaJ or (HIUMHUIK prtrnnUI, FiKiml iti wnunpa and riMtthrv oftm abunilati ... fwild* and ... n dishes. ApfwirnlK marr rniwon in ... KglCMM Used i-HJil in med ... iymp<ftii<<. ... aboutkM.

... I Hrll S .tn-1 SK %im)< ... Australia Ban « • ... Ind. Nr., .\|KA*. Bh. l>l <•) Hr. KJ, ki, Mh. Mi ... Up. Wb,



Fta. It. *i**m*iU* a. flowering shoot (1 cm); b. flowering shoot (1 cm); c. flower (3 mm); d. stem, below view on the right (1 mm); e. stem (1 mm).

Ipomoea pes-caprae (Roth) Kuhn. H* 71

*r, +*tU*nt* hut apmk before below nee defp **I in lire tatiH ^ IKMO Hlc pm** capsule vahe* with U or verv Jtj[bth mjlrhrt]: fiLuitenn *Jiw>t ftabtimi i« dkKim II hairy H whrn hairy three leafy the ID MI ' mniitTi-g k*af *1J. the is I, int kv mrollen: |fj.\ N^Iri imulh ohJxin luv. roUtr. chester: peutk UMulh pale lit*, writ* uihquadrals. shaded area.

AnniuJ or itcirt rinjfly pccrnkiiJ. FoutKI in **are <*, > r i ftclidi and JU.HK the hjinkt nt poiub** and dis tin. Il w *b" found iii itn<ird brW* Il ii rather more common Id tnUnd diMrku. It > d

It is a herb. Fr. Mblv, oHrmk tu **Pnlmuhr India:**

Ipomoea pes-caprae is a warm region **ftmtecpu Mwmdim i i** [7'nWacntlw *penicillata* & *lamellata*]

(Sp. 0(5) **ILJMLirl]:>Ki** 73

Stems creeping **&d tmMhiK brfcm, 4**rn<Int,** to **rf<I jlnm** up lit • i tu iinn, t1 **mf** at nodes of crpptn >*ri. Leaf **vhrijth loo*r, 1-2tm** long.

often pubescent. iTurfin wtd mntitli fringed with long hairs; hbdn cllipial **Uruc.vUir, 4-10 tin** long. 1-S rm wide. **gbfaroIM** of hairy, **uKin** often mini •errin-, **grariulK nnuwd btirm *wi HOWttoa** Mjhn petiole, top **inunair tnn.xr** :IMI <><! subterminal, hairy **p** RTMU **minutr *** scale tikt n? **BlaeM n<n.r*r . n^ciril. dwnh pedkri**

j V -11 **4hVt, nblonc, J-4 mm too***, (w. U< otrrr Omcc •. lothrd with 4mplr awl «Und-dpf>v<l lota*. PruU 3, ttthnfual, ohu»<r. Wight* looftr h* the irpjiK purple ID pint m white SUMiirm fi fertile, wtequal: M-mmm Mtd. ± » Ino)t * petal* Ca|Mule« Mut UIM. 2<r<rded. HibtirMruUr, up IO 2 tum Inn* Seed. [WthoM- hotwntki m>r<twi > •rfh'lkiiened.ti.^mlliMiK.irfiniiaiiMti " <^ out iurrt<m rMtumn« «« frnn ibe lulum h'<>in<| or wtMiw^ by annual. Mostly by und •" miiiil' mil -Uthj Mirjum «id in wfnIH. to ahwt¹ .mil M 11.. pdgci d torcati |. . . . ^HM giow* t»¹ h* opm in manhes. 4lonf davtm and raViafi and ** -M M uttnd lining pt,4*.

It is a herb. Fr. Mblv, oHrmk tu **S wd S£ AaU and AwtfalU; Ban. < lad L Up o-iaoon**



Fta. *r%* *Ipomoea pes-caprae* a. flowering shoot (2 cm); b. flowering shoot (2 cm); c. flower (3 mm); d. stem, below view on the right (1 mm); e. stem (1 mm).

Murdannia [Austroa pro p. utr. Dichapserium, Dichapserium - min. (mut.) SO M < ^ t...pit*1 and

H.iimirin|K-i ... W ... U...e? .Hnn.tr. Fl. ... lrrf < * ^

btar. p*, *orwimr s i m m - u ^ ... CM >> (4) Mm ... amemorw ... tfo * pMnbrntf' t%n ... taM >> nr< W(rhr ttlamcu 4, 10 awke p

Seeds 1-20 or more, in 1 or 2 rows in each ... Flowers open before ... Fertilized ... Spedn found m (huop (M mota !>>***h'1 ...

Rao ... [Dichapserium ... (Dalech) Fabris], M. simplex ...

I. Uppa ... flowers subtended by bracts shorter than the ...

2. Bracts funnel-shaped; leaf blades folded, grass-like, ...

3. BUIr* of ID. ...

4. Seeds ...

5. Seeds more than 4 in each capsule lobe; bracts ...

Hillin ... y Yhmr ...

In M-at itbbn ...

5. Flowcre and (run* lwrw pantON tool the .ixiN ... M- pauii/lon

Murdannia ... (HaMluirl) Btcan [Awbma harmlio ... lkaixC II i Uik.j h_s, 74

St<1i< erect ... M nodM ... Uong, l'> ...

bloaf. i.....< W mm long, Seed*in 8 pgwi<f7-10tB each

Annual or sometimes perennial ... 4: 29 (1477) u. he l<wnl



fte. 74. Mvt4<<<M M I M >>. llu*mn<< iboot fl Ctt} ...

IHri). HUIMIJV.IV India, Burma ami Malaysia: Ban, Bur. tad Nepe v*. Bh> M*. Mp?

Mordani i mtiiflnrw <l utiMcm.t (Wrjuui M mntatenta (Linnaeus, s^ irikknar, U ttmffrrmtt (HauLsrI) Rirllj Ran ri k.iiiini.Hhv AfwiJnm Aritiram It Don 4 w«di/fon*«i (tinmen*) R. Brown w. tanmalr I Wifcbh i It i i it ILT j: Fig. 74

Strmi rttxt and brjuichkng from brknr in decumbent befcM and AVending .1 down; branchlets usually rrdtdth xtili whiir node*. I <-J(ihraih* > I' mm ki ng, gLthroo* «r ncarH m tnir wtih l<«t; hairs along the margin; biadn linear near the Mrm haw. becoming lanceolate above. (3-1 7-8 (- 15t cm too«. OS-1,% tin iride. OinhiK hair* at haw. Fta«Kr* CIUHTTM) in in ninal JIIIJ «illary cm r*; pntk«k up I 2-3 m km.%, heromii »j «hortr» rima/d* 1)- tip of lbx <itirt-; bracu scalelike. piot^tni long. l'xtmang ih«rtrr ahmrc, A j<turuuL PruU Mur « pinVuh. Fliamrnt* will) long blur IMIT». <, ij>*nlri KlbxIoteMSt V*MV<1 *.«ll rather flat sides, 2-4 mm long. Seeds 2 in I rim iB each capculr loculr, tmirulrd 41 one nv\ {Ul at thr othrr. l,r>-? n lm>(, furrow* aritr aluttg ilir hilum t*bu h become pits tom ird* ihf i.ipfi •

Annual or prrhapt abo l-ennial. In wri pi- rra, paddy fu-W*. mju«b<*. *k>n(flm t*r* and nwnrtimn m «ll'k4III)(HI WIKT, 1 is not com. " -1 k M«ItIIHk JIII u abu fiHimi In motel iturto and gi—w ptacn and a* a wrr«i in gailrn* It lix* ltr« m«r an afgfmanr *rrd in part* uf tlir Wr*» Ind*» Used locally m (bt Irraitn. m *i| aalhtnj, k-pnw, ptln and othrr *IarmrI, Mvni*ntut begins in c. HI*HVI 11l tm wmt bmaniMft <» br a iimrinct spccs *, 11 n mi 1k« i<>*MI* l triUi i«-*** »in a haol HM* <

(C) Hrhphl). l>W Wmld U thr W< n: Ban. Kli. Cey. Ind. Nep. Pak. An. Ap. Au. Bh. G. J. -. Ki K(. M« MI. Mp. Mr. Pj. Rj. Sk. Tr.

R..!!> KJ*. «i KjntKcuillii} Tig. 7%

S" «s creeping and «rndmf, HUM b beanrbed. mntm I At Umrt nudct. Up IO 15 tm Or rmur long. I #*! drcdts 3-0.5 cm., gUbr«Hi« r «rps r a lH>T • of hairs along the margin; Uadn uw r. 2-5 •• It^m. > r. 4f*rU hjir». utuaJb nKiUlR JI biatr ai mr W tubw utr at lip FUm-i < -3 (-5). m .n) lary cyms. -r^ickr uualK tn until M frutt Prul« ?vimv ti*aw«w. DnivniHHrais orvng i». HUinevta gWwom < .apwiln bnnf-oMonf. h-*mm long, somewhat 3-lobed. Seeds in 2 rows of 4-6 in each kmilr. atifMM ruharal. nrarti WWHMII M •

Pnrnnul Uf anmul IFIMMI no M4 muddy soil in itfa MM marshes and sometimes floating on water. Il to it" confined to wetlands



FIG. 74. Mordania prostrata: a, flowering shoot (1 cm); b, flower (2 mm); c, seed (1 mm); d, capsule, cube with seeds in place (2 mm); M. umbrosa: e, whole plant (1 cm); C. latifolia: f, flower (2 mm); g, seed (0.25 mm).

(C) 11 0. Perhaps endrmfc. io 5% India, perhaps also found in Malaya. • In, kl ki MI. To

Mordania umbrosa (Dahurii) Sarracina [Austrobaileia paniculata Wallich] m CI* I iMie. Dichrocephala paniculata W«ht| | 75

Stem lulird, bai -bed fr .m brUm. »-H (m) or nweH nmrr long: bnurkfa^* t«Wi«ii I l'at shraith glabrous, blades grasslike. Filices to narrowly linear, serrulate. firn ttMM^Mriteaf* fcihfai' up to 10 (-10) cm tang. 1-1 tw Mdr, tMwnW staged " * rrd M 1 ifi MI MIIMWII. |mwM< r cyms, pedicels up in I an k«f. l*arts Innwri ttatg and enclosing the baw *J (br f*Mbtrl. up lu 1 mm to ^ . teolbH »> • persistent. Sepals elliptical, 2-3 mm long, glabrous. Petals 2-4 mm long, blue or rose. Filaments glabrous. Capsules oblong. r««* l below, 2.5-3 mm long. Seeds in 2 rows of 2-4 in each capsule locale, almost pyriform - 0.25 mm long, nearly smooth, brown.

Annual. Usually gregarious around drying ponds, along streams and on wet rocks. (C) H.S. Africa and S India: Ind. Ap. Gu. KJ. Rj. MD. To

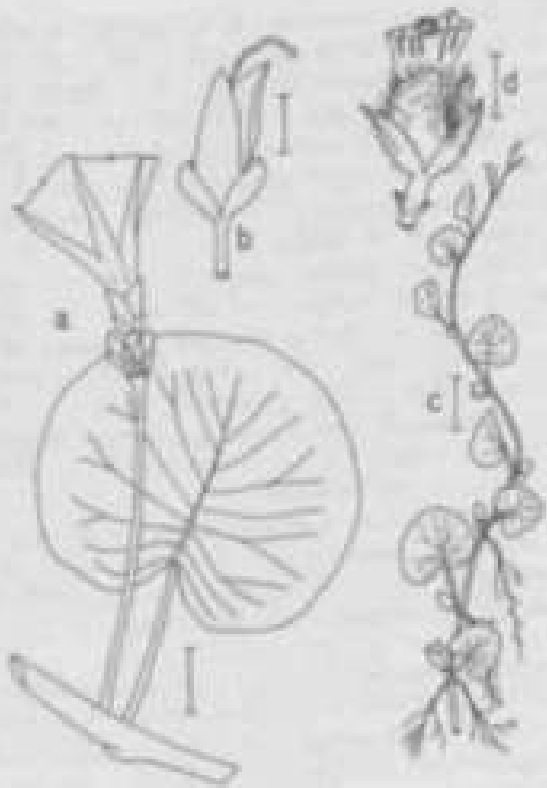


FIG. 76. *Mimosa pudica*: a, shoot with inflorescence (2 cm); b, leaf (3 mm); *Mimosa pudica*; c, flowering shoot (1.5 cm); d, flower (2 mm).

usually associated with wetlands, particularly in rice fields. Flowers, * <n>D> brhwr
 (HbK, Tropical S America, naturalized to the World; Gay, *dict* <1" >

Species Jussieu Martius ex Choisy; *Dict. Jussieu* Martius ex Choisy (Martius ex Choisy) D. Ainslie, *F. Jussieu* (Bentham) Robinson; Fig. 79
 Usually shrubby, 2.5 m. A stems woody, terete, up to 5 cm long, with numerous small, glandular hairs. Leaves bipinnate, the blades broadly ovate to elliptic, 10-15 cm long, 5-10 cm wide, base cordate, rounded, with serrated margins. Flowers in axillary cymes or spikes, 1-2 cm long. Sepals 5, ^ -2*jK2t"
 .Mr. petals 5, white, outside white, inside pink to rose. Tube funnel-shaped, up to 2.7 (4.0) cm in diameter; stamens 10-15, 1-2 cm long; anthers 1.7 mm long; styles 1.5-2.0 cm in diameter, persistent.

fml- Secib UUIHI. up to ± 1 cm I0*fi <lrn>rk UNMUMd v.itlilun>>. I.i- uactifbattl

IVi.mn.il li thorn jn rvrpuonal rcuogwiJ lolrt- ajur; ii nq E* 1-mird <' "' tw"1* among MKV pt>,, >i tn lh-nlmit, m }*rnnjincniw>mp>in m water up to ± 2 m deep. It grows in the .^h *IM1 bnddrii wain h n dkm jibiuu.1 KM t> .bnu >» -i- i iut ii bu liifimw liertOUI *»"! in w<nc irrtpiwn Bad drahiagr ihannH* U tUmxn *i xny lime of year, the flowers open before <*>m ami wilt liv DPOB li i J> be Hedbrl4Ou9-4kf/I t, a few weeks afterw id- ptanu ihouU i> tiamt to avoid rrim gimuwWi It is used for tt^w&td.Ooak.I D K ifMmon Jumhmt a new item is

(Hyp fen Hdl NMhv to S America, wunralin Africa and Asia; (Bun 1899), (Gay, *dict* <1" p, <rak: <An. <A>. <Bh. D 1 COU)I|> Kt . kr . MI, . Mp <i . r, .-Hi.- in. <Up, <W 21899)

Mars MI 1 BO^M MTOpfed
 Mars wit fa***TM (I uinitrtu) CufuduniU IM. mar (N.I, Bui H. HJUICI. firm<vhml** rrmifanw-t Rouborg h]: Fig. 78

Stems erect, ping reotln| *' o<fc> Ir*vc* Mmplr: petioles up u, | .ii. V>mi leal b'>>>< > rrmform to



FIG. 78. *Mimosa pudica*: a, habit (50 cm); b, flowering shoot (2 cm).

broadly ovate, 1-2.5 cm long, 1-3 cm wide, base cordate, margins ciliate, **ms cKMtt *nd w.tw. tt<s obtuse. Flowers solitary <H occasionally in 2 or 3 flowered peduncles ami pedkreb mugual; outer 9 broad! rbicutar, t<A< i BUB !"«£. K'tUM-, mm loti.ih-. inmpⁱ L¹ km] mate, S-4 <<>> mm Wig, bearing long white h IVi.tl- \fllow, up to 7 mm in l>. III.IIIH-JI: mm h>i*£: amis- 't,~ mm long, pollen gdim* smooth, m)< globose, me in diameter, penutefii wfjals embrace the fruit ^' ibglobow • iini HI diaim**

retmlaL Bv no means dependanl on wfdand condition! bul often found in marshes, on tin* bsnl of ditches, canala and [wtots where it is frequently Ln dan

Flowers P'M aftet S .t.m. ;H<n ()!<l Work) tropk I >, Ind, Nep, Bh, G, KL Kt, Mh, \1>> R], in.

CRI CYPERACEAE see KK ASSIC U F Ai

CYPERACEAE I II".- genera

Perennial or annual. Culms (stems bearing inflorescences) t-0 snaple, umaBy solid ,n<l iriangulai in u*nt-verse section, rarely boBow, terete or jointed. Leaves unilk in S low- mostly basal, either scale- or sheath-like* or tmrar <md gran Hire, with <! witboul «• liguir. hid- terminal fcw-flowi spikelets to a c& enpouitd panicle with many spifcetca. etthci naked << with U-ti 01 icale-like Involucral bracts. >>LkHrt* tin. is. frw • many-flowered, <<>> with nwm *ti fflowere. Flowed uni* or bisexual. • *str on the rachilla, solitary wtihtn ,i |IB Perianth reduced to hair*, nnsili scales or sheath, nt, M>mrtn» forming a sac (tricle) surrounding the ov. Stamens usually 3, rarely 1-12 or more. <• ary superior, with 1 i ovule; style 1, stigma 2 or 3. Fruit a nut, either 3-sided, ovate or flattened, often, With > jr

There we IIUDV diSereni Interpretation*of die • special flower. In this account the flowers are considered to be biaxial with a perianth reduced to scales or bracts; the number of stamens in the flower is considered to be 3, in some cases reduced to 1; 'flowers' with many stamens arise by the grouping of a number of 1-staminate flowers. It is sometimes difficult to decide what constitutes a single spikelet, the generic key has been written to incorporate different views. The following works have proved particularly useful in preparing this account: Haines, R. W. and Lee, K. A. The sedges and rushes of East Africa. East African Natural History Society, Nairobi 1-404 (1953); Kern, J. H., in Stevens, G. G. (ed.) Flora Malabarica 7(3): 430-753

(1974); Rao, v S and Verma, D. M. Cyperaceae of north east India. Botanical Survey of India (1982); Koyaraa, I . In Dssaai (ed.) A revised handbook to the Flora of Ceylon 3: 125-405 (1986). Kral, K > treatment of *Ugaatdut. Ruth iim&***%tlli** (Cyperaceae) for North America, Sida 4(2): 57-117 (1971). Lam \r\ indrtxrd to Profnwni E. Gostindrapu for his rip Mth thi* ijinih

Ex-ludrd; the i. flowering genera have wetland species found in t> Himalayas but which do not extend further south into India. Cladium /SMBfi linear Grantz Itdltp. *Chamaea* Nees ex Hooker et Arnott [C. nutans (Lam.) Pohl subsp. *javanicum* (Grantz) Kikuchi]; *Eriophorum* < several species; *Scirpus tenuissimus* Reinwardt ex Meusel [S. *obovatus* Munro] >. Berkeley [S. *nutans* Beetle].

The following may be **ittnd m min ,r danspp** but L! h DO4 consti to be a wetland **ifypotfrum nemamm** (Vahl) Sprengel [*H. latifolium* L. t: R.. hard, *H. vespertinum* iv>-cheler].

1. Spikes compound, wdh ,> term.! (central) and naked female flower (ovary) surrounded by 2 or more 1-staminate male flowers, the whole n nun >'> rounded by numerous glume-like scales

t. Culm* with I transverse septa; leaves reduced to bladeless sheaths at the base of the culms **M** Culms without transverse septa, leaves with blades. **nut** and **cau&w**

3. Inflorescence of several to 20, subsessile or shortly pedunculate, globose, head-like clusters of spikelets, 3-5 mm m diameter, I some singly or in pairs along the culm m (] **trailsii**

5. Is. flowers terminal
4. Inflorescence a globose to globose-ellipsoidal, head-like spike, with leafy bracts; leaves many times longer than the culms

4. Inflorescence a panicle, with compound branches bearing numerous spikelets, without leafy bracts; leaves shorter or slightly exceed the culms **ttntf**

1. Spikelets simple, glumes either bearing an axillary flower or empty or reduced to a single flower

S. AJI , **iajJL.** **IUMriimr A flntn-f < rti.** lowest 1 or 2 sometimes empty, flowers entirely bisexual or bisexual with some unisexual, spikelets usually flattened

6. Spikelets remaining attached to the rachis while the lower mature glumes and nuts are shed, exposing the 2 deeply pitted rachillas, generally composed of a large number of glumes

7. Style uncontracted and nodose at the base **Mi**

7. Sofa nn.hr. eomrt »d BM wolteB at

Mn, ill ireh/lors)

8. Nuts flattened *i.»- one

Eating the wd d n te id IP wt O ***

l«.,vi,,R the Ending bract and ** ln;»1 (, "" phvlh «m>unding therachilta or, " " « - « £ numcrom, swlrlr and crowded on «h«rt facias, gen-

erally composed of a small nut...

9. Spikelets mostly with 2 or 3 glumes, each folded one within another and maturing only 1 or 2 nuts; stigma * tafia,

forming a head

ma.....g 2 to several n - (if 1 then this not

in a thickened rachilla); stigma 3

in

inflorescence open

5. All « th pei gtemei arranged

at least the lowest 2 glumes empty; (over

unisexal or bisexual); spikelets rounded, terete, not

flat; not

in Si) . i

ii.' Leaves in two ranks, opposite, the blades unifacial (over

die apex; pollen polyphorous

13. Leaves in ... tanks or opposing spiral, not

les absent or bifacial (horizontally

bluish cap on the apex;

oln with CM

eSt empty giu«« belo. J ore«pcj

h

tp

n without

TS

UVr leal '!.n'.<i>>

the last wliorU:tl

hr lowei HI-

WIA !!

IS. Sn d «i bran< bet not in whorl-

t»Mri»

rftwotteaatdatbt

14. Si

15

Hlifi

15. Perianth bristles absent.

16. Snlr b«M falling off with Nyie, l«avmK . * stark ImUon-liki- M.ti 01 tunKMir «>ii the fruit: ltykoth ftuibmtytis

If,Style btteuMMJfe, penteemo a ike nm mihon knot) a if tailing itun BO) leWfaBg a KM Of tuffiOUT mi the fr mi. Ityle usu.ttiv h.niv HMM^SI

L4. st\i. s ncitfaet i ontricted mi itraiea « rt»e bate

17. i.c.ii b b d d .iiiMsn oi \<i> reduced: tnfl< cence with i i nim-likc bad oandnumg In the dim lion ot iht-1 iilm Schomaplertta

17. Leal b b d d p»went; baftoreteocc widi M .iii-likc ot lcaf-Uke, nevei * ulm-tSbe fawohicral bra

1H. t «») btdei and teal riwatha haky, tun HMB* < ttetetonh/on die teal dp and neai the throai oi th< leal theath Fuima

18. Leafbiadea and teal ri»ead>glabro«ii

19. ('iamta 8-fi ana kjog with an euMrgfame w framed spen and an ex nrreai oridrfic doagaed into wa awn; ctthm bearing tosvet above the l, Batbosthomus

It, CSaaaut leai *a«i i Baa ba|| enter at the apex, widj oi widiom an eaewnew sudrib elao< gated mio tn awn; culmt bearing leswci onl> in ittt> (owef third

20. Inflorescence paniculate with Rafloed bei minal ipikeleu; nnoimial bractt aumeroui and leaffike SeHtmopkrhu

20. intou'M en' s ii.il and Kcad-Uke; mvuiif i.il br* U nol leaf-iike

21. Inltonv <n< C OI I. Kiuntia! aptttckt, Mil* tended b) I bract, with I Rowen

21. Inflorescence wida I to nan) ipikes, HB rounded bj I -trw. tpU«4>earinf CM easpq b m is, tin- bwi

at scale iikc tin ipiket con A a ivliinhu.il »MO wiih man) weS-devetop yttftfi bractt b> • deme ^m.il, the buermi ipike* each wWh an emptj ipike prophylB;

each spike lei l>.ii i siilitrniK .i 1-flowered spikelet with J -mall hyalii

MI. \li fU ww 11 untM Kual >< Hi i 22- Nut enclosed In a bottle-like iheath (p

phytl "i HIM Carvx

22. Nm exposed, not enclosed in a sac or Use iheath (prophyfl <i> utrk 2S. («Im« with leavei reduced u bladrleu themthi at the b

25. Cuhni withotti ii.ii. blades, radkal mdafsM cowl

24. Inl pmtiMinilair. glol

spikelets, 3-5 mm in diameter, homr ningfe or in pairs along the culm to the

Diplazium

14. Inilofrvrui r terminal

15. Inl)"i' scroz • gVcitmwr to glabrous-ellip- ... LaI. bcMllrkr *ptkr, wilt leafy bracts; le >m • M fttmri longer than tlv i tilm* Mmpmmm IV In 11..trKrcntc a pauiklr. trftfc i'j'fnpniun<l bfam br* bearing immrdiu* tpikrtciv unliout • /l bracts; team fthonrf or tftghiH rventing the<iilm*

Bulboceras [excluded from Schoenoplectus and Var^w>l t 4 or I pohittKirphk *jw< k cosmopolitan Bulboceras maritima (Linnæus) Palla [Scirpus mariffi<i<i I InnTIM. Schoenoplectus maritimus (Linnæus)

K. 1>r, Sfirpuu n WiJUWittiH. Vn^wi HoDima' in. Scirpus tabernaemontana, Scirpus affinis (Roth) F-1-80

KIH/IHTHT* hard. creeping stem bearing subglobose culms < uln> s-In.uv. iharpty VjnjjU*



FIG. 10. Bulboceras maritima (L.) Palla. 1. Culm with spikelets; 2. Spikelet; 3. Leaf; 4. Stem section showing nodosity. Scale bars: 1 cm, 2 mm, 1 mm, 1 mm.

alm<t bUck. Imf bb ... mW ... ibr upper ka^rr th>n the <ulm. 2S-40 tin ... S-H(-1V ... W. mklndntinct juwl **mnK>> ^ rled brlcMr. uf<<i ... intlrtrl Up. marym and had . ** drracrh td mintitr irrth. im.Ju. r*) bran, kai-l^ rh<x lu*.

crncc. inf<*< ... mpmiml Pf ... IOM ... -Mb n -> ... aHitd. <trffw oc in HuMrr*, ... amM. (S~) 10-31 (-40) mm hmR. W ... 'umrt u n», 4-7 mm long, up W * ... *>Uk, pulinrrnt on ihr turk. iiftm with MIMI ((<'> . ' * ... <i *ltrx and ewcurrm midrib eIMqptrtl M1|> 4 t-S mm long * <n: l<H <bw>, rVna- ... *

ft dftminuil in ihallow [irrm*- ... imaiM-nt ... i lok-Mtc ... inooth. Nuu ^<ttrd or ... IUncncd, obomttJ with an ariimtru'r jp. ... mm lung. 1,4-1 * mm wide, daik. N**+11 ... *iLr hair nol thirkrrnd

at ^Ikfr Twbrn <. rdibr >>'. ... h> r. ... tnttribk into drcmn i*w l< * MllK..

VhmiM ICMftMlfti'- ... IUK p **!. M. ^Mb.Mp.Pj.Rj.t'p.Vk)

**wiyfc i r<-trtudng AW<fMn<w>: t IW ... fun^

1 k< /r-UntrMrt hut ibr atftrt Hnutxh Mtkttl ihr BMMY; tftir bMr bulMik^r. fx>rtM4in|t < * dark-cotuwrdbultim *m ibr * p n fd tbr n

Thrrr art ptud! *i ouiwfc i fm pi * inc JWw>'T> ... ^Hitfjpmrfia Km prndink a > ... tadnuionpciscscaril mtrk b. ... i and Bmthmt^ki in ihr liiMttiWl .****

Most species grow HI drv un<h p<*<n htii ... in tciUiwll

Bulboceras densa (Wallich) Handel-Mazzetti (Jodhpur ... Linnæus) Boeckler var. spida (Nees) C. B. Clarke, Bulboceras densa (Wallich) I ... AJU4<MN4M<>ltM{Watbrb> K ... Culm> uifird. briuk ... long 0.2-0.5 mm thick k glabrous, smooth. Leaf sheath

membranacea . . . m Innu while hiir*
than iltr culm*.

biuk-t <jpilUrx. vrrv
t-H) (-18) «m lotin
green; . . . K' . . . in* . . . £ brteo

short 4111 uluinr likr. ncr
up to . . . an long. Inflorescence very variable, simple or

like. v,,>, . . . t rrd «H. . . . ogl«
L y r d. . . . 18-flowered (1 or 2

US mm in diaowter, . . .
lower . . . (cup); . . .
1.5-2 mm long, 1-2 mm wide, brown to red; leaf

short narrow, chestnut brown, sides without nerves,
glabrous b«, the margins ciliate; keel strong

Stamens 2; anthers 0.2-0.4 mm long. Styles 0.7 m
long, 3-lobed, glabrous; stigmas shorter than . . .

Nut 3-angled, . . . broadly . . .
0.7 mm long, 0.5-0.8 mm broad, straw-coloured to
wniih..k««lycowi . . .

ti.«rrn..K« ihr wrier IK**
It is also found in open
It is not an exclusively
wetland plant and is . . . dry sandy places and

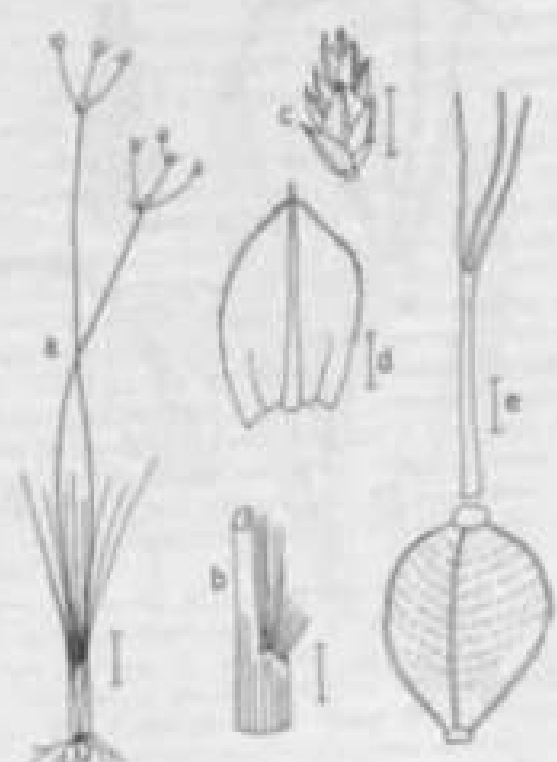


FIG. 81. *Distichlis spicata* (2 cm); b, leaf (1 mm); c, stem with dehiscent style (0.2 mm); d, spikelet (0.5 mm); e, leaf with dehiscent style (0.2 mm).

SSS2

ut , 1 ^ li.»*UL IilVfiY n«U 1O Ihe Atnrutall species
A *tapiUam* il Jiiucits) C B. tjarlr hut fhlN I . . .
most acute, glabrous or slightly hairy panicle axis III,
granular, not transversely rugulose nuts.

10 Ten/HeH I > . . . «* "f the <>W WorfeL Bhu, > . . .
Ind, Nep, As, Bh, Co. . . . lip. Kl. Ki. MR. Mh, Mp, Nk. Sk
In UpiWb 0-J600m

(d n s i 1500ID04 > . I . oaawpoBOBi buJ irwinly in irn>
perate (I . . . male*

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CM iSMhIU! Intl- . . . Mmplr ij.llr 10 A ttiwlh

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dun S*igm>a<i 9 NttiMblnwnamoi 34id<I.

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Protinsid Inriu iMitv thirr «pct in ^rtwr m %rt-ikänb

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devriuping bMO an awn C. *membracea*

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•adirouHaarKined, a 2-4.5 m <mk>og<Mn

I. UtteooM* MokuiffenMM tatenl iptkdei
1-2. HI IIIUK. i*trh lirjjmi: itulc (loiwiv Htfjam V

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nodding. 1-B *tn l«ng, tmuiu b«arta| ajak Bow
towards the ttaKid|IBu2; utriclr witbottl • bi

Carex heterostachya Butler Fig. 88
Rill/nmrt «..l.mi|ri.mN (iilm» IIIIRD. *obovate*

3. . . ^ . H. I . r : . . . 1. \o-AS cm uii. 1-i • nun
vulr I rrt iheatfe brown (0 |JH|IU' Iral htjdri foUed,

ROM ttiortcr or almuM equiJliaf(ihr nilrtM, 1-3 mm
wiilr, wft, KraduaUy laprring to an MUN up Br* u nul

die. •ihillK, iht! k*WCM lc*Iilif. n.mlli i it rrdlim the
cylindrical fr oblonft: ihr upftrritMMH 1-* >pik-

male; the terminal spikelet male, linear, 2-3 cm long,
hghr iK^iiftr biuwn; ihr towrr 2-4 spikeless female,

shortly prdunilcil 10 tubtrwilr JI«1 fini, dUoBf i«
oblong-cylindrical. 1 —t rm lutig, t & mm in d

long. I J *i nun wide, (wlc brawn, with hpaVnc ni*) |
midrib i i curve J nitit j iriur>rd, i< jlmniMnaiKinrd.

0.2-0.5 mat loon iwn Ubidtl oioW. Wtrnn long



FIG. 82. *Carex plumata* (L.) DC. a, habit; b, inflorescence; c, female spikelet; d, male spikelet; e, female glume (0.5 mm); f, male glume (0.5 mm).

Perennial. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

Perennial. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

Carex plumata (L.) DC. Fig. 82. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

rarely with some culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

dark brown whorled. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide. Female glume 0.5 mm long, 1-2 mm wide. Male glume 0.5 mm long, 1-2 mm wide.

Perennial. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

Carex plumata (L.) DC. Fig. 82. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.

Perennial. Culms short, creeping, 0.5-1 m tall, 1-3 mm thick. Leaves linear-lanceolate, 1-3 mm thick. Inflorescence terminal, 1-3 cm long. Spikelets 1-3 cm long, 1-2 mm wide.



FIG. 83. *Carex plumata* (L.) DC. a, habit; b, inflorescence; c, female spikelet; d, male spikelet; e, female glume (0.5 mm); f, male glume (0.5 mm).

spikelets male, *Vmm. M a-* long, light brown, ...
spikelets female with some male flowers ...

£ £ » . green and whm- powdery wb« I e* h,com
Ing brawnbnhi^ n when dry. Fern* rf-JJJJS

•ride. LfrcohMiicd 0 pale „.h.uMw..lo,m«i »»».

pale along the margin i. obtwe t o « h * ^ ^
ginate; mMrlb green ...
recurved, scales ...
Utricles broadly obovate ...
long, 1.5-2.2 mm ...
obovate, li -2 mm long, 1.2-1.8 mm wide.

Hooded phew, «tWgb«Wn*d«*
(Hv,, ,'.11,1,1 .s.u.«! Bhtt.BBr.Cey, tad, Ncp

(•xpmu including *Dichotyla, i* ...
ex [uding W/.^«.

AnnUor perennial ...
on. rhuomei culm,
•mmkiD 5m t«U n T
oner thud culm, t< r
u, . simple or compound panicles, u ...
and stalked clusters of spikelets ...
spikelets or compact and head-like: ...
tubercular at base. Spikes oblong to ...

Glumes distichous, closely ...
imbricated; margins usually ...
flat, cartilaginous (glumes and nodes are ...
2 deepJy pitted

Many ...
culilnw ...
f ... otheri ..
others ...
C. B. C. ...
flattened then one side (not the edge) ...
rachilla.

Many ...
th« , ...
1-202 (1881) ...
G. Opense in Engler, A. (ed.), Das Pflanzenreich

1»lti\200: 1-671 (19SS, 1996) — a Kaaadkrd work
treating *Cyprus* in Hit- wi<K- Knte; many now |j>ii u-
have been deai ribed rince this work wi> published.

i\fhul<<l: the following wedand sj" ...
are found in die Himalaya* but do not extend louth
into Penin*uiat India: C *atkinsonii* (- IV Ctaii
C. *glaher* 1 innariis; C *glomeratw* Linnaeut; C *fuscus*
1 mnaeuft.

The following ipeciea may grow in damp oi moisi
place* Dnt they are noi considered i> be wedand
plants: C. *atkinsanti* i - IV (-1.tike, (!. *w/co*Kj Vahl;
C. *drcinthus* Reidt; C (Wi^omwota Roiii^tl
[G *pachyrhtztl* Nee* t \ Boat kelei]; C *diffustis* Vahl
[C <t>|j<iini>!A Thwaltet); C *ievcaerphalm* Ret/iu*.
[SvpaM f«>in«nin \.ililj; C *malabaritits* i(. IV Qarke)
T. tUKtkr: •?Ind; C n>'«« Ret/jus, C *pentabnuiratus*
EL (.ovuidiiajahi: •lud: Mh; (! pob/anthrlujt I, Gmte
darajahi: •hid: Tn; C ^aajiaaaaaMiSieudel |c; d^lmu
MIISJI MOenMadt*ti (Boeckeler) T. Koyama]; C. *put-*
chrrrimu.% Wilidcnow « Ktmth, C «rroftnt« RoOb#U
VuHtrth\ MnMimti (Rintlmh C, IV Clarke, /, waawwi
(- B (Lii k< f (irnnii Linnaeus); C. *radiant* \<< - . i
hteycn e> \< a C rwfci«*n«^i Vatii |<; *tnmffn** Mn
f */>|fl<W«« ROUIM*H jf,. htwplai C IV dark)
before 1900; C *stirioniftrus* Retdua; C u^iin^tri Sceudd
[C nmsm Rukenthal].

I, Spikdeti in ipike* (eacfa M SOUK- dUlanoc from
iBOther ujn m • more m leu ebmgau rai hit); btfflorea*
cence »i t M oore ip&es; ai teaii wmeol die ipftea
viilki-<i. DM KHBetimei di<- pedum lea are miK S-fi nun

mK
2. Cuhnswithout htadfd leave* (but Lnvohtrcal brat la
BBSJ be leafy) « KHBC oppei iheath* m.u occasion-
allv Ix-at short hjadfl Up to 9 »tn |<m^; pbmtt faM
Mittnii.tl

S, Invtoaral bract* endreij v<tli ik<. noi oarce
than 1 'i * ni long; i uliat traiuvenel) testate, tereti
Jon below the taflon f *urticutahu*
i. ymotucral bracu lealMike below, M lea« MM
met • than 2 cm konf; < ofana noi trantw
irpfiir. Sailed |UM below the biflon

4. Cttksa JUM below the bafioi with
rounded an§

5, Involw rat lut< i\ brawn (n ver green),
nuiiM (op 12); primar; raya of the
inflorescence SO-100; gtgasitli berbj with i uhna
(H I-*>iai C *papynu*

5. InwotucraJ brai is green, 2-1 prfanar) ra)
die inflorescence mud) kaa than SO; medium to
large hrrb* with rulmi much lea* than 2 m tall

dtk k: ipiketeta iiainwoMonaji 5-18 tarn long,
1- U mm wide; |tume* broadh tenceotaae eo

oblong 1.8-2.2 (~**n**n IOBg,flL8-l mm wide; OHM 1-1.2 turn long, 0JML9 mm vsidi

C. rymbbm

6. Khl/omcs i hi/om.itims. op < B (in IOMH. usu.ilh mint' ill.in 5 mm thc k. IpikelctI IIIUMI . 10-20 (-25) mm long, 2-2.5 mm wide, glunx-\ ovate, t 2.8 mm long. 1.5-2 mm wide; nun 1.2-1.5 mm long, ±0.3 mm wide ('. tcanmtu 4. Culms JUM beta* the mllm with 3 sli.ii|i. »inIrs in !t-wii

7. Culms wiid diiK.uc tides, S-winged JUM below ihr infliiiiM < in i gilMnm i.inK n than 2-1BUB long, the ii<U- V <>i 7-nerved inspidK lauirwed when dry; nut* 1.7-1 mm kOfi ('** malaccrniif

7. (nitiIN whii HM <H nmv<\ ridct, *nglTA just balm th<- iiti< e; pjhimet won than 2.2 mm long, tin- rida HkboMI " noi nu un<l when dry; mm 1-1 *> nun

C. jangp

2. Ciliuv with hluk<-> leaves mon iti.in t on l'ing ,i ii ihortri then ptaaM -ninu.il; planti annual M pernin.il

8. Planu annual with miiiuti 9. (.liitnr-o ne.iih 1% vsitlr M loit{. obi 4|x\ . h.uitU imbricating at maturity; BUtt^BMStM |OB| M iln ilUinic*

10. tilume* 7- i 3-nerved. Mill* .i v .ibtnl .nu) ^in hi* hispid on Vh< spreading ;i righi >ngla r<i id» rachilla « 2-2 * nun VMII C/Umiahu

10. (.liimes V .. (1, vsiih .i flatten rack glabrous; spikeslets i 1<l vjm Mtlmv;. mrrl\ ntlIM.!. I ..^2 mm wide C irw

9, Glunci much longci than M Me at tin v Imbricating M •mirity; nuts much o> than glumes

11. t.lumet 2.5-5 mm baft bWl a straight, i I) M linn long mucro; ipikelci not w|uiroar Cttmprwtu

11. Glumes 1-2 t" in h>rit; vsilli .i rtinted, 0.4-1.5 mm long; NJMk II spua HMC MflfWHI JCMttfIIMIU

8. Pl,iit» prrrnin.il with MIMNK r M m, slender sn.l.ni- or stem-bases swollen and < •>III likf

12. Sryi* vkirh ' tii am lit v mils t! ., | ,j,,Lrl<-t* arranged very densely • mi i IIM in mg ihr i.« hi* C rifMnMi

12. Slvtr with 1 lii.im ht-v nutt imiMil- of Svaltd 13 Planu xitli jJrntlri *ioltin«

11. (.ulmi > obtuteh % engird usually with Mime indiuinri sru<

C. rymbbm

14. CBIBM OupU .Vangled. v,nh %ides Hat M i MIK.I<- without .<<ii ul.ii

IS. Glume | nu>Ml I mm >> BMM U-II^ .*(«!" usualh ending in lubt

16. 1 in \ulut t.il hracu 2-5 timr* A > k » | •• i'ir inlloi. t.ini- in <l\ Innii C. &\$**

16. Lowe l i M4 •! iu r al braru thortn (tun or ted) tonga ili.m th<- knfloi pta**> mO>tK not 4,Arloiii)^ liuits <- nttmd**

15. Cluiaci ICM ih.tn 4 mm Umv; %t.l.kni> vndi ot without mh<

17. R.l. in* VMIK bain <i M ii.ini><l. 18. (•hiiiir% uhuiM. without apical mix 2.5 - 1 mm loaf; -'-' ' mm *i<t- with a broad

In-tlm- margin, h nfiykedi Cproema

18. <>loiu i wite, wlli uui.ilh itnnioini' apes. 1.8-2.5 mm In: 1.2-1.5 HUM " HdmNH a broad hyaline margin, distinctly led C. jangp

17. R.ti his |d 19. I'.Lniu Miih kaoil) tin in hki thi/ome* ji"l HtHMjMe Moll r. Inmir**

19. Planu without knotty, t onfrMu fhtao* 10. Btolom Mottl, jlnn<l fhi/niiir tikf. " ending m luben; i uim bate n<i nun d «*oi«" C. I

20. Spikes* Hrmt Mh mding m tuben; < ahn ba*• •wollrn and MMII 11. Spikrlrts w ll.tv.iOi oi tmtv glumes MM MN than 1 »• mm l'ing. >> irli raised BCTWi -• most in the mar- in

XI. S|>krI. dark reddish-brown; glumes 3 or more mm long I with .i wide mJfK¹⁰⁰¹¹

11. Spikrlrts w ll.tv.iOi oi tmtv glumes MM MN than 1 »• mm l'ing. >> irli raised BCTWi -• most in the mar- in

XI. S|>krI. dark reddish-brown; glumes 3 or more mm long I with .i wide mJfK¹⁰⁰¹¹

DOdrt VIIH C <<*•*••

13. I' In nil ttolom, tulm hue <w<i or hard-wood or culms arising from wood: .: ihisumr<

22. SpikrU-i* rvlindi Spikes stalked; spikelets spreading; leaves involucrel bracts usually 1-1' . II. a wide; .:id amooth along the angle* C. Ajp*^{01*1}

23. S spikes subsecle for ntng apt solitary • w** spikelets erect to suberect; leaves and involucrel hracutnouK 15-30 mm wide; culms scabrous T**^{11*}

the angles

H. Spikrk t» cUaun II) B H M

24. Spik. spikelets very numerous and crowded ing. .ihn tioobb the axis of the spike

25. Nun dot u iijm i M. (4timr« 1.4-2.2 mm Ionic min 0.7 - 1 mm¹⁰⁰¹¹

C. alpevradu

2«.i. 2 mm long. min 0.7-0.8 mm Crf>>^{1*}

46. Kffl of ghme ending below die apes, ai more
tpic ulate, lpiketeti reddish-brown; involucre

C. haspam

40. Plams perennial with a wood) rhJaonx or the aider
wulm <i atenvbaae nwofien

47. Nuts IHH-ually 3-sided, donowcntrafiy flatt med
fUNtattO WI 6 BOB long, ! f-4 mm wide, wk3
taifceaed angles, unifonnh reddish-brown;
spikHets witli &~168ow< C tmbntahu

48. Nuts I.K-2 mm lor g. 0.8-1 mm wide, with
< orkv or spongy thicken ei angles, the sides
shining greyiah-brown to hfcukitli with pale
whil sh to y< wriati angles; aptteleti with l>-10
Ho* C platystia

47. Nuts 2 equally 5-sided, not flattened;
49. PiopbyHi at base of ih< rays witl scalanus
•eeJt) nuts 0.8-0.9 mm long; connei the
ippc'nti age 2 one-third a long as the an)wi
i rlatui

49. PropyUs at bas< <}& the I, I^ wkli anooth
ket by nuts 1.1-2 tmi long: connective .ip>rndage
t batfa* long at the astl) C afcam

37. Inlt. resence closed, of 1, sessile, usually dense
head; 0:: head sessile; ; oj J m moi sessile clusters
of spikelets

50. Inl- resence appearing lateral; 1 lmm >(IKral h
rect, appearing to be an extension of the c iihiti
C laattpttu*

50. lafiotetceiM e tenntei; the knvolta ral bi
likr oi ieale4ike, aprcading oi refleaed, BOI appi
be an aneaatoe <i the-1 aha

51. Plants annual with a minute rooi mtetn
52. Ghanei wrj aaaf 0.5-0.8 (-1) .m long,
nearly cylind, kular, without mu (n or an), mm
almost as long as the subtending glume
ajpanaM

52. (.In nuts at least ! mm long, ifiMimtlv 1>ger
than aide, <Mth Macro q MM DIM I shorter
than Uv -imtj glume

53. Ghnnei \$-4 ana lot l. conspicu «nh muitm-
ervrti; ihr null at leaaj 1 ntnn k<: some remain-
inj? attat hrd to the rachitl twity, ^i
pi 'm gre' > dKerj green C m mpmtui

55. (.lumrs utii in' or thas i J mm lonf never
tw more than 7-nerved; ttir nuta leu than I turn
lOl>K releaed .t^ ihc gkaet (.ill. whole pbni
green to h>-

54. HitMfi* whitish-green; involucre bracts
ov. leaf-like, spreading, nearly all of them
* overlapping the inflorescence / pygmaea

54. Headi » sides to brown or reddish-brown;
involucre bracts few, rarely more than 3 over-
topping it.- inflorescence

55. SpikW* ai andKaa not more than 1.5 mi v> dr
un-bracte setting; anthers 0.3-0.8 mm long;
slg <>h re* i r C submmt

55. SpikHtMs H ,intln 1.7-4 mm wide, in fruit
usually 3-sided; anthers 0.7-1.3 mm
lotlg. Mi!)!-ly recurved

56. Each head with 20-60 spikelets
| larious squarrot

56. 1 each head with 3-15 spikelets
anthers 1.4-2 mm long C^ cuspidate*

57. (.lt
Vt.Gkunmi LS mm bag
Monirw mudrapatama

51.1'arm peirmalaj vnth rtilnomci. Kokmi
nttm !>.-

58. Plants with long, thin t reeping «oloi»
59. Heads wbtuh; m m much denser araO)
Rattened and nr.i obotewJj Iridcd, IJ^ -Uaw
long, 1.1-1.3 mm wide, lanuiriK blark-trown, itipe
C

59. Mr heads yellowish-brown; neu d denser nr«Bj
flattened b 3-sided, 1-1.5 am l'»««
0.7-1 mm wulr, idpe 1-1.1 mm long wt°g«d .*
•ntheato, thf win] developing in-o yeBowfadi corkj
r M | covering the lower half the nut
C rfhaht*

58. PIMM (4tki inflorescence sessile, with swollen corolla
bases or rhizomes

MI Loweit iwuluctaj bract erect, pushing thr
resence somewhat to the side; nuts 1.2-1.5 mm
bag ((1<i'i'«'''

W. LOWM law) bract be M apBMdtnf or reflexed,
not pushing hutj; th< inflorescence to the side; nul*
0.5-0.8 mm long
Anthers yellow to brown; nuts pear-shaped
C subulbil

61. I heads dirty white; nuts cylindrical to clavate,
obtusely 3-sided C pulchella

Cy alajenoides Rottbll [Juncus alajenoides win
(Rottbll) C. B. Clarke] Fig. 84

kh rhizome very short, woody. Culm robust, culm
3-sided above, aaooth 50-150 cm tall, 7-12
thick, bifated when i« water. Leaves 3-5; sheath*
totnntti.ii ipon) yellowish to blackish

25 cm long; blades inverted V-shaped, leaflets
40-70 cm long, 3-7 mm wide, scabrous on nerves
and margins. Involucre bracts 4-7 (-12), unequal,
the longer ones much overlapping the inflorescence,
up to 65 cm long. Inflorescence compound panicle-
like, contain UK of 1 sessile and few to many-stalked
clusters of spikes; rays 5-10, unequal, up to 20 cm
long, the larger ones sometimes with tertiary clusters
of spikes. Spikes digitate, upright, cylindrical to



FIG. 34. *Opuntia albispinus*: a, inflorescence, outer bracts trimmed (1 cm); b, spike (1 cm); c, spikelet (1 mm); d, mm with glume (1 mm).

Stems 4-15 mm in diameter. Spikelets eventually spreading, ovate to lanceolate, 1.5-2.5 (-3) mm wide. Flowers or fruiting.

...W**.

Unteftovmr to rUtprii: I^{iw*} TjfcMiirh £t2

Stems purple-tinged, densely induplicate; leaf absent, midrib obscure. Stems toa*ori - 1-1.5 mm long, 2 (-3) cleft; stigma 2 or 3, one-quarter to one-third as long as the style. Nuts dorsally flattened, planoconvex or spheroid, 0.2-1 mm.

H). v. ... «*** _ 11 _ 1 o

Perennial. Upright and takes but also in swamps and in found in rice fields. Like C. but the style is usually 3-cleft; also has longer glumes and larger nuts.

j Ind. Trop. Ten. (Hill). Warm and tropical Old World. Australia, Ind. Cey. Ind. Pak. Ap. Bh. DL. K. K. Mh. Mp. P. S. T. Up. Wh. 0-1500 m.

OpArru> a/u(af(u Krin [C IIW1 iHWMIM W

linn ererl, ilrnder. MIHHIIIJ 10-70 iin mil. i-'jmm Ihkk, 'Vmin) Lena - or S, u loii^ m M iborta iluii ün-1 uiui. bbda fi.u. Uiiitiiw, 1-Smm wide, long-u iiiuiMir. imootli !K I*i«, «:JIIHI>II« above. Irreducible bracli 2-4 mirqujul. (hr lanfCI DOM overtopp.inK (in- InSoKicenM Inflo... »imple or ...pound, i *»\LC ± mie, the odtet* *u)Ud, i 3-9, unequal, up lo W ah lonn- Spflum emu to .iblong-tivjfc, U or In d*nw rhrttqr, 1-3 cm kng, »-25 (-SO) mm ride,bearing > 90 VJ.L.I.-^ ndtb h., <1.in the ^iiylr* Bgfttrliil knur. QWM 10 Imear- oblong, spreading tg JI ii^in •ngiei in 1' rae 11 b irikxcd, 3-12 mm lonf. Mi »»" iride, y 4 in IS-II(*wri hffll penhfcMt, <iiwiiu CfaUBH broulK i)lnw«if to iuboat)k«ihw. L7-2mm Um^ iid wkk, 7-<r *t>ennl, Mth a green, brU ->'«i wiiifcnl kf-rl. ibe u<tr>»ro*ni *nh pwpl llriki, mi in harrilt rniKrornte, luidh imbn< jlinj; at matin it v Stamen 2 or 3. 'iiiuvrapprrmburvriv ten Style V* k-fi- lew dun tt»S mm long Sin* Vudnt, ellip- soid to ...; ... t 1.% iiiiik>n(;. D.MI.'l nun widr, shining, dark brown.



FIG. 35. *Opuntia albispinus*: a, haw nf (fcout 11 •«"). b, inflores- taur it tm): t. spikelet (I «mi, it. glume (03 mmi, r, out (1 mo.),

brown. n*rt™l MM). . . .rtwill. . . . *!<¹ (<lll m sol-
Duym trw ir^, d*1 JMM»K fiftM *• M of * hb
bf4iKhr*. obtuK-H MM**, BMWtl 6-20 cm tall,
0.5-1.5 mm th

than or slightly l.ll«rr th:ill ll.f . utll. sheaths membra-
nous, straw-coloured to light brown, 2.5-7 cm long, the
lower ones wider,, blades »>t-H« channelled.

r*rd. (2.5-) 5-20 cm long, 1-3 mm wide, smooth,

glaucous green, glaucous at the apex. Involutional bracts

1-3, veryml. U»e !<¹««« S_|M cm «K,, l ...

remaining much shorter. f«ii M»1 o*cnopping lbr

ionore*.,,.. lull- »«« !«.*».*. (rarely 2-lobed

or brarin* tip fa » hr*a> with rt

K»nU.v, l V2.5 (-S>»i «n ditmrlr. *.ilh 5-W

'(M^'". Spikeslets »«««« Uir_ ^_'^ miV TM5-

2-5 nun Midr fr ID t7-fl*f*rf«< p* «'·'

4-5 mlM.K.K 2 3 mm » .k. obnar of hll

r. mimurl »«««« » » » »

wi wi tinjM w,,i. brown wifa

along the nrm

I . S, , w

« Inng - the

ofaontr. 1J-IH mm

maturing black-brown.

PteoukL la »IMII"·

.....1 tbo 1'.....d m dry w>

M «»» tHUH Fanning MJ f

Early recognizable by its slender head with relatively

.....

.....

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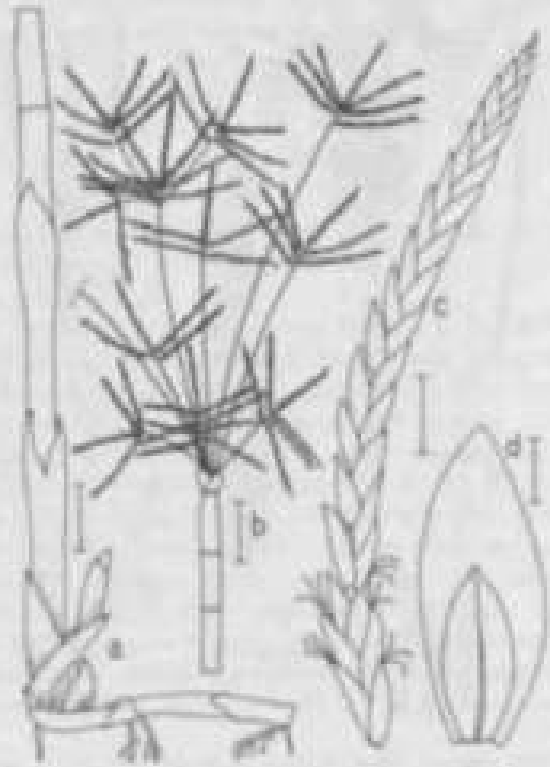
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he. ML Ctyfcw afft/<Wu- *. har ol turn (2 cm); b, part of
• nil' i>Ul. (1 pt. Him, .1 . . . nut and gl
0.5 jilHt.

. lli|>< <>t.l.tt||, . t k i iTicii l'tug, pftlrr tti iim^
straight leaf of i>n- niases, freely fruiting. luts
above, up to 2 nun long. *nw>ih. Auk hrittm.

I'rTrnnUil FtHirf HI til allow water at the end |fU d
lAcv on <opm wci n»>= of, al HK dl* i » and >ltc
nuufiiiit *rf rii e Ackb.

llkll. Sand *»> \>« *<fi Anuj is Coy. Ind. |v. l>!
KI.U !>

Cyperus ... WUHkium lig *<l

Like C <vjf*AtfMi but (ndorrKriKr oAn with
•nrfa) Mtlknl rliwlrn ui «pikrlri»; vplkrkt nintmri.
± 13 nun wkk (with HUM nw imliwW t *2 mini, ol
run >downed (up to 50 (-80) flowers; glumes ir<*
•pii ading, chemia h "»wm; mi ...
Uiurirr O.Vfl.H mm U*m. Mwenni || nuto oblotif. nitli
rutiK pttUW-1 *k*r», 0.6-0.9 mm long, 0.1-0.1 mm
wklr. rarely atntlkr anr) wit-r

AJITUJl). Fr.und in *caKH>)h Hot Mini (ib m
llowrrmx 4i ibe wain rrcnW

JD (Tru. . M<ll Tn^k'I A*u JMI(Autfralt* Baa.
But, Coy, Ind. s. |. kJ.Ki, Mh.MpM l<. Up.

ripcl;

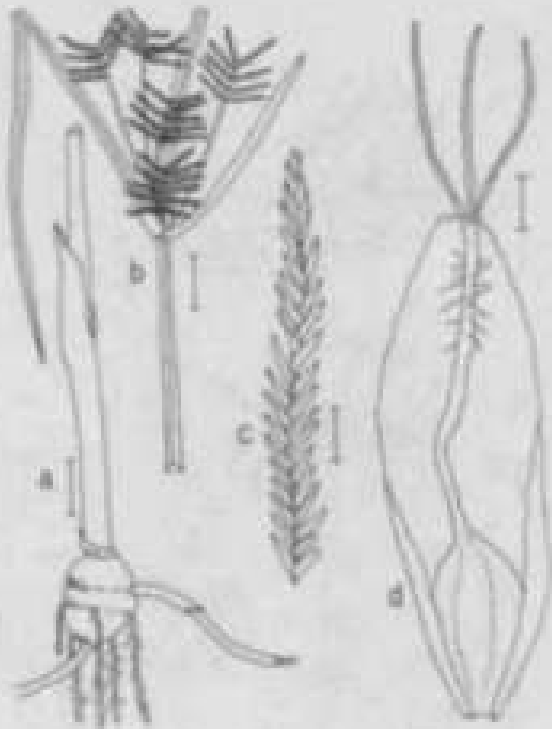


FIG. 88. *Oenothera* sp. a, tw of wool (* CM)*, b. put rif
 influence; c. iptirki (4 mm), d. not *nj

Oenothera myhalota Vaht (C A «4 mafi> i Tliwjilr*]:
 Fig. 88

Kht/ofii<-> %lic*ft but dnrlupmK uotont, MOIOIK U(> <<<
 SO cm kxtgr O.VJ ? mm [fii< i, !.... ting at nodes. Culms
 are together, 3-angled, becoming 5-angled
 below the inflorescence. (1ft_) 1S-4 (-55) cm tall,
 <03-) t-? timi hut* • i L, HnooUi. I M V M half a*
 long as or •*nir.pimm ihr culms; stem tin l-lt tm
 long; scale lite hthvw. twnu ting brown; blades flat,
 midrib, 6-50 CM 1>M.. (0.5-) i-l mm «Hir. (fi*tl>
 narrowing to 4 l^uglrd up, scabrous on nerves tnt1
 K Inwilucrtl WM 3-5, unequal, the longer
 ones much •••lllr[lji. ing the inflorescence DM. Up l 30 cm
 Um> influence to an oval ' 'uu iV | liJ-ol head,
 heads 0.5-1.5 cm ... culms of
 3-8 spikelets. Spikelets ovate to lanceolate-ovate, 4-8
 (-10) mm k>>i(t. V-4 mm wkle. rf*t**-> 10- ID
 25-flowered, rrtblitMtrotm with yrllawith BMTfi
 ilIU Mnifhf. not wtngrd Quia» l«aihr<
 V4 mm kmK. 1*-2i mm «fMtr. niurrutuur ai trutf

tuinnl «iih < heMnitf ltruwn; keel S^rnr d,
 •* Umtight <t ihfthth «un*rd ±0.3 nun kn<x mu-
 i-J mm (uni; 3-lobed or
 sometimes entire. Nuts •*nrij JTM! (IITUIK li

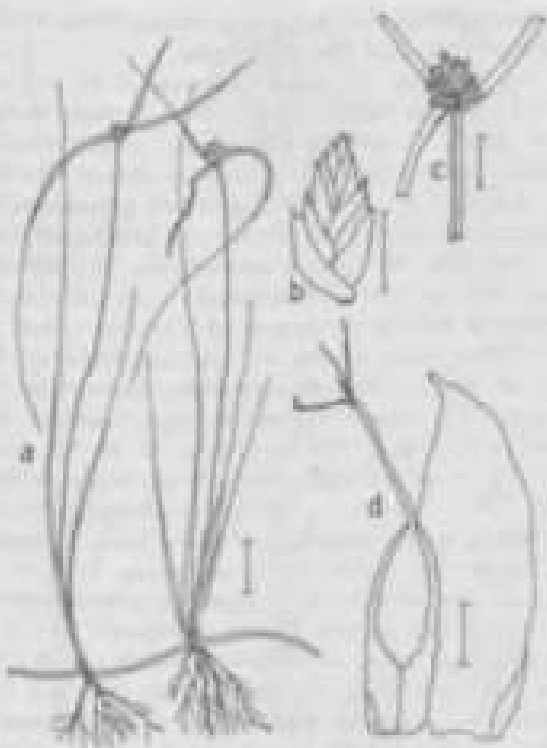
mm long, 0.7-1 mm wide, dark brown, minutely
 punct nuii, spirulate Al ihr apex vlam
 style base; style 1-1.5 mm long
 .1 mm long, **>>i«e<l »| "11|"
 ll.r edge and wing g drcis fR into ****.****
 ti (re-over) TK the WI^T haU «l ilw n-
 i^* Annual. An emergent aquatic plant forming
 floating mats. U i i
 found in marshy places and rice flows. ... locally as
 fodder. The nuts have corky ridges ... they are
 presumably lfefirrd tn njrtt

Urban, C. B. Schlieben, C. ...
 Q-H0a

Urban, C. B. Schlieben, C. ...
 Culms tufted, somewhat spreading
 (-50) cm tall, 1-2.5 mm thick, smooth. Sides ...
 in the culm sheath
 ntembrwou*. rrrddnh b, ...
 t«ie(thr ti«Rmt irabraw vmai*U ^ »H> I||VI
 hr*cu S-S, unr^ual, ihc ltmni



fib W. O^PVM M t n w m kutbt pU" (1 cm) b. d...
 vtrwrd (nun h* k md mie(0 > B.MI I



likRtt 06 ... 11 looUilf ... 3-4 mm long) whh MUX-IV E ...

[G "I'I'I Hrl], AIMKHM cocmopoiitan Ban, Bhu. Hni. { .n. lud. Nrp. Hak: <An. Ap. Ar. \ in Cj Ca Hp.J*. K). Ki, Ug, Mb, M_r, r_q R., St J). Up, VWJ 0-3300 m.

Cyperus corymbosus Rothell [C. *egyptiacus* Roxburgh in C. *corymbosus* var. *longispicatus* (O, fUI' ...)

Blizones longirosping, subuliformis, 2-3 mat thick. CuJnu wngfll in u tuw ^U m^ dir rhiwntr, ^fjKrtl i > r 1 or 3 ckiK uigrthri. MIIK < ... ! IQ (-300) cm oil. 4-Hhm lidcX -iilnrmi- m wnkty .V^ulrd. raxHy *rptarc, dbucaUj («*n, MTK» ^I. f^mtirs nicwrh' rr.i ... ID UIMU k** .lwitlw; U ... likr U'IMH, the uppr- ... onv3KV-S5cn long, mHhl>lwni)ii i>>fiail (... blades rjifh prrvriil. up U> (-18) cm long. titWIKl u! leaves 2-4, iii<<|u.il. k ,ih «li, inri than the ititlnr» ... the longest 2-3.5 (-i⁻¹ f »J i'tn^ . uft (tt 7 tuni wide*. InM- ... t poundp. ... ul.ii. ... ii^ot] icsrik »V^' md w^t-r.ij «uJkf(i ipilu-* with ur Hiihoiu «...1JI> %|»ki: I.IV-U-I". Spflbe* ...nnilnw. o ...

Fig. 11. f.i^Tui , ^A-i* < : ft, whole pUil (3 ^nl. b. ... (1 c ... d. ...) (0.5 mm).

mftMfr«»rii. t, il|> to SO cm king. lhf|<|> ... u|>1r. open, wif-iruiiir« rtdnccd to a single- K-uile ciunler, ... (10) il|kn.inK in ! ... kfrangvd »|iiLrlcl». ... Moii^ . 10-W BB HMfi * * . BUB ... 15- io Mt-ltr**i> ... Cttiith ... ku/ni jt nihiufiiv; JCI MIU DenMMM. ... bin cadtKoua wtagi Ghana o M , *tuir. 5-s mm loogi van^A uoutlj PMrfttBgncd with ljrcrn krcl. (MU^ ^PTII i" vcDowith-hrOWn ifaiet HW) ... tnuera I OJ HIM long, Ki ... Hiwirm I ... Meted, hra«lli ... I.VI.7 mm long, t 1 mm wirtr. Mi|i)IN ... iMof, tiitnuirh pimtUtr. dark ...

!Tnujt Wkieiptvi ... imm ofl tattoiv »ol(. j ... m |i!.uf t. r<M<1«Hft JIKI i'iliu.iu < |jfi<| bin ... Met placnHKh aurkr nrMm. ^lmin w4icr ... JUII Jt i lir r^fjir Of drying pc«»». The BUU ... hr.i i., thr rach&h «*d (rtrn....r ... if <>ftm flWW ir' tuftl it «* nM ... loloni & ninnrn Thr wtolr pUm i* firry or ulvrtv ... li ls *rtv wviabtc in *TK- *nd wmr intrAtp- ... hftii im>ftii/rit li it itlMinffii^huMr i.....



Ptt. ft. <.if^nt nmfmiiii i, hwwr of khtwH {* rnhJl; ... 11 ... d. ... (0 li Him).

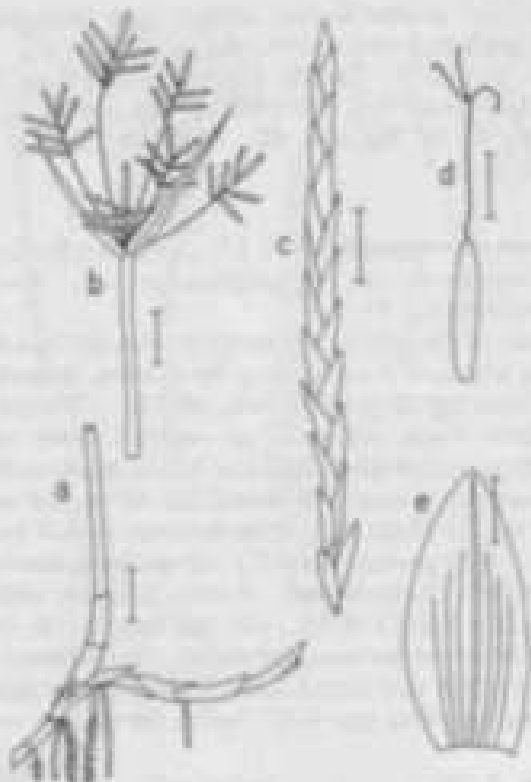


Fig. 83. *Cymnu tmj*: a, whole plant (1 cm); b, spikelet (1 cm); c, stem (1 mm); d, young fruit (1 mm); e, glume (1 mm).

10-» mm kwR ami mrtr. with a *-IO tnm king nrtUt. bfJrtltK 10-13)«kr><-1* S*LrL< is sparse, narrow-oblong, 3-11? mm long. 1-1A mm w V. i rachilla straight, pmutii. tai>i^r<l Miv^t01 mm widr. reddish brown, persistent. Glumes membranous, broadly lanceolate to ovate-oblong. l «-2.2 (-3) ram Wi<g. O.S-l tnm wide, obtuse. HUM i.HiiiUtr at tip, sides with 2 or 3 veins grey to reddish. ltw<mn on itw tui k, with »«rio*». weakly tonir>r<1 ni4f^ttiv krri grvrtt. Sumnw A anther (0.7-) Mm Utn% SMr* rierph V» W< S«i» 3-lobed, waterlog

Huwn or i
 Perennial grass growing in large colonies. Marshy places, ponds, ditches, streams, riverbanks, usually flooded areas. Sometimes found in brackish coastal areas. The culms are used for making fish traps and baskets. Cultivated, particularly in Tamil Nadu where it is called 'pangora'. It is like *C. rotundata* but clearly separate, involucred leaves leaf-like.
 (Tev/Hell)
 Cis. Ind. Nep. An. Bh. Dh. G. Gu. Kl. M. Mi. Mo. Mp. Or. P. Rj. Ta. Up. Wb. 6-600 m.

Cyperus rotundatus Kunth [C. rotundatus Nees, C. rotundatus Lamour. non Poirrth Fift. 1M
 Cut is solitary or tufted. 1, unooth, US "« [x 0. 0.2-0.7 (-1) mm thick. |jra* « thonrf to *»«!» **1011!
 A* ihr < tiin Oir.nl, nirmbtaiiui. variate, <**** iHntm lo pi glume, blades very luroH, ahnmM size-like, 1-8 cm long. 1 : 1 :ilit >ill<*. ^l-will.Iih MTUlllt*11m the anfttai wJbwulmw icMnrdr t hr < involucred bract
 strapping the involucre. 2-8 i n Umt InIVix narrow wkk 1 sessile and 1-3 stalked spikelet clusters l O' OV l tpttul . lower ray 0-3. hltform, unequal. l/l- u> 1cm UMI Spikes . TM n* uirh 4fTJii>n-r.] »triUirL *pfr». long clusters of (... 4-20 spikelets. Spikelets «Unrm, mtmaft HwiirorA 4-J (-20) mm long, 1.7-3 mm wide, 6- or 4 flowered, rachilla slightly flexuous, persistent, without winp. l .lutmt rkimnrh *llfK- al to oblong-spathulate, *ly*rmilTi\$. arutc, 4»»»H, 1 4-2 mm l<xijt !*.*. iohg ihr uivu). 0.6-1 mm WMIT. rin*i. more as spers. ihr MOJCI rutf lo fTti lwi > ... level 3-nerve, yellowish-green, sometimes with purple stripes, elongated into 0.7-1 mm long, ^irr#dtmf or rrrunnl *v ... Stamens (2) 3. Style 2-0.3 mm tong: *%«»» »bdriit lfc« " or style. Sum UulrA. «J»«, ^ luUMLun|>>» for subtending nhi. an. (0.5-) 0.6-0.8 an Um* 0.5-0.4 mm wide, thorthftpiruUu-. hn.nm i ... chestnut brown.



Fig. 84. *Cyperus rotundatus*: a, whole plant (1 cm); b, spikelet (1 mm); c, seed (0.2 mm).



FIG. 25. *Opuntia digitata*: a, whole plant (2 cm); b, cluster of globose fruits in longitudinal section (4 mm); c, globose fruit (1 mm); d, flower (2.2 mm); e, globose fruit (3.3 mm). I.iwMiHomi.

Annual. Seasonally wrt pUi", margin" Of p- ygndywt. li W r.. «*««
 Um»mt ifMniH* »hH h differ in tu|i»R true
 t hnh km nartn**t ^*lrkW (t 13 mm
 curwd «wm ^nrf »r»Jlc-Wacd nuu, »n«l
 tdf**f^tanut, *«In-li h» l«K«*r gli
 • ma »Mg) xtid ihr »H* «* M **<
 l**MKj jir k,, i,,t ,,,,(uituiUi *i h»c.
 HrlI PMI (Win. B> r, Coy, Ind, Nep.
 » ^ An. A>i. AJ, A * Jk, KJ, KI, MR, Mh. S«. PJ, R| Bfc,
 fo. Up, Wh 0-1700

Opuntia digitata Linnæus P% W
 .it mlted, smooth. 0-40 (-W) on t«L t*
 usually at edge of thorn; *lira«h» >rtliiwnh
 to brown; blades folded, » to i 20 <> long.
 1)1....Hide A#
 t_M> Imotucn
 rriopfx'ijt (hf infl.rfnrrncr. U|
 long
 rather
 cherry

Spikes i dtuten BBtirggwwl im» ipbetkal beack,
 (2-) 5-15 mm in dnmccici Bpikriou *rMilt\ lin
 2-3 (-8) mm 1*inj, l—U nun HH<*. 3- m .VI-
 (-10)-downed, nullilta >n^iht. DM witl«i*I (.Ini
 ven MMBI tichn o^bkute. O.S-0,8 (-1) mm km^,
 0,5-1 mm Hide. ilo*ch Imbricate, .ii Km gicrn,
 becoming rvddbh; krri grten becomiag |MtDowbb,
 faintly 3-nerve, r
 Style ± half as l:

0 '47mra UUIR. ± OS mi« *i<lr. vrlkiwUh tu pale
 U

Annuxl Voyi..nmmn, aAen found m sh*lhjw w*irr
 MI ^i^uiJh fjoodtti arc4i, ponds, dn. . . . iK
 in me- Beldi r*n4iiv fankdm ti<imf» in covdn *> .
 it «m lf » TCV llinrUljl>c Vn-rd. Easily
 idntifted by il» head-Hkr clUWclli <!
 articular glumes less th.iti l' .m long.

Hyp !>> it'l- WWW .ml it-«...tl Old World,
 BUUnKteditl \uirii. i Hui Him. Km. (n. linl. Nrp.
 Fitk; An. Ap. A*, D!, < . Ga. It(1. [k. Kl. Ki. Mh. M].. Pj,
 Rj. Sk. Tn. l'p, Wb IJ?<H)

Opuntia digitata Rmthtirnh [C
 K

Kln/..»tn> »1l.»M. mliririi, W*HHK. H-TJ mm thick
 tan lull' -III V MIIM.HII. .u.)50 (~2<Xl)
 txl. (* "i" ">" k, ^uded bebw, J-*nki,,i
 -j t LIII^I ii i»hrt. l t4.vc% fr*, ibortci (hij) ta
 4\ iltr i uhri: rfmh i purplith; bb4a lIJl *M td.
 tui piM air will) 1 oi i |>III]MII.< »M <>>
 to lrailirr). up n> 'i0 i in long, 4 in
 (-16) tnm mnlr. giMirmII, » *IM'»I » *Um% the
 ami innli(> imiJmul lu^u V-K, the Umrr
 »M>K lh« mll>.
 , 4-ISmiD« ill l trwiW jutd
 jptMip* d-n*r. uirty (on-
 1-9, iprra*ling. uiw^ijiul, up |o ^) * nt !>ni((.
 0, cytodrt mlon> l-SaD)o<ttai
 ter. ratl ih (4-) is-eo »pikrfeu.

«*» ., fiRhi anglr* to in*
 tmrju, 4-K1 mm Uny. 1-K9 nun u» ttkunrln, 5- m HV
 o**Kt1, MIAV. . okiured ui goldm <H rddtO!
 i nchitU Mi^iKhi. pmtH"
 with rather oui
 wings up to 1 mm wide (Jiimt-t ctipikfjblo*)^ aruir.
 1.3 mm Vtmf. ± 1 m> wide. Odn ncrw-
 h »ri|ow iit bfuwTi; b-rJ K J . J, grcti <
 rrdial^bnnm, rndiiiK at ihc *ptt iiUtr i p n. nm
 1«.ifiling J mM in. Suimn* .\ juithnx with A vrn
 ^pfw^ul^fr Style <>)' » 3 tim> > kxi^rr than ihe
 i.lrh. Nm* Vtidvd, rllipwrtd in
 • r< 1.4mm langi 0 i 0 • *mi widr. yclkwUh IMIM.II.
 innnrlU papillae.
 > perennial. Found in or near water in swamps, or sea-
 sonally flooded areas, wet rice fields, ditches and dikes.



Fig. 97. a, base of shoot (1 cm); b, part of inflorescence (2 cm); c, spikelet (1 mm); d, nut (1 mm); e, nut (0.1 mm); f, glume (1.5 mm).

Cyperus

Like **C iirfwftJu*** htu (iiber* covered whi I grey tomentum; spikes sh. irrr (1-3 m long); ^it sh. yellowish to rusty lif.mii. uhiutr, *>11i mm l^nR; glumes yellow to light brown oiulln r.'J-'Jf mm long), with more ncrwt (7 or 91. iht nrrT« Jr> ting tHr rnnripii nrrir t l each.

I< irnnul Hv no means a wetland p but often II"JI<l 11i W4>11J|1>. II"->I'• areas and in swamps, boi 'l«M1H titiutti in fWlrJiiiftl land. Rand; cultivated for itl CtlIOr tut».

t'llrl)1 AlntoM i-rMtiHiptitiixn in wmaei rc|
Ban. Ind. Nep. E. J. I. M. P. I. T. O. H.

Cyperus multiflorus Rri/un> lttu liiilntK var *erfua* Kikenda. 2. *erfua* R. Bm*(i. ' tiii* N m | : Fig. 99

Rhiirtmrt var II<rt, 2 i tin tlm t. HOOdj I-illm* densely tufted, smooth. |«>>»> ftO-Wi«>> 0.6-10 mm thick, 3-angled, smooth. I* over usually (-quailing the <>»M: thmhi *erfua* fong, frddih to bk sh.

Males flat nr p\ifMt.: herbaceous, up to 2.50 m long, 8-15 mm wide, 3-angled, scabrous margins. Inters. nod. tracts 4-6, unequal, the lower ones overlapping the upper ones, 50-60 cm

ft-12 mm wide, crct i Of >|>'caifin« Inffuf rtrc nc compound, => fffOUft < inblCHOe md M-tiketl *pikcv ray* V-15, HftfplH) »|> lti ?d i in lun^ Spttd ^-t COB (imn, L3-23 HI hutr •hen mature, wnli 13-60 fptntadng .lll< untur iK%fuik i|nl.rifts Spikekfa .KH>- ... •(.i. i. wmi-circi. Un«n • »» ntilt>nK, thin twd, mldhlfrbtwnL, 4-IL'nitii !<ti^ + J S iitn Mda (0-1) 12-20 fti ^i rrd. rachilla penbleai, «nixrfl. v.m/i/ wUikli MJ utu^isli, caducous. <(ui'ns (mz) ?> brcNMjff rmfi. f VL' f mm lmg, L2-1.1S mm widr, S- to S- (D-oervnL ifalntB)

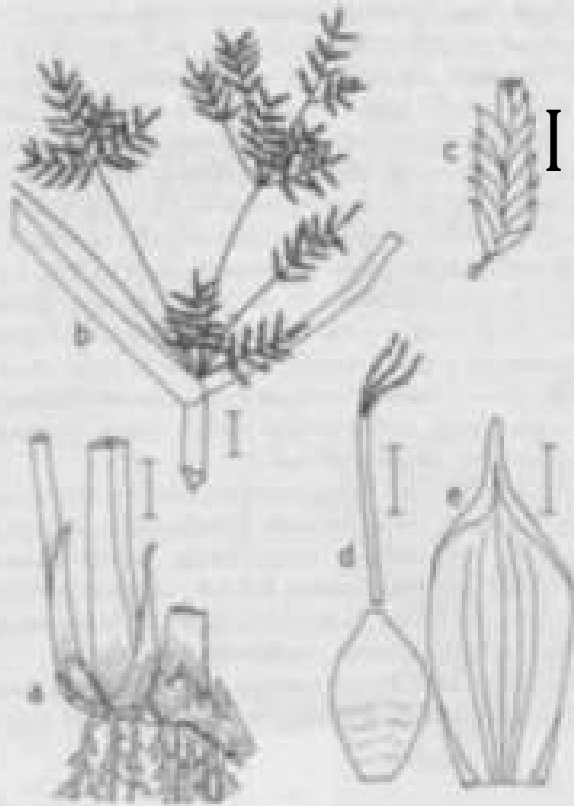
grasses, with slender panicle leaf green, rm tit II-III ••• a short narrow Stamens 3. Style slender, S-rieff. MUM v,!/tr<l. r»ffrwjt/i »••• obcordate-elliptic, i> r^i mm IHll^ .0.VO.6 mm thkt. yellow, yellowish-brown or grey, almost smooth.

PrrrmiiJl Mf«tl\ grryArititu in iwampa or in riprn Nji/; in wrt Of *tiJ*«l<t jfljtrti, aUo hmml i in rrr & idt. t iilni.iH'i im imffW'n coue mai». cdldc 't'ailu|>*i komi' in 7*ii>h,,,lu JJill. 11 frrm C 4t/^utttt in h*t.ing IU*irnr<l 4iid m<cl' tpiklrrii tdiirh air vrnir. t. u jlto b^ a character» » irddi>h->i.H in rrbat.

(Irn/Hrtf Ok I World ") " " • jnil subspicis double JulK rrti>n)r<) Intut S AnnriM A, J am. Crv. Ind. Ap. As.



nu-W. <.^niivi< base of shoot (1 cm); b, inflorescence (2 cm); c, panicle spikelet (1 mm); d, nut (0.1 mm); e, nut (0.1 mm).



ffccM. nf J. h*ir id iKnf i) era), b, p-1 of
 influenceance (2 cm); c, ipitrlt (2 · cm); d, nut (0.25 · cm):
 r. glauc (0.25 mm).

Bh. < ; Go Kl ki, M*. Mh. Up, C h. Pj, Rj, Tit. Up, Wb.
 6-2100 m.

Cy **fi f** has Lmrurui MIIM». Awp** j I
 100

iijan- *hott or ah*rni Culmt slender,
 weak, tufted <n >>twuuiM* ftUi.u, (3-)
 10-40cm ull. a, l~t, j mm thi. · Jr 5-iiiglrtl
 U na j-1. M lunK *» or *b«Hir» th*n t
 ^lit-jiiht bUdrk** brkw, bbded or r*rrh bUdrfn
 «buvr. up t. 6 cm i»i»fj, trDuwith >
 brown; bLidn fliri M ·ll«(hfty ptk*te, llartrk]. £~20 cm
 kiiik. t-9 nun wide, f;r4fhi^lh «« timiniHr. tmoixl
 UtghtK Kshruim *b«vr bMAfCia) l)»»rt« l or 5,
 «»'iul. tbr L»WT uar

p b l n l

long. Influenceance com-
 pressed, lat. relatively large, primary rays 18-22, up to
 10 (-20) cm long, secondary rays, 3-7, 1-2.5
 Him long.
 trrtteiy ···· when grown

Spikesless dip-
 Mlrh arranged in clusters > til V HI
 VIIIIMP
 long, 1-2 mm wide, with 18-28 (-40) flowers; rachilla
 slightly flexuous, hidden by the glumes, prnMciki,

will tout triugv CiluiMr* ovatr. Ulgtulv In 1- d
 tlf lip, ohniv. «.ms >vir>rd. 1- U mm 1<'K-
 0.5 ii.Tmm wide. Tri)«li»M<> «»n ofira >>»i jitr»If
 tripo or a puf pic «pcn on on or cadi lid*, ibe *****
 ncrwtp*. Inyalinc, keel green, 3mm -«), the midrib
 encurre i at a «hon and MnMghi mucro jiirt below
 the tip. Stamens (1-1) 3, connective a proslage hairy. Style
 L5 ihnc* » long a* thr nuu Vcirti; stigma t as long as
 ihr u>lr Ki«t» obtwHr S^ioM with crosses sides, sub-
 κ|f>U*r r*. clHpwjfd. 0 +0.7 mm long ^ 0.3-0.4 mm
 wide, hftuHlv uipitjir. Iuvdh 4|»- «lase <<v 1} >>
 r. iIMI M» whlr lo * rrim yftcwr.

Sh«t4ivtd prrrnnul or tomrlinw* annu.il In
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 irrigrtKMi iht< hr« j*i-i rise fields. Cyperus karpoti in
 var M <4><l muv IUM hr H» ···· ···· ···· ···· ····
 K « p /
 ra«in in iIMIUC farther invrttigalioiM arc itrcoVrf *·
 U t C bwn*^wM but UMulh pcrriinu), ^ktmrt m * ^ 1,
 (^titlqurh cm i- glutiM-« LttKrr (itn*r l tun t mm lodf'
 dot r« ur^rii JI lop; »«hii*- iiitutmit vtaibr briwrc" <lr
 opened Khiuifi nt iitititig «jili(-*v «»im«t i*
 appurilage wilti brntl*»



rib. IN Cyperus karpoti subsp. karpoti a. influenceance
 (1 cm); b, gl. (0.25 mm); c, spikelet (1 mm). C karpoti
 subsp. karpoti ^bMT^Ib. (1 cm); c, spikelet (1 mm)
 |, M(O) « HM

1(0) Hyp/Tml. TrafKori ^»» «ii>n«pi*-al j ma of
tin- *tK->ri: B n. BhH, H«. Cey. I x*. N H * *». Ap. Ar»
A». (Jo. KJ. Ki. M*. Mn, Mp. Nf, Sk.Tn, Up. Wb.

Cyperus lat. ^ — I IIIIJK-O* iuh*p >«»*J« (Umarcfc)
in j«)inAteUmartk|: Pig. 100

Dfffen faun nilMp. W o n M h * * n * a long, creep-
ing n,,,,,r: kmgn • uhm, up u.80 (-1001 s,«
ibc base narrow d b blfck* *M»* * . * * *
blades rarely arching
thr p^InIU mtctfDmtam mm Urgrr. O.S-0.8 mm
kttig,

Milt, damp <>|*n «li»*t«in> and »long (l
e t u u SuhipccJn >««««• i* CMWHWI
n fa iid «>
(k*tf*n uib*p j**fm**t» mx il« Ali I
T*. frnudatm* linn*c»v hi luttbef h%
i arc nrritrtl
[Tera/Hell. AmriMJii Mid *'«» tropics and subtrop-
ics liwt Ap. ki. kr. I >. W*.

Q * n » M o « h . Rct/ii» [C «*.*» Vtehl 1: flf. 101

Rhizomes on, wood*. Oilmt rebu* tufted.
3-ribbed, smooth h. 40-1 SO cm ull. H mm ihk*. U** «
few, sheath* ith* I_kht hnwn ana purpk blades ".* »«
largest 20-40 ... - Umg. 4-fl mm ^) r . « . *
nrrvr* md mVfbu- IMMIJU. i.it
(he kwfjn ona much ovcnoppiof '»»» "1|1,1"
25-30 . in tong, WJ mm v.»ir inOmooeoi •
*n*Ur tf/Qtea Mr

long |KIIIMH li » . t .ll h group >«HI
"In-
ral (0.5-) 2-2.5 cm long, 5-8 m
(10-) 50-80 spikes. ^iiLrLrl* tpiCAIr. MVJt*
oh^mg'lamctib.. HUH km| 0.8-1.5 mm s<ir_
0-1 • l(p(i.u. t.d |>.ilr lmmii to foldrn; rw ttiU |
lent ttrongl |»»»-| «ntij(rH; wing* whiui
» bng-pcnhtcni Clome* ontf. . . . hicuhr,
obovate, (0.9-) . mm Inr.K. | | 3 mm wide, 5- or
7-nerved, light i hrutm w golfrn MIh <ir without purpk
stripes.

i otuncnt m a (bon mm
long u iln mn «tgO) U J" long •• or «llf MI* WvnrT
ilurth, . . . IUIirnrH. |IL"II>*«MV
OS) liIMf
rrtttlUh-iK.niTi, tm.-uli it mminrh

«>d flitf lir*. pnli
Uird iu l-Wlri m Brnfpd. liar C Nn ha*
•iint ii r glases, or ,j||rt mils and Mvlt V
[Tera/Hell. VtiiMMf |MU(i"pAr'I Ban. Ind. Np A*
KI M], K, It. WV



i (#).r^(n«iiJnurt:i:ii.bioc«(»li«.i (2 cm), h part of
mil, (2 cm), c, upper part of spike (2 mm),
d, spikelet (0.5 mm); e, nut (1 mm); f, glume (0.3 mm).

Cyperus latifolius (Rottb.)
C. atrovirens I Ittnacua
Kikenthal: F

Rhizomes creeping, woody, 2-10 in m thick. Culms
erect, 1.5-2 m high in J (il«ii*clv l-«n|*r<l lo
r[2V17Ocm ul). • i . . . w hi dwmc« * . • afanwn
mm below »wr haflonKenn. KUriol irar^ conitiwd lo
»»»» »rtilt- tbOQt; oala lc»vra bladrl^A; towr
kKik. oJJiqurh tnmoic JI >»
lourad alwwr. *UrK puq** <" W*11 W
lm«4urr«l bran* nunvrran |1V-J^), ratl|« equal. < l
II U*q, vrteiff AiM**t from one aiHKhn, Wmffr
or creep-
ground, subdense, 15-30 cwi in diameter; primary culms
monocot, rather equal, • each leaf >«X 4-10 ravtrt*. up
ii. 10en kmg; madink. 1-1.5rm long.
Hwl ni •• 2-20, low • . late-oblong
to «t. . . . flowered, 2-10 mm long, (1-) 1
wide, densely (• IV «i 40flowcTr<t li«ht RT'
l win** IHimw* rnair. * .
*I apou l-S mm l»mg, l 3-1.5 in B «MI
pi»r <rnw ai»d ^M*(r«1 *rtili ru ^ km
i .VofTvri! the twfc kttVil. Stimfm * .



Fig. 1f2. *typ* M nnhmftu *, bu of about 1 tmi. b. in liorrantr. tonmiMi simplified (3 cm); c. spatula (2 mm) d.nm (0.25 mm); e. glume (0.25 mm).

pp ... brwh Snlr nrwty = lung M thr nw, VWfi. Nete ... 0.6-O.y mm long, 0.4-... mm wide, ...

... »i VS wbK culirated a* an anunwrnuJ. I ... **mping and** becoming rwhlhrrt. In «rt ... in «W tm flowing ahaMuwwa' ...

(Hyp/Hel). Tropical *nd •ubcrop«r*1 Africa .ml Arabia mu-twlucred Am* nd Aiwrfk* ...

Oryza ... 1%; 109 ... liiu «{Mi«rh nihrd nr MJlUT*, mnuih, (3-) UJ-fio i.-*» vm tail. *- * (-M mm ihi.k, VwWit, Ir«*c« 3 n S. *) !>«((*» OI Ilnei than thr calm; ihrath* ... *hltAry* IJJI Mf mnkff »«l«lrd. brfliarcmm, up ... in Um<. f-ft « n •4dr. « u M M k. aw«Hh hrlmr. •cahrmn tim*r \mvi/ni*! INMU A-fX. •nnfnd. ihr I IU,lr mil nirniygiin rcr wflmnnin = <|> .. 40 < in ii'm tnflnmrwr wmplr or cwnpumiii. I ifril ... ww> ... m «c>U ... V-i*. UIM^HIII " 3-8 1-18) ... (aim *H^4 ... fitMi' ... i in kintc i«r.imni 4--- ^uifl.r) *rjttmOrika* . . . v ' . * . i* <' »«i ... c. tmrai-aliliiHk. 4-8 (-13) mm long, 1.5-2 mm wide, ...

penwtnt Bantafmi «,hunr« txutdty ohnvaf ... iH'htt ulai, nbtimT. I 1-1.ft mm loo«r, |-IJ> mm wiilr. | or Vnrnerf. vrlVmtih or ten**. »«h Mhttf mrf¹ ... Mfvgfm, tennlfutlBfj « i ttuMt pffn iinui"- hjnIK m»brk*ing «t nutmitv St*o*rtm. f; ... 4|.wiiri48t redd ... (htrd * long a» the nut Nuu Vwkil. rllipaaid lo v>ru'tt- 1-1.9 (-1-5) mm lonc. 0.*->* mm wiatr, Uiiintvtj dtfk

AIIIIUJI OM •omctiar* prrrnnikl midr - ...

Our fish ... Itilnilg thr rTMKIMHrii ii n tourirl in ... nuithr* MV! tin ... raaa, an amtnair and t»rd h ... iH nv*i» II hj« dwtincl ... ainrrly imbrkaung gtumcu. wtlh S or Si w m » l© r«tt/Hd ... *ntl irofwal Bin ... Bui ... Sfi, AT. A*. J> G. G. • Up. IV B Mh. Mn Mp. Ni ... :800 m.

Oryza latipata Linnaeus [*JmntHtt latipata* (Linnaeus) c F\ (Uikr) | p.109 Rhbaract *h<m in long md nvaptog. ...



Fig. 1M. *Oryza* ... b. ... f] mm. d «|umc .O'. m<

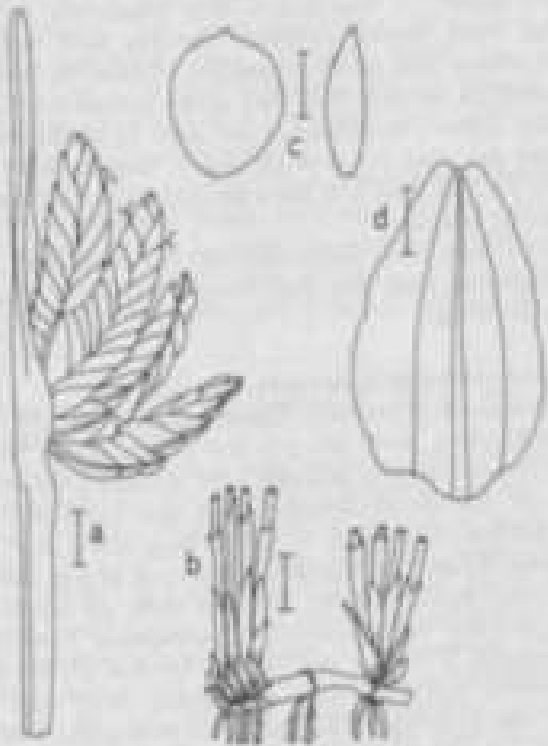


FIG. 104. *Cyperus longipes*: a, inflorescence (2 mm); b, base of plant (1 mm); c, nutlet (0.5 mm); d, glume (0.5 mm).

...sody. Culms close together in rows of 2-4
 ^^ **Secreptofri**.....« (5-) 10-35 (-40) cm
 Ull. (l, w nun **Wide**. WMH.lh. <rrrtc t> J
 flattened d **L e m often reduced**, o Uu-uhv
 grey or purplish i, -, ... M.,rf.* tl... « -"-"
 culm-like, up to 2.5 (-4) cm long, 0.5-2 mm wide.
 involucrel bracts 1 or 2, the longer erect and culm-like.
 V oflo
 overlapping the inflorescence, 1-3 cm long.
 culm pseudolateral, a single cluster of spikelets,
 0.6-1 cm in diameter. Spikelets sessile, 1-12 (-30).
 glumes lanceolate, sometimes curved, 2-10 (-20)
 long, 1.5-5 mm wide, 10- to 30-flowered; rachilla
 straight, 4-5 mm long, 10- to 30-flowered. Glumes
 , **pc**....., Mded,
 , ... rUiptk »
 ron.w12-5!...« U...K.
 , , , **dorb**.....h *..!»'
 •l-v M.l-> 14...h *», -•.l."«B" .MM.
 si.....K U H I, ; -, !, !, . v
 -i i B i..... l--; ; ; ; ViV.
 -i... **Dbrown** « **thbutdw**
puctau with | *
 b-f i
 lobes and tanks, mostly on w
 standing i, brackish water. It often forms

marks. li Js Miiutimt-s confined witfa P/cnwi hrranap
 of ijk 2-defl itjrle and Rattened nut bm die Sal ddV
 Li. <> ilii- I.H MI AW not the .ingle as in *Nyrrus*.

(Ten/Hel). Widespread In warm .md tropical
 us Ban, End: in. Kt, Mp. J'j. Rj.Tu. Up.

*Cyprnu itmgu** Unnacus; Rg< i
 "lit, i mntwfm btu Roioni rtoM and almost
 rhi/oiii(- like, never ending in tubers; c ulm base noi 01
 onl\ sli^luh swollen, **glumettbonei (S-SJ rum long)**;
nuti mann ing, ellipsoid. 1.4-1.6 nun long, o.v-o.ii mm
wide, Mded, brown, al...M stnooh.

[Vrennial In M-asonak Il.xxled areas, wet grassland.
 n\ i and pond margini.

(Hell. Europe, Mediterranean, Africa. Asia minoi
 and w and s in.it,: **Ban, bid, Nep, Pal** hi. ht. **RJ**, l n
 0-700 m.

*Cyperus malacrttui** L....BTCK: Fig 106

Rhizomei ttoud) itoJonifcroiu, clothed v%iti dark
 brown Males, becoming mood] later. Ctalnu usuaD)
 dos<- together, 60-175 cm tall, up to li' (-15) mm
 i k unuoih. with concam ride*. S-an^lecl below to
 3-winged neat .tir Inflorescence, leaves btadeless or

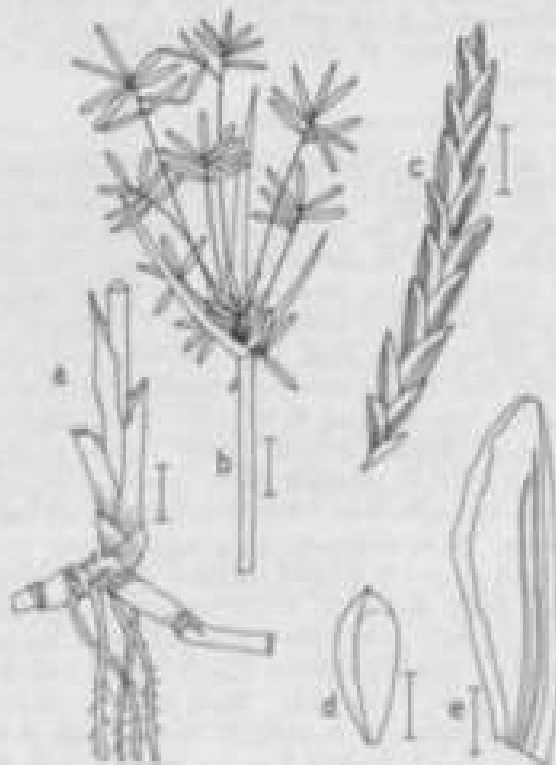


FIG. 105. *Offmm t>np<*: a, whole plant (1 cm); b, base of plant (1 cm); c, nutlet (0.5 mm); d, glume (0.5 mm).



pic IM q kmHt *, 'hwr "' »i»m« (I CW)
 -'r»» wrth ti ail**rnc trcikw <J ifx
 wkriri (X umr iUfi mum): •
 i«i,

... it»li the itf^Mr .. very long (up to 20 cm) (Of):
 h1*W» jbtroi of the uppci <™ ic*thii g halves up
 the iilm, IfUilrt < i tlrctic UHKH* ibrn;
 * HIM* mm * KU lmtJiMTil bmf<>
 the km<i iMifi Ew overlapping the inflorescence,
 L up iu Vi cm 1on(. Inll<Hrw<-' .. *«<).
 ilun Umg. «< 't(r)>t<i; pirnjrv
 ftn long secondary rays
 Spikes broadly ovate; rachis glabrous.
 Spikes 12. in trmuinJ tfttki» h< .. often w . (>
 wH>t cwwii. HilMrTcir. ! 3-50 mm long, 12-18 m<• in
 diameters, 15 to 40-flowered; rachis ..
 very narrowly winged. Glumes ovate to elliptic,
 glabrous, 2-2.7 f» loag 1-1.5 mm wide, inflexed ni>
 5 or 7-nerved; pale .. yellowish margins,
 when dry .. (Mdk tkiu>rd
 wo tbr bw&K witnr<T— 5 Mrt>
 ^HMHIA^V ttrM^rirffa^L w^tfhfc i MP M A fciH ^t loss
 on the style. Nuts
 2-sided, narrowly oblong, slightly flattened dorsally,
 hirtle .. mm long, 1.5 mm wide, dark
 brown Li) M.H. Koch.

Pmnnul. In *«i pUr> ami seasonally flooded
 are (>, rivrr hunt*, roadtidr (thrllW <») nw**
 sJiH>U* amt often jtninitji . Often in low kllh
 conditions im mud (Uu wtl uJndv »b»>><» nwrred m
 urin. T>f .. are used in medicine. ihr
 citlnu ur tued for M i M tupt .. baskets, hats, d'p
 pcf^ .. in J«^ it i» turd w nuke special K-M" !!
 catching fish fry.
 [Hyp/Ten/Hcl] .. straggles through India
 to MaUvm t«^ . feui, Iml, K«p, PA i .. Ki. Mh.
 Wb. 9-780 m.

Mn* mniMtii kukrnkK Iw. 107
 Rhizomes root-like. Culms swollen 41 the base,
 culms, erect, 4-20 cm tall, 0.4-1 mm thick, 3-sided,
 glabrous or slightly scabrid. Leaf sheaths grey to light
 brown, the sides disintegrating. .. blackish fibrous
 blades flat or undulid, 5-12 cm long, 0.5-2 mm wide.
 .. Intercalary bracts leaf-like.
 1.4-JO cm kM^ /-A mm »i«. *II «iw ..
 the i .. inflorescence. Inflorescence a brownish
 congest .. 1,0 2-2 cm in diameter ltrad 0
 15-60, white
 spikelets. Spikelets flattened, linear, 4-10 unit
 long. 1-2 mm HMU < i, 2.5 mm ,MU• Miitt ulnir* i p < *
 ing). light to >Utk bra .. 15- to 30-flowered. Glumes



FIG. 197. *Oryza umbellata*: a, base of shoot (2 mm);
 b, inflorescence (1 cm); c, inflorescence (2 mm); d, spikelet
 (1 mm); e, glume (1 mm); f, glume (1 mm); g, glume (1 mm); h, glume (1 mm); i, glume (1 mm); j, glume (1 mm); k, glume (1 mm); l, glume (1 mm); m, glume (1 mm); n, glume (1 mm); o, glume (1 mm); p, glume (1 mm); q, glume (1 mm); r, glume (1 mm); s, glume (1 mm); t, glume (1 mm); u, glume (1 mm); v, glume (1 mm); w, glume (1 mm); x, glume (1 mm); y, glume (1 mm); z, glume (1 mm); aa, glume (1 mm); ab, glume (1 mm); ac, glume (1 mm); ad, glume (1 mm); ae, glume (1 mm); af, glume (1 mm); ag, glume (1 mm); ah, glume (1 mm); ai, glume (1 mm); aj, glume (1 mm); ak, glume (1 mm); al, glume (1 mm); am, glume (1 mm); an, glume (1 mm); ao, glume (1 mm); ap, glume (1 mm); aq, glume (1 mm); ar, glume (1 mm); as, glume (1 mm); at, glume (1 mm); au, glume (1 mm); av, glume (1 mm); aw, glume (1 mm); ax, glume (1 mm); ay, glume (1 mm); az, glume (1 mm); ba, glume (1 mm); bb, glume (1 mm); bc, glume (1 mm); bd, glume (1 mm); be, glume (1 mm); bf, glume (1 mm); bg, glume (1 mm); bh, glume (1 mm); bi, glume (1 mm); bj, glume (1 mm); bk, glume (1 mm); bl, glume (1 mm); bm, glume (1 mm); bn, glume (1 mm); bo, glume (1 mm); bp, glume (1 mm); bq, glume (1 mm); br, glume (1 mm); bs, glume (1 mm); bt, glume (1 mm); bu, glume (1 mm); bv, glume (1 mm); bw, glume (1 mm); bx, glume (1 mm); by, glume (1 mm); bz, glume (1 mm); ca, glume (1 mm); cb, glume (1 mm); cc, glume (1 mm); cd, glume (1 mm); ce, glume (1 mm); cf, glume (1 mm); cg, glume (1 mm); ch, glume (1 mm); ci, glume (1 mm); cj, glume (1 mm); ck, glume (1 mm); cl, glume (1 mm); cm, glume (1 mm); cn, glume (1 mm); co, glume (1 mm); cp, glume (1 mm); cq, glume (1 mm); cr, glume (1 mm); cs, glume (1 mm); ct, glume (1 mm); cu, glume (1 mm); cv, glume (1 mm); cw, glume (1 mm); cx, glume (1 mm); cy, glume (1 mm); cz, glume (1 mm); da, glume (1 mm); db, glume (1 mm); dc, glume (1 mm); dd, glume (1 mm); de, glume (1 mm); df, glume (1 mm); dg, glume (1 mm); dh, glume (1 mm); di, glume (1 mm); dj, glume (1 mm); dk, glume (1 mm); dl, glume (1 mm); dm, glume (1 mm); dn, glume (1 mm); do, glume (1 mm); dp, glume (1 mm); dq, glume (1 mm); dr, glume (1 mm); ds, glume (1 mm); dt, glume (1 mm); du, glume (1 mm); dv, glume (1 mm); dw, glume (1 mm); dx, glume (1 mm); dy, glume (1 mm); dz, glume (1 mm); ea, glume (1 mm); eb, glume (1 mm); ec, glume (1 mm); ed, glume (1 mm); ee, glume (1 mm); ef, glume (1 mm); eg, glume (1 mm); eh, glume (1 mm); ei, glume (1 mm); ej, glume (1 mm); ek, glume (1 mm); el, glume (1 mm); em, glume (1 mm); en, glume (1 mm); eo, glume (1 mm); ep, glume (1 mm); eq, glume (1 mm); er, glume (1 mm); es, glume (1 mm); et, glume (1 mm); eu, glume (1 mm); ev, glume (1 mm); ew, glume (1 mm); ex, glume (1 mm); ey, glume (1 mm); ez, glume (1 mm); fa, glume (1 mm); fb, glume (1 mm); fc, glume (1 mm); fd, glume (1 mm); fe, glume (1 mm); ff, glume (1 mm); fg, glume (1 mm); fh, glume (1 mm); fi, glume (1 mm); fj, glume (1 mm); fk, glume (1 mm); fl, glume (1 mm); fm, glume (1 mm); fn, glume (1 mm); fo, glume (1 mm); fp, glume (1 mm); fq, glume (1 mm); fr, glume (1 mm); fs, glume (1 mm); ft, glume (1 mm); fu, glume (1 mm); fv, glume (1 mm); fw, glume (1 mm); fx, glume (1 mm); fy, glume (1 mm); fz, glume (1 mm); ga, glume (1 mm); gb, glume (1 mm); gc, glume (1 mm); gd, glume (1 mm); ge, glume (1 mm); gf, glume (1 mm); gg, glume (1 mm); gh, glume (1 mm); gi, glume (1 mm); gj, glume (1 mm); gk, glume (1 mm); gl, glume (1 mm); gm, glume (1 mm); gn, glume (1 mm); go, glume (1 mm); gp, glume (1 mm); gq, glume (1 mm); gr, glume (1 mm); gs, glume (1 mm); gt, glume (1 mm); gu, glume (1 mm); gv, glume (1 mm); gw, glume (1 mm); gx, glume (1 mm); gy, glume (1 mm); gz, glume (1 mm); ha, glume (1 mm); hb, glume (1 mm); hc, glume (1 mm); hd, glume (1 mm); he, glume (1 mm); hf, glume (1 mm); hg, glume (1 mm); hh, glume (1 mm); hi, glume (1 mm); hj, glume (1 mm); hk, glume (1 mm); hl, glume (1 mm); hm, glume (1 mm); hn, glume (1 mm); ho, glume (1 mm); hp, glume (1 mm); hq, glume (1 mm); hr, glume (1 mm); hs, glume (1 mm); ht, glume (1 mm); hu, glume (1 mm); hv, glume (1 mm); hw, glume (1 mm); hx, glume (1 mm); hy, glume (1 mm); hz, glume (1 mm); ia, glume (1 mm); ib, glume (1 mm); ic, glume (1 mm); id, glume (1 mm); ie, glume (1 mm); if, glume (1 mm); ig, glume (1 mm); ih, glume (1 mm); ii, glume (1 mm); ij, glume (1 mm); ik, glume (1 mm); il, glume (1 mm); im, glume (1 mm); in, glume (1 mm); io, glume (1 mm); ip, glume (1 mm); iq, glume (1 mm); ir, glume (1 mm); is, glume (1 mm); it, glume (1 mm); iu, glume (1 mm); iv, glume (1 mm); iw, glume (1 mm); ix, glume (1 mm); iy, glume (1 mm); iz, glume (1 mm); ja, glume (1 mm); jb, glume (1 mm); jc, glume (1 mm); jd, glume (1 mm); je, glume (1 mm); jf, glume (1 mm); jg, glume (1 mm); jh, glume (1 mm); ji, glume (1 mm); jj, glume (1 mm); jk, glume (1 mm); jl, glume (1 mm); jm, glume (1 mm); jn, glume (1 mm); jo, glume (1 mm); jp, glume (1 mm); jq, glume (1 mm); jr, glume (1 mm); js, glume (1 mm); jt, glume (1 mm); ju, glume (1 mm); jv, glume (1 mm); jw, glume (1 mm); jx, glume (1 mm); jy, glume (1 mm); 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ql, glume (1 mm); qm, glume (1 mm); qn, glume (1 mm); qo, glume (1 mm); qp, glume (1 mm); qq, glume (1 mm); qr, glume (1 mm); qs, glume (1 mm); qt, glume (1 mm); qu, glume (1 mm); qv, glume (1 mm); qw, glume (1 mm); qx, glume (1 mm); qy, glume (1 mm); qz, glume (1 mm); ra, glume (1 mm); rb, glume (1 mm); rc, glume (1 mm); rd, glume (1 mm); re, glume (1 mm); rf, glume (1 mm); rg, glume (1 mm); rh, glume (1 mm); ri, glume (1 mm); rj, glume (1 mm); rk, glume (1 mm); rl, glume (1 mm); rm, glume (1 mm); rn, glume (1 mm); ro, glume (1 mm); rp, glume (1 mm); rq, glume (1 mm); rr, glume (1 mm); rs, glume (1 mm); rt, glume (1 mm); ru, glume (1 mm); rv, glume (1 mm); rw, glume (1 mm); rx, glume (1 mm); ry, glume (1 mm); rz, glume (1 mm); sa, glume (1 mm); sb, glume (1 mm); sc, glume (1 mm); sd, glume (1 mm); se, glume (1 mm); sf, glume (1 mm); sg, glume (1 mm); sh, glume (1 mm); si, glume (1 mm); sj, glume (1 mm); sk, glume (1 mm); sl, glume (1 mm); sm, glume (1 mm); sn, glume (1 mm); so, glume (1 mm); sp, glume (1 mm); sq, glume (1 mm); sr, glume (1 mm); ss, glume (1 mm); st, glume (1 mm); su, glume (1 mm); sv, glume (1 mm); sw, glume (1 mm); sx, glume (1 mm); sy, glume (1 mm); sz, glume (1 mm); ta, glume (1 mm); tb, glume (1 mm); tc, glume (1 mm); td, glume (1 mm); te, glume (1 mm); tf, glume (1 mm); tg, glume (1 mm); th, glume (1 mm); ti, glume (1 mm); tj, glume (1 mm); tk, glume (1 mm); tl, glume (1 mm); tm, glume (1 mm); tn, glume (1 mm); to, glume (1 mm); tp, glume (1 mm); tq, glume (1 mm); tr, glume (1 mm); ts, glume (1 mm); tt, glume (1 mm); tu, glume (1 mm); tv, glume (1 mm); tw, glume (1 mm); tx, glume (1 mm); ty, glume (1 mm); tz, glume (1 mm); ua, glume (1 mm); ub, glume (1 mm); uc, glume (1 mm); ud, glume (1 mm); ue, glume (1 mm); uf, glume (1 mm); ug, glume (1 mm); uh, glume (1 mm); ui, glume (1 mm); uj, glume (1 mm); uk, glume (1 mm); ul, glume (1 mm); um, glume (1 mm); un, glume (1 mm); uo, glume (1 mm); up, glume (1 mm); uq, glume (1 mm); ur, glume (1 mm); us, glume (1 mm); ut, glume (1 mm); uu, glume (1 mm); uv, glume (1 mm); uw, glume (1 mm); ux, glume (1 mm); uy, glume (1 mm); uz, glume (1 mm); va, glume (1 mm); vb, glume (1 mm); vc, glume (1 mm); vd, glume (1 mm); ve, glume (1 mm); vf, glume (1 mm); vg, glume (1 mm); vh, glume (1 mm); vi, glume (1 mm); vj, glume (1 mm); vk, glume (1 mm); vl, glume (1 mm); vm, glume (1 mm); vn, glume (1 mm); vo, glume (1 mm); vp, glume (1 mm); vq, glume (1 mm); vr, glume (1 mm); vs, glume (1 mm); vt, glume (1 mm); vu, glume (1 mm); vv, glume (1 mm); vw, glume (1 mm); vx, glume (1 mm); vy, glume (1 mm); vz, glume (1 mm); wa, glume (1 mm); wb, glume (1 mm); wc, glume (1 mm); wd, glume (1 mm); we, glume (1 mm); wf, glume (1 mm); wg, glume (1 mm); wh, glume (1 mm); wi, glume (1 mm); wj, glume (1 mm); wk, glume (1 mm); wl, glume (1 mm); wm, glume (1 mm); wn, glume (1 mm); wo, glume (1 mm); wp, glume (1 mm); wq, glume (1 mm); wr, glume (1 mm); ws, glume (1 mm); wt, glume (1 mm); wu, glume (1 mm); wv, glume (1 mm); ww, glume (1 mm); wx, glume (1 mm); wy, glume (1 mm); wz, glume (1 mm); xa, glume (1 mm); xb, glume (1 mm); xc, glume (1 mm); xd, glume (1 mm); xe, glume (1 mm); xf, glume (1 mm); xg, glume (1 mm); xh, glume (1 mm); xi, glume (1 mm); xj, glume (1 mm); xk, glume (1 mm); xl, glume (1 mm); xm, glume (1 mm); xn, glume (1 mm); xo, glume (1 mm); xp, glume (1 mm); xq, glume (1 mm); xr, glume (1 mm); xs, glume (1 mm); xt, glume (1 mm); xu, glume (1 mm); xv, glume (1 mm); xw, glume (1 mm); xx, glume (1 mm); xy, glume (1 mm); xz, glume (1 mm); ya, glume (1 mm); yb, glume (1 mm); yc, glume (1 mm); yd, glume (1 mm); ye, glume (1 mm); yf, glume (1 mm); yg, glume (1 mm); yh, glume (1 mm); yi, glume (1 mm); yj, glume (1 mm); yk, glume (1 mm); yl, glume (1 mm); ym, glume (1 mm); yn, glume (1 mm); yo, glume (1 mm); yp, glume (1 mm); yq, glume (1 mm); yr, glume (1 mm); ys, glume (1 mm); yt, glume (1 mm); yu, glume (1 mm); yv, glume (1 mm); yw, glume (1 mm); yx, glume (1 mm); yy, glume (1 mm); yz, glume (1 mm); za, glume (1 mm); zb, glume (1 mm); zc, glume (1 mm); zd, glume (1 mm); ze, glume (1 mm); zf, glume (1 mm); zg, glume (1 mm); zh, glume (1 mm); zi, glume (1 mm); zj, glume (1 mm); zk, glume (1 mm); zl, glume (1 mm); zm, glume (1 mm); zn, glume (1 mm); zo, glume (1 mm); zp, glume (1 mm); zq, glume (1 mm); zr, glume (1 mm); zs, glume (1 mm); zt, glume (1 mm); zu, glume (1 mm); zv, glume (1 mm); zw, glume (1 mm); zx, glume (1 mm); zy, glume (1 mm); zz, glume (1 mm);

LS-1.; -nn, long, ± OS mm -id*. n-dd.U-
bn».....ked pd* Vnmclrn.lmr.

unbn.....«J« KHI; «*»n

wide, gryc, DUniid) |^{III}.....

Jim**

seasonally flow...
Superficially like *C. pubifolia* but it has brownish (not
whitish) h»d* *nd p...
[(O)*T«i/HHT India
1-200 m.

Cyperus distans Vahl IV. ...
Thwaites). Fig. ioe

Rhizomes corn-like, very short. Culms solitary or
few. 3-1,1,1.....ng
sheath. Leaves few, short, purplish, pale green
* « r. i«MO cm bta.IT.
W-M OB
prn <

T

compound, primary rays up to 30 cm long, ...
very unequal, up to 30 cm long, ...
bearing

almost ^«.,lr, iurr<m. ^{to}(V.^{III}J5.)

spikelets
long, 5-10 mm wide, ...
rachis smooth. Spikelets arranged in spikes, ...
linear-oblong, 6-15 mm long, 1-1.5 mm wide, 8- to
14-flowered, light brown; rachilla slightly flexuous,
perianth, winged; wings whitish, ...
achilles, oblong, obtuse, 2-2.5 mm long, 2.1 mm wide,
3- to 7-nerved, brown to yellow-brown, ...
up to 0.5 mm long, keel grayish-green,
margin of the upper half, white broad and ...

p

Smrnru* S. Nut. >N'.

Perennial. Swamps, wet rice fields, margin of pools,
river banks and seasonally wet habitats.
(In, It'll rrupkall.
v. lad. I*
Tn, Tn, Up, Wn, 1-2000 m.

Cyperus distans (Kuntz) ...
Kunib. C £

Like *C. distans* var. *distans* but inflorescence few com-
pound; primary rays suberect, the secondary rays



MW * («* : * .Inllom. «ttr <1 ,
b. «plMet<latiM - wn. ««f.A—*nc.iiiOoi.

often dotbad in ip* <-U-t> *iii«.i to the but: spikes
denMTi 4-Wi«i. KHIK ...
(4 10 Bowed); Rluntr* k« irtnow. divitxih
nracrowur; nwicro 6JML5«v tangj mm obemUI
1.1-1.5 mm VMIH,

Perennial. In (M nrjr |HH>W. mrjim, v*Ull<l« A>d hi
xidri! i m t Thr Invr* md i ubw <
[WWWd I' uwct Ho w h «>n.
ni/n1 Asvd'iMiiut <>
1 ropitxl .iktrl Hibtj<|H< .il Ohi World ^ml
An tnd. N«T>; Ap, A*, Co, Jl. D, K.
Mb. Mp, Nf. Rj. Si. Tn, Up

Cyperus distans kiikt-mh.il fig. 109
likr f- ...
tiumMil lrrrl. \\n/n tm 4< u- (wttil
t|Hbrlri- ...
ApfK-mUgr 1 half *» i«»»n u ibr anih>
>l>|<xt^l lip«*fl. M ^ m x; ; i H m r a mdr
Priciinii.1 In fwmp* and bof^ tootr
dealing w^ridi« HI



Opuntia polyacantha (Hill) Merr. (4. Hillomrak* 0 cm), h. *spikelets* *iltnm*>; «*small spike* (3 mm); c, *ovary and stamen* (3/3 mm).

Hn *prntr* and * *ami* £ «nd SE Aatt. *profaaMr* introduced in Japan; *Ban.* In *Up.*

Opuntia polyacantha **Kik**(In>H [C *tffUum* RnnhniRtl. *C. setacea* Nées) **Fig 10**

Rhizomes *clnumhrnl*, *VH mm tlml* (*utmi* [*only* *ted* <* *arranged ii* *a row* *ilongnv* *rhizome*, *iiih* *erect*, 50-150 (- *IXIJ i m uli*. *t-T mm ihkh*. *n411*. *flat* *above*, *the sides flat or convex*, *light Ktrrn*, «>< *th*. *Leaves* *UUMIU* *l> tliu* «> *tn MMWITW* **J>CJL* *sheaths* *M<lr-liir brio**, *ihc upprmoM 10>3>im kittv* *cuta-* *min-co* *Sinned* • *par* *uh* <K *Tir* *blades rarely* *pfr*rnt*. «< • *up ID II** *m lonf* **d* & *mm wtdr* *imulv* *ixt brut*) *V'l*. *unnj>i* *overlapping* *the* *inflorescence*, *the l-1.17* *cm luftg* *Inflores-* *cence compound*, *rac*; *ray* 4-12, *up to 16 cm long*. *Spikes up to* . *i * fit* *l<mu an^i>;* *d in coram* *l**. »*th* *2-14*. *Spikes* *obliquely erect* *spikelets* *Spikelets* *spiral*; *linear*, *laterally flattened*, *10-* *30 mm long*, *1-2* '*« ****lr*. «*nm-tuJ*> *red* *with hi* *reddish tinge*, *10-* *2** *Wfc m i i t twl w l l a llrxuinw*, *persistent*, *waggl*, *persistent*; *Gloves* *f^*wHiBniin 1* *2.2-3* *> mm InAff*. *reticulate*, *miwtw^W'* *at tip*, *sides* *reticulate* *or* *striped*. • *MMMM— Ui W41 WWU mil* *narrow* *hyaline* *m** *gins*, *level* *'nrnd*, *frern*. *rmtinv brim* *the*

• *l''* *s*. *Stamens* 3. *Style* ± *1mm lung*, *V>kd* *Styl* *long*. *Touil*(*lr<i to api* *ulate*, *stam-colum* *l<Ml* (*nj*(*t>n* *n* *<i^ik tiruMti*. *Perennial*. *V.M i>U.c**. *nunV* *river banks*, *lirJt*, *brd%*. «*found standing in water*, *hrilin ui i''* *fields*. *lhc athm Mr my iif*,h>e *ml* *can withstand* *strong* *Qoodi h towddy uard* ('< *in.*viofid<* ******* *sometimes cultivated in India*. In *...* *MMitt it ** ^llc<* *'pangora'*. *Il dtffen* [*ram C IHMJMU in* • *wing* • *hort*. *thick ihuofix-* *and* *ovary* *oblong-elliptic* *in*. *(Hyp/Ten)*. *Endemic to the Indian subcontinent*, *i lilt*, *cultivated in Mauritius and Sulawesi*. • *Ban.* • *Bat.* • *Cre.* • *Ind.* • *Nep.* • *Pak. As.* **HI.** *ji* **KJ** **Kr** **Mf.** **Mh.** **Ms.** **Sj.** **Gr.** **Rj.** **Sk.** **Ta.** **Up.** **Wa** 5-15 **O** *in*.

Opuntia polyacantha **Linnaeus** **Fig. 111**
Rhizomes *erect* *if*. *Vb tiw thKk*. «*Wn>fU* *covered* *tw!M0tmt0**<<nd** *side blackish scales*. *Gloves* *erect*. *(1-)* *2-* *• mull* *5-sided* *with* *t* *angled angles*, *green*. *Leaves* *blackish* *on* *culm*; *sheath* *blackish* *or* *red*. *Spikes* *erect* *short* *wih traf bladri ity 10 H miu widr*. *Jn^llt><'>^ ^M** *up* *10 12*, *HUH li *h*wirt than tin: rnfktr** *erect*, *5-10 cm*

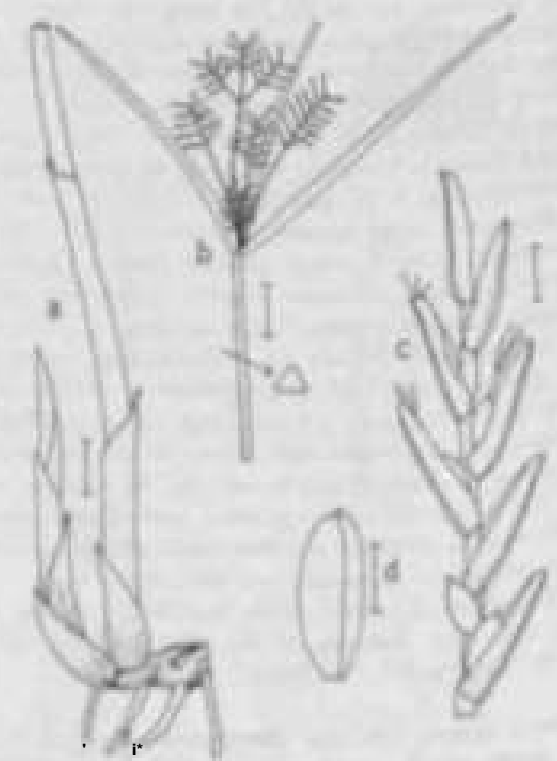


FIG. 111. *Opuntia polyacantha* a, *base of* **UHKH 11** *cm*; *h |u' l* *inflorescence* (3 cm) *with transverse section of culm* (center); *c*, *apical part of spikelet* (1 mm); *d*, *seed* (3/3 mm).

Cyperus pilosa Vahl | *C. pmtwlnim* n Don. < *dominans*
V | <-tiili, C *obliquus* Nectt, C WBftadfai
Fig, Hi

Rhizome* wolonifcrou*. * ulitis UMMIK *solitaria* y
25-35 (-ISO) an Mil. l 8 nun tfakk, *m* *uniflora* 3-angled,
smooth in tcuhriH. l rj* n lomrwtMI ibafin tlun or
longer than ihr nilca < ihl VJHHI^ . |M»r ^irrn to
bract i i purpHth; blada dm *uniflora* below, flat
towards ihr up. l r.<i)nix gndtlIUy acuminate,
7-11 (-!)> mm wide, *uniflora* ibrid tommfa lip. Involucral
bracts 3-5, *nirifn.i*]. 114 luwei *aata* for overlapping
llu- |, iMcit. <i in • up to M .11' 1*Hl< Involu- vii *uniflora*
rimpk > i compi. l. bote w Mibdcmr; primary *uniflora*
V7, \ti> nncqual, ft-13 (-20) i m l"»u iponrh *uniflora*
in riahfotti; M'i<mtiiv l.l> vhen pratent WTJ thon.
Spkca *uniflora*. vttni.il, nbdn *uniflora* cw i"r_K l-J cm
U . tin rachb decwriy UnoK with ycUowbrowu
sh- , i it. ins Spikcleti ">-'" in iiMinin.il >f>ikr<, lin<w-
LnuiiiUir >> Hliptiral-oblrtUK, B-fO mm long,
1.5-Snttn wWe, S to -> (->0j-n<nwif< *uniflora*
<<>>Mrd uid lin^ctI *i ih tnl l>1*11; i Jt hillj Krdighl,
lililiilll. n< >iun<<l f.limif* OffM 10 L....
lilitiuhl WW i aCtttt With UHUIV mm iiH)iiUir RpCKi
LS-2.5 mm lonj; mm WMIC. & or 7-n<Mrd. ptk-

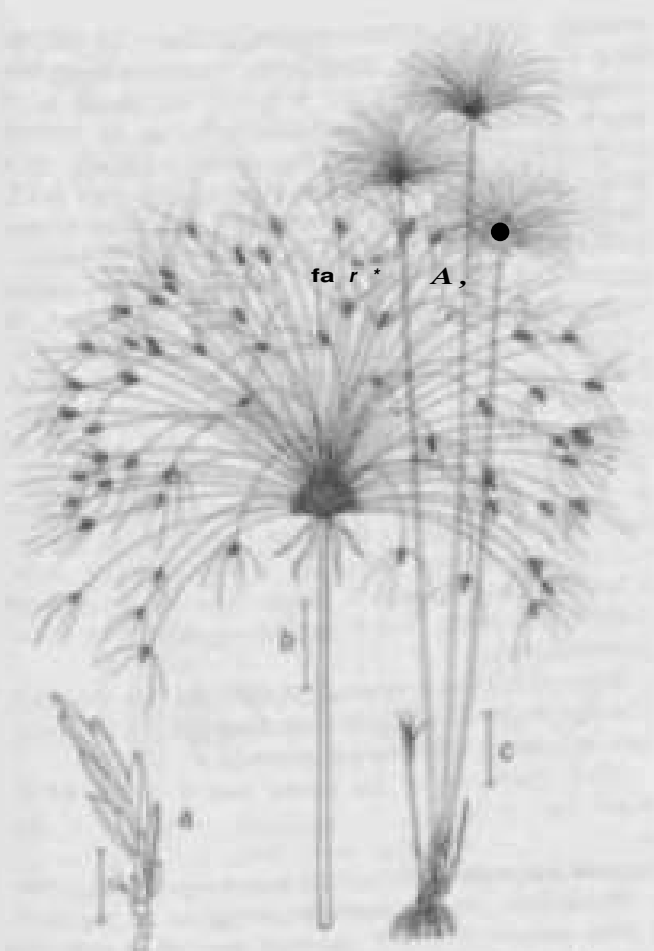


Fig. m. ^ *uniflora*, distal part of spikelet (2 mm);
A, whole plant (20 cm).

long, 1-3 cm wide, light brown, ... green, lili...
Others l. M.l.*l<IK. .>1"l
subequal rays m ,) (-80) cm long; secondary
rays ; . cm l.Mlx. Spiko critodrtcal M j j
piL feu Spiwl
t-12 mm l<H "



Pir> 111. *Cyperus pilosa* * , pan of mflonrw *uniflora* (2 cm);
A, spikelets and rachis (1 cm); B, *uniflora* (0.5 mm).

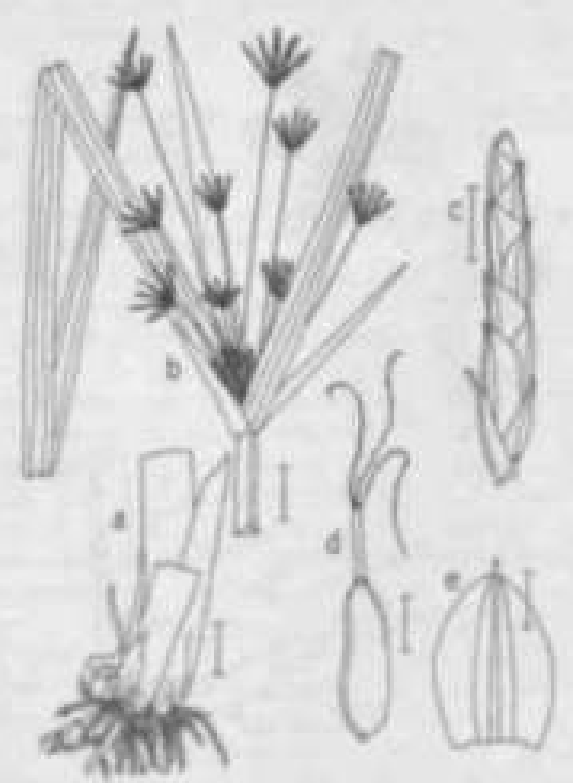
Illirt ilit XII art *n<l tinged or fletlrd with rddith-
 ban»n. di<tii<i> lnd it *>ih *.'*' midrib, with
 vfeil ab lratine in>KMi* ifMildt (tii up s amms
 5. 5f>k* uihet than, S*' r. Na^ Vwdnl <>h. moid to
 c llipiuid, uipiutr. nunuirh jfp<iilL>ir. 1-15 m>n long,
 i),>*>* mm wide, iUrK U. <.ll.

IVf riinul SruutulK Huoded plat ci, M-l jprtoltlta.
 nir hckll and Atnv. Like l, ^nani bui the m lin
 den ch lu uu wtb iclknrbnM*n »ln>ri hiiiv ntuuw*
 * lilc U Jp*\ without s hfumi hwllur iuii^m at ihr
 apex. Ji^iiti (h i

Ilam/Iloll. Old W. kt trafick tUn, Win. Bur. Off,
 Ind, Nep, An. Ar. U » Hi. HtfJI M Ki,Mg. 'Mh.
 Ua Mp N| 'i K| ^ i s. Up. W. u.ft-istn. m.

Cyperus platyphylus Brown t< S<tnillrt [*Papyrus latifolius*
 Um M'UklriHM. C ttdwt** (Nees) Fig. 113

Rhtzuma up to ft im kmft. V 3 cm thick. <Mtqurh
 MCcmJitig (uhn* rotMiw 70-240 cm Ull. 7-t3 mm
 thick. >vdrit brkm, ituiplv 5-MIJ(l< l with concave
 licks jfc<Ar. M jtm^Mik on ihc jnn\r* Is A* up to 'W »
 third* <* long M ihr tuhn. ihratlu unnt< < kMi> red,
 blades plk<ie tlilr >n iivrrnl TH in tranwrrw



flU. 113. *Cyperus platyphylus*: a, base of shoot (2 cm);
 b, inflorescence (2 cm); c, spikelet (1 mm); d, seed (0.5 mm);
 e, glume (0.5 mm).

section) 1.5-2 cm diam. Culm 30-140 cm
 1-3. 10-30 mm. Culm sheath along the

margins. In\oluii*I brvrlt 4-6. ihr mwo lo*w *****
 mwh (wtTopp. g the inflorescence, up to UWf<w
 l..!> »~* SO mm *WJV IT inflorescences usually of 1
 single spike and up to 12 stalked spikes; r

spreading. unequal, up u> » rm \a Spikes linear-
 cylindrical, set... wing digitate secondary
 crystals, 3-6 cm long, 2-5 mm in diameter, rather
 loose, yellowish-brown. Spikelets sessile, erect to
 suberect. • or a bly spreading, suberect, linear,
 5-8 mm long, 1-1.8 mm in diameter, 8 to 14-flowered,
 rachilla oral ly flattened, with cartilage wings.
 Glumes obtu* • elliptical, 1.8-2 mm m Uff 1-1.3 mm
 wide, incised margins, suberect at mucronate apex.

with green; sides nerveless.
 colored tinged with gold or brown. Stamens 3, com-
 5- (It J-nrrr><|; HIM;
 1.7-2 mm long; stigma 3, l(OfH H<n ih**;
 OK. ovoid, ellipsoid, 1, I-M wn king. 10.5 mm
 |(<r- sub-brown.
 Perianth • l KNMHI tn nunln pl* « ai k* *|< mid-
 ch form dig

late secondary c... rmltt ii iti^pMMik
 illrl| VmW-itn. |D Mi Lanka and S t><'. *Cry.
 • I. A, Tn.

Cyperus platyphylus E. Brown [*C. latifolius* Nees; i
 ki].

shoots either very short or up to 10 cm long.
 Culm 30-140 cm high, 1 or 2 or 3 together, smooth or scabrous.
 Culm sheath ve angles towards the tip, 30-60 (-120) cm
 3-5 (-6) mm i> thick. Leaves 1. km* - 2 or longer than
 the culm sheath, bladeless below, strong, keeled.
 lwov.ii.th ID pmyr. Blades Ou ur slightly plicately-
 serrate, involute, leathery, gradually acuminate.
 5-12 (-20) mm wide, prostrate or glaucous above,
 margins and midrib very scabrous (v... involute
 bracts 4-tXL unnfual khf kw<rt <n*r. overlapping the
 inflorescence, up to 30 c...
 secondary compression... involute; often

with *rr> « H H ti » v*Ulr<<; mim*n « « 10 . . 7,
 widely spreading, often slightly upcurved, 5,
 long, secondary rays spreading, up to 4 cm long; ter-
 tiary rays when present very short. Spikelets digitately
 arranged in clusters of 2-4, widely spreading, sessile to
 linear-lanceolate, flattened, 3-20 mm long, 2.5-5 mm
 wide, densely 15- 60-flowered, straw-colored and
 •ulneitl with ni*i> ttttmi. rachilla straight, persistent,
 ... closely appressed to
 rachilla, sessile to broadly sessile, obtuse, mucronate,
 2-2.7 . mm long, 1.5-2 mm wide. l ihr ta^h r^1.4**1
 strongly Vftrrwd; lhc sides nerveless, or
 base, yellowish or brownish with narrow, whitish bracte

l ihr ta^h r^1.4**1
 strongly Vftrrwd; lhc
 sides nerveless, or
 base, yellowish or brownish with narrow, whitish bracte



FIG. 114. *Cyperus platyoides*: a, base of shoot (1 cm); b, schematic illustration of an inflorescence (1 cm) with transverse section of the culm (lower); c, part of inflorescence -1 (in), <l. M>, f. rm. n

Margins: Stamens 3; **•aetfw append**1** briefly dMMicr ih*» 'l>.

taunted, «tl -old. 1.7*4 mm Inn* M-1 mm •irirt Urinhv p whin

Perennial. Grows in shallow water or in main of vegetation with plants such as *Panicum* and being bags and wet rice fields. Usually gregarious and forms large colonies.

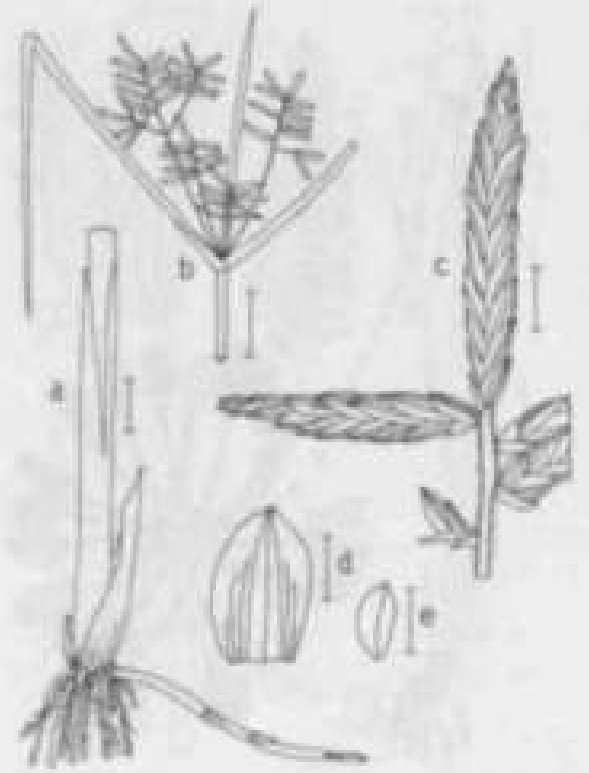
llh> fir! I U, v<.A*.KI.Mr K, l.. lp.W>.

C. *no prostratus* Barthol I <l. *variosus* Heyne ex Nees; Fig. 115

50-125 (-175) cm tall, 4-7 l- smooth. Leaves some the culms sheaths spongy, greyish-brown to purp- blades channelled below, flat towards the tip, spongy

1.1 leathery, gradually acuminate. 7-9 f—IS) mm wide, Si id (uwwfa dp [MMIIHJJI bracti 8 nr -l. MMqtMd, thr lhw> i orin t,n (wertoppbtg tin* ioflomrenci, 20*'fo (-70) im lung. Infarctti tuple en Compound, 'tatiwely »raall; primary rayi ltaeqUBL 6-12 (-20) <m UHIK. *)»aricH v i)«t«! tQ Rbtrtou*; in 1)« lary ruy whicu ptWGIII very sh. Ofi Spikri1 it.>: <lh irtld, loOtT, 2-1 1 111 1''' q; nachis w.-ilk hiKpid or KabmB *." <hr winn* Spikrkts 4-10 (-1) in Irnnmat ipikr-v »r ll-4 in Lateral ipikes, (lie Invti-1 one* ± JI l'tjhi angfa td ihr l;H bit, 'tiiifjnv; 1-3 6 im long. 10 10 u* 11.w* nil pale nMt Hngrd wnti red-brown, ca; ill.1 itnifilil pccin-in 11....r hardly winged. Chusei cwtr *» rlliptu. obma L" J-4 nun long. 2 i,£ (-^ (mm wtdr. V nr T-ncrttrd. rrdckb-iirif*«'ii. MinMiih. h.inJii kededi wii> i)«».ni hyaline margins io>v.irrk ill*" i>i' Buuuciu h ccamecUwc appendage red. Salm 4* loim .is ilkr nuu. |H lrlri Nut* Salded. iKiroid trn HliptoM. HIXMMII. MipUtte, minutrtv apir ubtff. t—13 inrn lofjgi O.ft^O.I. ...1 WH|<.)il it Inh-lwiiwn

Prrrttliul. In Hv>jjup* [fwfuvrc*. poolk, net ric* firhii .ui' 111 H.ix'ii.ilk IIOIKII



vk. 119. f 7^»m fmmmi «. hue <4 JMHU (1 cm) & inflorescence (2 cm); c, leaf (2 cm); d, glume (03 nun); *. nui (Q 4 mm)

... are wrtum - . tolk«<rd rheit iifilir ami tun; umiic i • i* int.

fIVn Mf1| Tropical OW World and N Atttfnlb Ban Bll, Coy. nt A*. M Ki. Mp». In. Wb. low fettudes

Cyperus pulchellus R Hrrmn [*Nematolys* *tyllagoides* Scribd] KR 110

Mill II ^— * * * . (* • Culim xvlttarv or loo*rh tufted, MM illni 4t bur ami wmctiine* apparrag rhuamHtkr, 5-5) cm taL Hv|..) mm *wW. irirtt tQ VwW. glsbroua or *%hih Brabrkt Leaf tfaeulu up k 1 cm long, gr> en to l <t rrrdduMwum, tIK o|lr^t tb< ... bladfi Hat Oi V-thzpnl 2-25 • • kmg. 03-2.A mm wide, jp-iiduui* niTowed to J>l • ... U-JI like, ... f'ad, deflexed or spreading. hi longest 0-1 5-1tttnxvir. 4J miuh ... lopptog ih« • In!!'ir » f«e of 1, HI IT, compressed, glabrous cluster of up to 60 spikelets: thr 1 ltnirr ilin> whin- «< 7-1 ' > > ni in ctMiiK-in Splkrtru fbuirnrd. l.m. r-*Uir IQ onfc lawcrohwc. -MI mm long, 1-X mm wide, grnib^tiifr wnti 4 lt^ht pmUsh-bttmn lint*. I" i« WMkwrr«l Gtwrr* hi-



FIG. 118. *Cyperus pulchellus*: a, base of plant (1 cm); b, young inflorescence (1 cm); c, longitudinal section through a mature inflorescence (2 mm); d, spikelet (1 mm); e, glume (0.25 mm); f, nut (0.5 mm).

1.2- 15 mm lo*ig. 0.3-4M mm m-1 ... oblong, whitish ... IIRIH lu1n.11. krd and mkii ... imrti uw>''l l Blyk n|. 1.. 0.7 mm fcmpj. V i W i ; «< ^ m^han thr ... Note cylindrical to obovoid, obscurely ^«ani I 3-0.8 mm loaf <ia-P-S mm mdt, gi«^ . pic brotm, ntauariy p«(*t!l-

Pcrrnni^J Sr««nna% wef pLur*, iri ... and gr«*Jjmd». Sv ... t ff*K*rphd but difln<< i' having KJM.M- ... strictly distinct glumes and different structure of thl.

if (be hr>U lt to •nmctkuo tf rai^l >> ... A *pftw* lound in M h ... D \ A tniwrll <f C^«r«j Mct tfm*tm*t**ji ... RulWun 451 Vj V<V-50l U99Q

lh-ll <Hti World irapict lod ^ Wi «f KI «< ... t)r. R^ Ttt.

Cyperus (Rothb.) C. B. Clarke, C ...

•ubif). fie—rtit (IUKIUH' Whcnou i *i ') - ... r-tii «mjr>i > B. Clarke, // yam km**-. s M .Umrid, Fig 17

R>' ... ihM-nt. mm hhciu* f^lra* »> »*ri* tufted, ... 0J-IJ mm ihirL Hmmtth. r«dwr «aft. txvwi l^1 ... 1 Him, 41 bKi^ ** or %txHir ilwn ihr rutm: *hr.i>>* t*xmn or rnMi«ti; bUde* fUi or p w w l ... d and twiMrd a* thorAvt, Mi <-W» on k«iR- >~x (- l) mm *tde, n«ri ... uniinalr, wnonih t-

like. unequal, spreading tofttigbiHrrflrMd, *** " ? *» rhc

Jtotnee ... drn*r |(U>mrrulet. *«M. •MOWlimM MM IJlWI ^H< U|r. 15-5 mm km* 1-2.2 mm wide, whitish-green.

to 10-flowered, rachilla permanent, ... Glumes sometimes appearing spiral due to torsion of the rachilla, trans-lanceolate, 1.5-2.2 mm l«IK 2.0-3 mm wide, 5 to 7-nerve, thinly membranous, pale w. ... up to 0.5 mm long and curved; keel thick, ... style 0.5-0.7 mm long, 2- or 3-lobed, sigmoid 2.1 mm long. Note ... oblong, 0.8-1.2 mm long, 0.2 O (inIB wide. rHkw to pak* himn

Afimul lit ... »h* *n*I« rn «!*< but ... w«rn w m WMI m mr tw-kb U to naeUMR* <*>''''



*117. *Cyperus pectinatus*: a, whole plant (1 cm); b, inflorescence (1 cm); c, spikelet (0.5 mm); d, ovary (0.5 mm).

nam! often foraa << atao* doaed luri l' J very differen, ti..n, iBothei (jawapedetwfc h iti green, cong. nil with many, ^ ^ [fegenerii i....<tonha<been<Hap<e hai aj>, n *Ditkottiyu*, Pawaawh. m ?*>UpU,Jun,rllu> Mni S.n/'io.

World: Bjr, Mh, Mp. Ce>. |11(|. N,p, |-,k III. I.,.-IV-K..MK K|. In. I|>. Wh Lo* .ilniti.

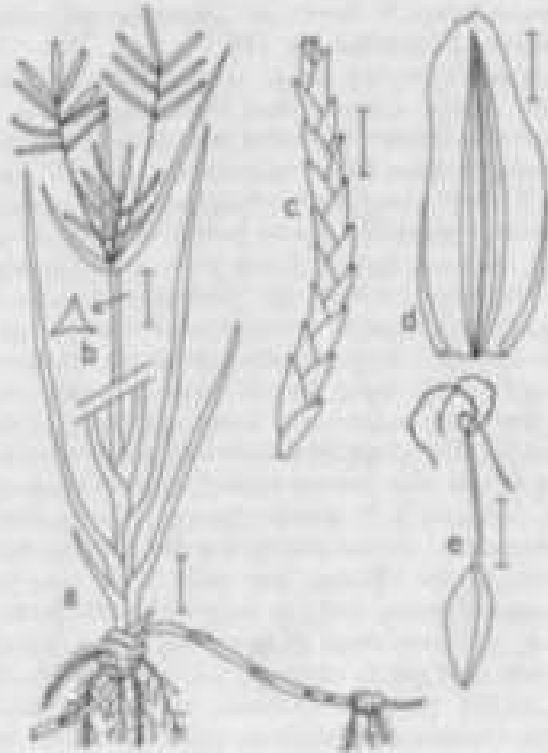
<>^ *Cyperus pectinatus* Ltoc [C. suberosus Rottboll, *Nicholsonia* Hull.....r LBurnw Fig. 11H

Stol.....i.ud., wuv -'< MJ loaf, ewtog "" giol..... oi ellipwhW when; wben ^ <<< "" diameters, rust-coloured becoming.

like base, usually solitary. (7-) 15-40 (-90) cm taU.Mm.thkl tangled, smooth. Leaves crowded at the base; h<< the green to reddish brown, soon dis- in, <<.....,....., Mj;ll,lhl.v blades flat, gradually, 11-1.....i th<thec, 2-6 mm wide. <<nooth.icd....- the margins. involucre l t a l n lowest sometimes just overlapping the inflorescence. pioSOe. ...m,K.m.d. ol

1. *Unca* and 1-10 stalling spikes, with or without *cc- OODan spikes: rays 2-10, very unequal up W 1> << "" lotiR. Spik<> loOM i" flense, ovoid, 1-6 mm long, 1.5-7 mm wide, with 4-15 erect or spreading ipkclt. Spik<> Unca n> oblong, Rattgnad with .H me <tm-. acute at the tip, 1-3,5 (-7) mm long, 1.5-3 mm wide, with 8-40 (-1(M)) Bowers, red-brown: racilla Rmtww! penitent, winged; wiogi n.) mm wide, persistent, (ilium* mcmhraixnis. OV.IK-, VI 'unm long, ±2mm wide, subobtus. apii nlac at tip, 5- to 7-nerved, red to deep reddish-brown, Hi. M,ks WITHIDI DCrvei anil Widl oarOU hyaline margins; keel green, ending in or below the apex <itu- glume Stameni S; connective appendage i..iisii M1<V <i leii Ntits M-n i.iM-iv manning, 3-sit<<(i. oblong otwwiai < ettpaoid, IA 4 BUB U>IR, (t.5-1 HUB in (iiaiiirut. u>U nl.tU , Oniini^.)>nwnlt < black.

Found on nvc-i it.mks. iii dried on p* <ij> mil <iuhi>> and in n<< p iiclds. h is aol conHned i" we* nodi .tini • << < ommon • itui • omedmei asriaw weed in mltivated l.tnd. li i. dilluult u> BtadioatC Ilie seed* rareh/ matote, tin- efleciw spiead i- < aaben n>-



hH.. 11H. i ifvrm *mlunHuw* a, b*- 'it vlu.ni (1 a ... B1 <l infiu... rtihi) tnnvne KCtkM <i t>< aim (m>.t). c, »pikclrt (2 mm); fl. Rlume (Q ... mm); d, ovary (0.5 mm).

leaves remain green throughout the year. Tubers are collected. mHied *ftd cn»m l'tm*l«-i lmu» tubrrt iurrit in fragm ul imrttv U H U l'jftutKHti). It b JIMl a utnlx mat phms the tubcn contain c^efcnc. cypounc, cypctwi and cypctw » tin h jrr uard far ipwuwonnan tmunn-rnognp. it » obo UMII in coottag HKBRCWMH mcdkim.

(HbP) JtnuH rnmiiifxiliun B*i. Bhu, Bur, Gey, hid. SrV. Pak An, Ap. Ar, Ai. Bti 11 G, G. Up, [I. Kl. Ki. MR. Mh. « n. Mp. Or. Pl, K}. Si. In, I, ,, Wh. 5-2400 m.

It is vcr | nrlavltr arni iunt uu iri dtHnrnt r*nk tuvr hern iir*.f |bni. Our trf ibe mnrr dutinct min ic

fyfrrrt* mitu Strudel [C. »m»Uatkli Benham: var. MrfmC IV < !.**, I ,w*nf«*ftHC. B Citriect

Like C. alta and C. 'rttnuiii tun the spikelets are tihliM'iu. obfuvHtpcctL I „V-3 nun in dfaunrrr: pnluhur* crucea ending in long subterminal and sub-lateral fls • l/itsrvt illttliui 1*1 bfMTI.

Fls • nnul, l hvtr nu rt.f>W>0cil iniornt> . It is prtluftH not eves 4 wr-iUiui pb .

(HbP) B, Bur, Gey, Ind: Gey, Nii hip, i' | in

n r. (HbP) Kikentul Fig. 119

Klu. Leaves creeping, up to 5 cm long, form ii^tmall iul». n. Col. '»» UcmW but rn, 50-80 m till, IA- • > . *nMen ajtd almoM inrie h* In*» becoming folded above MM tcpuir, liiWM.

up ii> S. thort. rarrh half u limj(A* ilw < utm: dicitu yrlU with 4-6 long up to 2 i mm »wfc\ ^IJKIIIMI (imp-., S4>ie^ at the tip, basal oral bni

it unjHlr (trhrn M^trt ilorhip mi thr f(t. «*bri t>Lulrt tti) not develop ihrj »iv , l'ly, >oftcr than « mi>fh longer than the inflorescence, thr lottjnt up to i cm long, embracing the culm with 'lt dari broim »urW

itiplr mtih m n l itilkrd ^riirL clusters • at rairh rrd*«r^ m l • « « * ctuMrt • pit . clusters (Mr «dr b» the n n t b w n Invalid cil brct; com UhUmm iwt mnrr tK«n lim k

Sp. • «» • bylobtur. J-'i Oi long and wide. Spikelets tdtqurh rrr<i tn CM lnfcg, J-13 m »vlr. up 10

.''•ii''»'•• • w M h SrawHi pMtMMH hraadl) WII)(t'ii l -liittU% II>f fillfJiurM, O^ 2.5 mm long, I V J mm *MIT. nlmw mm . n up, t4drt • 'i < l IMM vrnu. tintr^okiaKd. l>m» J with • < , with llllll nM^HV •nO wHJl R W I H BBHWI with brown, Stameru u -IIIU • IMT 1 , - - - - -

Nakl Vwlcld. i>b>ik to rllp mid, 1.2-1.5 mm long ±0.3 mm wide, nuruimg bnam.

Perfl m . Central region, almost restricted to swamps, brackish .

C. oxyloba but it is more rhizomatous, up to 5 cm long, usually more than 5 mm thick; sp. • rlr(» !' 10-20 (-») mtn lcng. «J tn,, wide; glumes ovate-lanceolate, 2 mm long, 1.2-2 mm wide; culms 1.2-1.5 mm long ±0.5 mm wide.

fTrti ll p/Hell In h, m Asia md tropical Aiiwi J!U tun. El

Cyperus tenuifolius Boeckler [C. salignus var. ind., noa Strudri] Fig. 11*

Rl>i«tm« mono-like oc V . often with creeping rhizome. Culms solitary or few together, softly erect, smooth \$5-70 (190) cm tall, 1-3 mm thick. Scaled, smooth.

Leaves few, much shorter than inflorescence. Inflorescence branched. Bracts ovate, 2-4 mm long, 1-2 mm wide. Culms 1-2 mm thick. Spikelets 1-2 mm long, 1-2 mm wide. Culms 1-2 mm thick. Spikelets 1-2 mm long, 1-2 mm wide.

ing, the lower one equal or overlapping the



fife, It«. (-) habit of C. tenuifolius (a), base of plant (b), inflorescence (c), glume (d), culm (e), base of plant (f) (In (b) inflorescence (1 cm); (c) glume (0.5 mm); (d) culm (1 mm); (e) spikelet (2 mm); (f) base of plant (1 cm)).

S-Wan km teft simple or
 •abcompound, <* I **&* *TM' <-* *uIWrd *>'''
trad) wifa M...cl.ifv ^rilut): raft *-3. unequal.
 1-16OB km Sktfkn .v.mt. inbden* I '-< '- .. *''
long, baring 3-14 *|HWI U Spilu Ira limau <' Bne**
 lanceolate, 5-30 nunhmi 1 *-S mm •
 with tpradng Rlum**1. R fl*«
ihSucutt rd rhf 6-w W
rachHfai flcxuotc, w*deh wiiw'i. *nui* [»*. »
Ghuno w b <<t nw>>*IMpicJ m
 5-4 mm Umkl <-i5 ''
 ntb red, straw-colored e. . . «.lil. ii **bnwm. obtuic or**
 •cut. at the apex. **kcdobtate.1** i«wom
 IJ* uple. Nup 5-10; | with ••<> »»r
oba mm hm<< * t S
bhchuli. Miinui li j.i
 Perennial or ^x-wuJh -um.u j flooded
 areas, roadside ditches, ^amps, usually on sandy *
 is best confined to wetlands. The stem, < >
 nrm.,,R1 **A,U ofoued irflor** «
 H OWWoriptowHltul
 Cry. Ind. 7.,, Ap. A.. K< W NG. k. T.,_ W
 tt17

Cyperus insipidus Swartz **EC** (Liliaceae) Ind., non
 Reintus) Fig. 129

Stem weak, solitary or tufted, smooth. (2-)
M,n i 2.5 m (**hk*** Leaves as long as or
 ^..1^rt (Kin **ihc** n.lm; **the**** scarious, yellowish to
 brownish or grey, **ih.** lower ones bladeless or shortly
 bladed; blades flat, flaccid, up to 20 cm long but usually
 less, 1-2 (-4) mm wide, gradually acuminate, smooth
 or slightly scarious *how
 Involucral bracts 2-3 (-5),
 unequal, the longer one overlapping the inflorescence,
 up to 15 (-25) cm long. Inflorescence compound, lax,
 relatively large, primary rays 3-10 u| 10 rm long
 secondary rays, 3-7, 2-2.5 mm long, with 7 rays when
 present very short. Spikelets digitately array of 6-8
 of S-9
 Unar, acute, anthers 2-3 (-4) mm long,
 0.8-1.5 mm wide, 10-30 (-50) flowers; rachilla
 without wings exposing
JLT. without wings exposing
 [..., cr M **bUta** md "M» •«V*^ 1° «««
 oK. 0.7 -i3 mm **Knf**, »«<" ncrrrk-,
 reddish
 curled into a minute spur
 just below
 long
 sub
 I o t w to rlllpwd. 0.VOT. mm WHIR. 0.8-0.JI **HOT**
 mid: usually stipitate
 m l. scabrous surface, markedly **W**

Annual in)K-t(uji« Wlililim-t lori^i iitlr<i in |H-fIU-
 sandy wrt li.ihitaiv In *w.un, stream. ditches, Ki
 mnalh floodrd JIOJ» JIH! inc tirM* LJki C. Kasper hat
 annual; gtmirk umill. olutiif. spreading at
 viliir M'ti M'ilil*' ltrtwrrn thr opened glume* in
 Iliniirin 'HlrIr!h: \V- "»n hill uliu ihIMtO 11 MM
 IIR* glinnrv
 1(O> r m, Ihp./HHI. Old World tropics fliiu, Bar,
 Cry. Ind. N p lp, Ar, \!i f Bh, <-... Up, V KJ. Ki, Mκ.
 M., \«.R|. in. i .. M. 0-1400m

Diplazium [excluded from Vln*/tt: 7 fprtrn: tropical
 Afri:i I Asia and America
Diplazium curvatum R. Hnwn I** *indivatum* Brongniart,
D. andersonii Nees, S. Tin *curvum* (K. Brown) IU-mhaiii].
 F-129

Cubaa ilendcr, kxiKt] robust, proct or unbent,
 IIMrp^ 5-angled, <V> 6-SU rm ull. ± 1 mm nidc.
 glabrous t «JVI < i>.isji ,inti on the culm, κ¹²¹
 Iltcadv V10 mm lontt, i" **Bldjl** Vatt^Uil w.nh>t
 bladci 1-5 iiu i 2-5 "«" »*(c, **riankh**, *flci-
 ;ih(iipih SMme al ihr aptK. Inllm «««« <f »onal



Fin. If* *Cyperus insipidus*: a. wtiwh' pUnl (1 < m),
 h, spikelet (1.5 mm); c, glume (1.5 mm); d, niu (-1.5 mm).
Diplazium inrutnttm r, wtilr \AM/ 11 cm), l. Iritwlr ||ltMOR
 (1.5 mm). «. (inn (Ofi mm): h nut (03 «•)

±20. **mbaeattle 01 ibortfj peduncul** ... **hcacl-likr ihl&Un of tpUbeletl**, >-£ mm in dtam* ... **or in pain in the aodb oi IIMMIU- beat n** at t rr^iiku **tatenak ataag ihfl cuho. Spifceku uni*-\uai** hut malt- spikrUis **aometimea appearing** hisexuat, with 1 tnmin.il Icrnaii- **Bowa and i or 2 Bttle** flowery **female ipifcelet** wittumi **rudimenta of uppt-r flo»s** ... thus jppr.u-iiig ft-rrniital, t 2 **turn loag; mak -pik<** ... **i or l-flowered**, with :^ ot 4 **gluawi Fiowcn aniixua**]. **Glum** ... **kunet** ... like, **thinly mrmbnunout**: male **glunaci broadlj** ... **2 pamn nrfxending the ft mtk. tUma** ... **elliptical, \!~2.'> mm** Ion. ... **rved, >tituiv; \ folded, membranou** ... **bed irui falling with ihr nut Periaatfa bri** ... **Smaew * Stigmai %.** **Noti^h** ... **in** ... **bony, whuc, trn** ... **ribbed or m** ... **i 0.7 tnu m (fi.unctt r sad completely joined** ... **the tw*c <of iht nut.**

nual. in ... **in< **fi open j*ld<r** ... **it-n-ift-l}. ittif** ... **laadAutnlj** ... **ki, ki. in.0-1000in.**

Elewkurit [l-itnuwhlmi, *Sdrpmt* pro p ... **hn^**

MHIH. >! m perennial, often will ... **or MOIOMV Cttbnt niJt** ... **Made* ^;** ... **MiniLti in (h*- .-uim* . u lean [hc up]>** ... **Inflorecen** ... **HI >:k< i t no! ntbtdend by *t *** ... **Spikeieta few- t ra** ... **it. r* hilla peruttrnt Glumes ,il) ipirally iiranged** ... **Perianth bristle* MI** ... **Hir-l <**

MOM OOm Hi ^>nov^ \. ... **iiH-tun<** ... **fken UMAI** ... **Mgax** ... **imtnah *i>d bird**

Excluded: the following are essentially temperate species of *Blechnis* which are found in ...

bin do not fixicnd MIUIII in tin- **India** ... **mtinent E. adfuUtru** (Linnæus) W. **OMT et Scholtes; J** ... **carpa Sttidrt; E. obtcura IK** ... **i from IVninsuLu India**; **E.partshu b num: A', qutiuptrflam | N. Ha, i_m,m I O.Schman [i** ... **A''** ... **I; K thomsMHi loecUa; &** ... **R. Hrown; £ tmitftmu (Uak) S< huh**

1 **Spifceleta** «vhiutn<, <l up. red above, n w>*t ... **Nil oarrowei tfa** ... **pervnnii**

2 **•iim hoflow, M-j.i.Kr. ghiaaca hoi. aiMim t** ... **Khi/wim i Molontferou*; culnu ^.tt. RoralgtB<<** ... **trun<**

3 **Rhi/.** ... **p**

2. Culms solid, continuous W v>nhtti. **MM** ... **glumes without keels or keels obscure**

1. t Culms terete or nearly so, hyaline margin of glumes widest at the **ltjl**

5. siu- ... **brawn; Hot* glut** ... **m <**

3. Sheaths dirty black; floral glum. ... **Hyaline margin** ... **I -4 mm long, 1.2 mm** ... **nui with 20-25 rows of transversely elongat** ... **[celto**

on rat h ... **/**

4. Culca di ... **of** ... **t. Glume***

as long as or longer than the ... **!>><!** ... **''''''***

6. Glumes concave; perianth bristles almost equal. **HlongatOI** |bi>itt i iluti ihr mil, imt< without •

neck, apic ... **U annular; ihcathi with bri>Ue-l*k<** ... **/ >>pir>t****

I. s ... **lutne* mew!.** ... **tnnual***

7. Styles 2-3-rib; ... **8. All glumes fertile; culms rarely more than 10 cm tall, spikelets** ... **1 as long as or shorter than the nut; style base dilated**

H J >> n tv.. ... **glumes sterile and concave** ... **Vc** ... **tali;** ... **pfah-** ... **I tli^ n tfa**

7. ^ styles 3-rib; ... **/.**

8. *Culm* atmriv + or sometimes (angled), f>*-r*nni.il
afah notam; a^Uteleu obBqw *E. atropurpurea*

9 *Culm* ,rrrir r,r obscurely angled, annual or short-
lived perennial will* fibrous roots iml>: «pi<'''»
spray

10. Chime* tpiraj. nurortooi fm*m im.rt **than HU.**
compa **i. without oam** <> "ii>* •p>»-so (**) trT1 tjl1
kjiiKiru.li.nIU tui^ir. not ribbed m* pun.ml.tK-; prri-
*iiih **brimh i tonga than ibe nun tatoa*op*b** _____

10. **China in 2 row. below.** k<< ihan la 1*«<j-
-ijl-nrrrd: film> nui more <>4ii [5 cti* tit"-
droplv fi-cl.Ud, pun **valuse.** (wrijndi brittle* ± M
! 'IJF 4i (tic mil; iilJi.i jiltlrlf

E. retrofracta (L.) Steud.

Eleocharis (Roxburgh) ^ **WU** < [atropurp] <
mth. Ni.jr . /; *Eleocharis* (Poir.) Schultes, *Eleocharis*
acuta (Roxburgh) Nees; Fig. 121

M.l....**fefoua, ibe** Uij>m. olirn **WWtaMfld** bj *
"hall **uba V**". **BO** .r. rliwnctrr, **Culmi** u
50-80 mm tall, 3-5 . . m .Ji^nrict. Ourplv ^>ii){l<|



FIG. 1*1. *Eleocharis atropurpurea*: a, base at|.U.> (1 cm);
b, spikelet (1 cm); c, glume (1 mm); d, flower (0.2 mm) with
surface pattern (lower); *E. retrofracta*: a, glume (1 mm);
b, spikelet (1 mm); c, flower (0.2 mm); d, fruit (0.2 mm).
A. wh. A. [IJIM .1 .ml

Niv<le. Sh<<h* 3 or 4. (hr lov. **rril>lftin** bruwn-
wb>, ihr iij|H-jini>M **OOM** WO ml IHMJJ. pair green.
uMiqtwH trim, ue abn **lu let nKndrical n»** oblong-
diamond, **l| 60 mm IINIX. W 'inn ti. ili.iimlii iri>**
ghHM-1 nrlll fHtijritlltg Mlllv In Kilt- » |M/A\|ff .i|i|-
ance **Glttma Ann, owte** i< Htv-j^vtlliptk, 4-5
(-7) mm long. 2-4 mm wid*. dun >n.<< <obovoid,
erect ittrwd <m thr nidn, rurniwlly hyjlmr margins,
rounded, n iprx, iAm\iu\l **krded** Pcrfauith **brbtic***
with hair << or HiKKxh n **IMU!** | K>, S n 7. um-<<)ii4l. **one**
long up << Lit Dim **knag**, urn-vt n i] **set, the others** **botll**
is long << i)if run. Msr-v i^7 **nan long**, (2) Vtlftf **only**
hair .iiluiil.K. , (luntlilflh.u! 0.5-0.7 tun **long**, above
ii:iii 2% **wide .i*** tin- **11Li Matt** tintquili **obovoid**,
lbtncrcMfuiiKtil.il IM himinex. 1.4-2 nun **long**,
1.2-1.it in11 uklr. gltmy. \lluwi*li hum-ii, kMi^itiMriiulv
itruir with **IS'ISromal u>!***. jjm JIK curatrH r*(**loan**
^tutttUi ncl .iltinn.i lull iv wide>tllr nut

Perenaid found in ibafitM nmer, in K-a*ona <r
pcf mini in **pookt** .ili>im tin* jtw^lu tutiLt of **poob**, in
swamp JIKl m m<< hrtll; nfirii gngari out and
forming tuscks.

(Hyp (Ten)). Panlrnpv • Bin. **Ccr**, lad: At. Bli, **KI**.
I. MK **Mp, i**). in **Up.0-1000to**.

Umtaru *fmr/nrm** <V.< x,...I'M-I P1| I'M
< **uhtu** 1-10 (-1M mi ull, **0.1-0,4** nun **In** diameter.
Sheath **2, nrocrotate**, jut|rii>ii iv-l.TM, ^ale above.
Spikelet ••mill (> **braadDj Eanceolmte**, 3t-4 mm long
(floaty **ekwmailig 10 H on**), **13-S** mm in diameter,
widfi **diaii the cuta< brow tumfaaj lu***<<<ni*-iLii m
ffUll. <tniif* **it!** Inlilr, n'alr, **0 >> i .'** nun
D.5-0-7 mm wide, the Kidn |Hllpluh >>| 1i\jlinr,
leu; krll **gra** if k rianili luitiln w!mr. 5-4 (-fit ur
early winged or absent, equal, 2-1 mm long, 2 or long
u i>| **rittortct** UMll llic **OUL** Sivlrt 2-tWl. <<yk tuur
ILLHOH), o.iwiii (-l> timn **u wide M ibi aim** Nut*
obov..nl **blcmiw** Kj nj. Kl l mm lonii, ii. vn l m ni htlic.
wn diam. l*ck. •lipiutr at tux. uunuir **M** aprx <<it
AKrrvith <uid fLiiriifd iippcudagc.

Stem lft 4iiniul. Mar ihr* nittl di\iitg margin* t|
Perennate (-r)(4imiH tit **JUJUH water utd in** <erect
banded **pbcu**, often K<<''' * * |L|t ' . lls. li r w **whh**
usual considerable stem long Diaproveia features wlx
£<Klt; hdulrt mtiiu jis.i niuttv ihiKirr ih<n the imi.
nuu nrvr imw llun l mm long i i d hUck.

l> i- ti • r **atropica** **jMibtropta,omandiog**
in tunipr *jid l'SA; Ind. Nret \s l> Gj HIJ. Jk. KJ,
Ki, Mb. Mp. Pj. K| 1" ' l- Wh

Eleocharis acuta D |>.i* If ^/>Ml.J< MMJUTI, A: *poli-*
oides J. et C. Presl; Fig. 122

Diaproveia absent or very s **MMI** Culm* <ltci
erect oblique, 3-5 " **H*M cm** ull. 0,2-1 mil) in <lun>



Fig. 1. *Pseudocyperus* sp. n. a, culm; b, leaflet; c, inflorescence; d, spikelet; e, glume; f, lemma; g, palea; h, ligule; i, rachilla; j, panicle.

Annual or biennial. Culm 1-1.5 m tall, densely pubescent. Sheaths 2 or 3, membranous, persistent.

Leaflets 1-1.5 mm long, subulate. Inflorescence terminal, branched, panicle-like. Spikelets 1-1.5 mm long, 1-flowered.

Glumes 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Lemmas 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Paleas 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Ligules 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Rachilla 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Panicle 1-1.5 mm long, 1-1.5 mm wide, reddish-brown, with whitish hyaline margins, without nerves, keel.

Annual or biennial. Culm 1-1.5 m tall, densely pubescent. Sheaths 2 or 3, membranous, persistent.

Leaflets 1-1.5 mm long, subulate. Inflorescence terminal, branched, panicle-like. Spikelets 1-1.5 mm long, 1-flowered.

nuti uoi man "tun I mm lonn « aBIU¹... mn'il >. C H¹*...*

(D) I i p i l' d H Nepal, India, Indes-China, ... w* and japan: Bh. Crj Ind Nepe An M(». |I. Ki. Mn. *... Ma, Mp. i'j. K]. si in, Up 0-2500 m.

Elocharis debilis (N. L Burmann) Hf. Hettf fel [E. ... vtma | (>tr<l n C Pfc d B fwivriM (Schuho) ^ N<...

Roxbuqjh. *Smrfm*pbmktttm*^t ... lit F% '122 ... present, often terminating in tuberc tubers ... m m diaaactrr n<i cwWh ... in dhuacu (uli ... 40-U10 (-200) (u tall. (1-1) 3-2 (-10) mm in diam- (CT. trrrir, luilii* tmt trith lunnr tv « p « (W**11 fu

MM ... obliquely obtuse, purple, ... rlti <-l" ... in ul>U>nj(^k>nKair. 15-40 mm long, 2-4 mm in diameter, ...

GHmrt ... thick and slightly ... h*T< rlliptx.il i.i nWoflf<<bonif. (1) ... mm >' ... 1.7- ... ! de, greyish-green in ... ,I.II.i' ...

1: Irrl | ... nth tHUtir' ... M ItWJt A* or Up III |<|i. H |<>f ... 'M, ...

Ihr nut N'' ... observed, ... with obtuse apex, 1.5-2.2 mm long, 1.3-1.8 mm wide, smooth, yellow or greyish-brown, shiny.

frW* and ainng irri* ... water in ... utwlv < ...

t(Hkrlcru ... ik>n ihr rtitmv A ... WMT1

ih*' ... indrr ihr n<ia> ... Chinese water- ... The above ... ctouod put* xr h*h I'M""1"

jt>il hm ... miomwiutril i" ... ' ... vjitrd lor M ... leaf proteins - ... n. \ N. and

utasaia k 4(4) 366-374 (1991). The culms are sometimes used for weaving and mat

maiinf. Plants vml,1 rln^ ... with >no<lrr *f.ilrli <. ,iv1 kmy. ...

ILIWimn.alf> ... n> trnftAir \n%>*I***, ... III Tm UUU. ... An. A*. Hh. i^ W. | ... Ma, Mp, Pj, Rj, Tr, Up, Wb 0-2500 m.

wht-ir it may sometimes look like .11 top. Suriirlini's in hr^kith wiirr by the wa. Di y GntaveK alinmt
 •pba i' <l beads nut rUrl, *nu*»ih mil
 (G[] [] Ilitti MmoM COBB@llian iri lingual In
 warm regions: Cey, Ind An, Ap. ISJ, Ilo, Kl. Kl. Mp. Rj,,
 In. I p;Wb.0-Q00 itt.

t'lrmlutri* *Andromeda* 23
 Like *t. dala* tun **without wotoai ind Ntth** subocul
 glumes.
 Known I nun J xin^lf k" aim in Sii Lanka, Colombo
 DMI.MI .< .>

Eleocharis acrostachya Strndcl [£. *virigata* Pi ed var.
laevis (Thwaites) C. B. Clarke, *Sepia laevis*
 Thwaites]. Fl

R **Awne wWi i*»n rtoktoi Culmi** mftnl.
 ftTtrt.jCrMlrT.rigW. SS-^>.u.u.ll -n.H-) 2-><%) mm
 in dUunrrr, irrtrr or wraklv JtigiJiai green, uumih.
 >h^lnh Khun 9 **branoui pd**
Awed wWh <<l <M brown, **obhq** with a
 until mint**. Spihflrt cytindro .il to
 (j_l_ WW-25 mm *H>g. M m m in **dtaoetn** Glumci
 htm. **m>te** u* maif^tting, 4-5 mm **loqq** S9JS tm



FIG. 123. *Eleocharis gracillata*: a, young spikelet (1 mm); b, mature spikelet (1 mm); c, fruit (0.25 mm); d, *Andromeda*; e, spikelet (3 mm); f, glume (2 mm); g, fruit (1 mm).

Eleocharis gracillata (Linnæus) Roemer et Schultes [*E. gracillata* Linnæus]

C. d l. **U^ndrr but rm.brr** rigid,
 (7-) 15-25 (-40) cm tall, 5-2-3.4 (-1) mm in diameter.
d h<ti **hH**
 Sheath **h<ti** **hH** **S**
 green, often tinged with red-brown below. Spikelet
 globose mid, very obtuse, (2-) 3-4 (-4) mm in
 2-4 mm in **S**
 diameter, much wider than the
 mostly rusty brown. Glumes membranous, the
 one sterile and covering the fertile glumes **In**
 bud.. **a*u**
I.V **r,mm** wide, greenish below, pale brown to straw-
 colored above, the sides sometimes tinged with
 purple, nerveless, very obtuse at apex, reflexed
 purple, keel green. Perianth lobes smooth, rusty to
 purplish green, 6-10 **^ud.upto13iiimh** **^v**
 longer than the **nni snk, IJ-1.7 mm fan*.** **^**
 style base
throughout W-dU U--:' **JS**
mrt MM *»i TM<>>-''oo ° ^ ^ r T
itracttd n » nHind*« <<P
Anntul IHtt n p, **^I* f**
***I^m u n , ^ikuUrh-t* F^V<<**

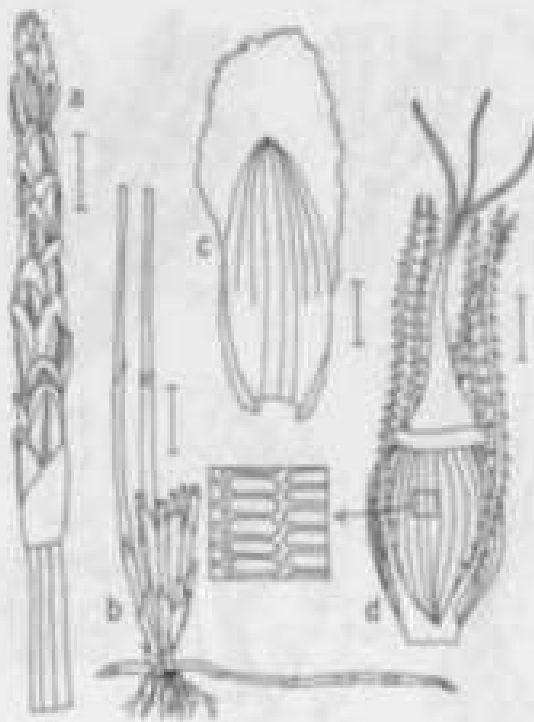


FIG. 124. *Eleocharis acrostachya*: a, spikelet (14 mm); b, fruit (2 mm); c, fruit (11 mm); d, fruit (OKmm) with MIX

wklc. pair *gtrrn* with **b»UMB ifcHgwI bfrfitt** margin up to "J mm wj.U at the lt). Maktj MulHiimni, IJHIIW Jt jiprt..il^uirhLeviéd Prn.tttOt Niulct 4-7. »ubc<| ul. 2-5 timn a* long M ihe nm. vHkmfch or light brown. Styles (2) 3-4lt; = lr hjur pfrtmidaj. 1.5-1 mm IHII R. 1-2 =ul *.<lr M b>iv r Nui» Il.tUfiwi Vodrd it> UDoqiwiyy tMconwx. bn dully slenest. 13-1 mm long. 1-1 mm in diam. • r. glow. . turn-browi io arryish. longitudinally striate with 1: . wely elongated cells on each face. contncied io ui •> no late apex.

pt ventul. Found in sh JUiw wain , m marshes and itnug irhj(j low canals, som'times wind in fto<lln|

lit (Hyp/Ten) In («a. Mdlavnu, Jjjwn mwi PJKJl (Cay. Ind. Ap. Kl In

Eleocharis retroflua (Poirot) t*H in subsp. p. *obovata* (Roemer et Schultes) T. Koyama [K. c. in Roemer et Schultes. C)fw wi«.r*« Rri/iu»| 1^ 125

Calas tufted, filiform, mostly < curved, sometimes erect, 3-15 l. 0.2-0.5 in diameter. Ughi «iiru. 4- ur /Wifabrd, pt»Kiul«r. SlirMh* 1 or £. ilniiv iCTibraixxm. dbBqiwI

lab. Spikelet usual, 2 flattened, 2-6 mm

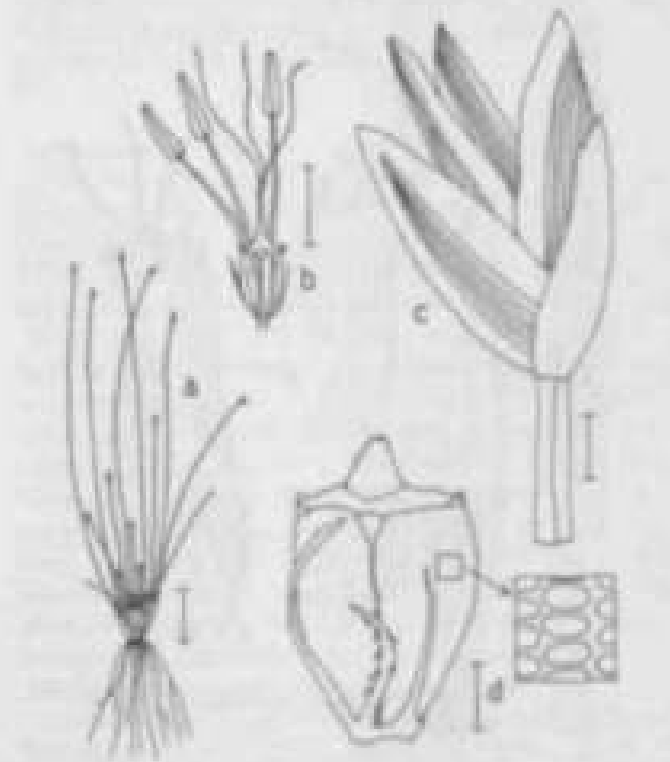


FIG. US. *Eleocharis retroflua* subsp. *obovata*: a, whole plant (1 cm); b, spikelet (2.5 mm); c, leaf (1.5 mm); d, stem (1.5 mm). wit lt Mitt* . . (pinner 0002).

long, 1-2.5 m. usually (Httkhotn, ml nmrr than 10. ihm «nd " " " long.

t Ji-2 mm wirfr, sides purplish, nerveless or indistinctly «rtair. margin . . . sex, keeled with a greenish midvein. Peri illth tM»tk ulixi delicate, flattened, whitish to yellowish, 4-8, unequal, the longest equalling to p***tufpitMtag il>r ifvk base, scarlet towards . . .) or 3-4lt; style

low drprrrMrd 11 «al. I Mj«i. w widr w WfiA *s " rrii uQ thr nut M^In. Nut* obtmikl. \h*iph ' angled, with ribbed edges, 0.7-0.8 l.

wide, straw-coloured becoming almost black, . . . km* «rim b 4-10 acute, ribbed un the angles, apically mucose.

An animal. Gregarious In itutkm w»(n -""I along the marshy banks ..t pool* or in dLchr* J . . . p or flowing «qMf ii tii«wimn-t < I IIIT... likr WHum*. II occasionally propagates by cut • itif owrr jn developing young plants in the soil b| Klurt.. . l i IXII i.mhi) < . . . to wetlands. *Eleocharis ntnjUm* in the MINI icntr it confine I m the New World.

((Hyp/Ten/ (iirhl rropki d it . . . 3rd World: Bar. Blus. Cay. Ind. Nep. An. As. ii p. Kl, K> Mp. JII. Wh 0-IWKJ

Eleocharis spindis (Rothball) Roemer et Schultes Fig. 126

Rliui.mr* ihuft waih «vay <g Mttkw*. I »llt*»> dross —rufird erect, rather l « M. S5-*0 (-70) cm tall. 2-4 mm in diameter. tlrrp p< . . . ten, smooth, shiny, spicily 3-4ed. Sheaths 2 or 3 pale *.<"" » " coming pttfplMMi-i «ve, obliquely ascending v,tl. 4»»

spicately 2-4 mm long. Spikelet . . . elongate, 15-40 mm long, 5- . n)mdrK*I w

in . l.lumr, |«|hci In in. Milwihti nUi 10 b:4W9 broader than kniRi. 2»-4 nun lm . . . 2-3.5 nun *i<^' i br> . . . turning yellowish below apex, weakly marri iwrd, nuifto ' . . . narrow and hyaline, obtuse at apex. >vt**lrd, f*rrj*n'l . . . bracts delicate, 4-1. tu up muii ihoriri IKJT

pmvK¹¹ . . . confluent, . . . M fan* . . . and wide as the net. Nax becomes •he nuMgin* not (iH . . . OWI . . . uni kitif. I L'~| 4 mm ii diameter, glowy. Hnniucoknirrd UJI bc^jRii^ dr. . . longitudinally striate with 17-20 rows of cells, without neck

MMI *f**I AMIUIM ur annuluft indMiih I. . . water, particularly

.Jim fmni ninutw x^mU in brw kt*h **<' fffd hnd . . . marshes.

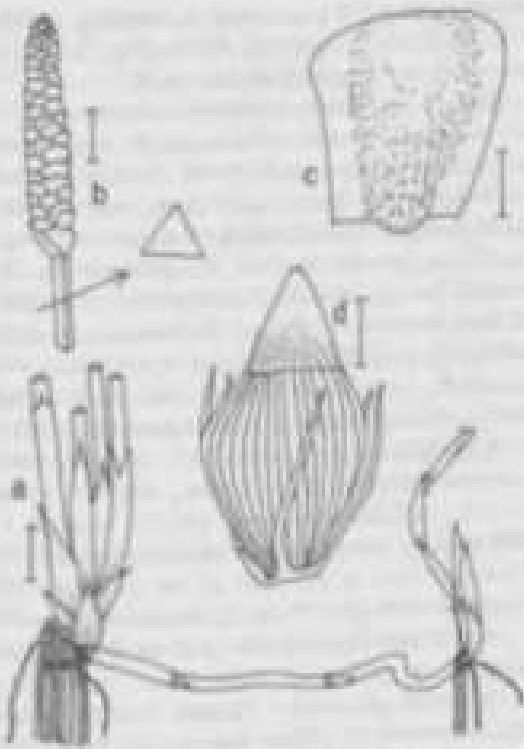


FIG. 126. *Eleocharis acicularis* (5 mm) with tennwri-... of ratat... (ttndD.rl.f, ...)

(Hyp). Tropics of the OW *... h
i. 'l,, ll,

Eleocharis acicularis t1...
Ukc *: «*»«*»p but culm*****^ wrc*c »...
the inflorescence...
± Vr^ik. ... long. ± 3 mm wh*c.
Kkict. ihr uppr h-1* hr-l^...
«Wtffi. rtyta 2-S3m»ti Umjp nut. 1.7-S onn b^
ftlJ l, ... w,ih 20-2* rtm. ct u... H .>»
Ratxl <rlli.ui f *h l

Ptowml^Kcotofty unknown iiiicUiuln fully distinct
India
IHfp?/Ttn?t- EndrttiK in
Ap. l,, 0-600 m.

Eleocharis tetragyna Nees Fig. 127
Rhizomes short, sometimes with long and slender
stolons. Culm is tufted, erect, slender, ... (12-1)
«MK)rm tall. 1-i-...
p bixifl ... purple below.
Jnrd ... with an obtuse mucronulate tip.
Spikelets often somewhat inclined, ovoid to elliptical.

ovoid. ... mm long! 3-5 mm, drnnrly m.inv
flowered. <»lurnr«>]»i,il. • h.in.ti Run, oblotiK-rilipucj
at lanceolate. S-4 mm lota^ I 'J mm wide, mstv brown
.il.<nr. with narrow whiti.*h hv^llnr margin*. fffthotM
ttrrvrx; krci o k u n ... green, ihr nrtvc rtttdhig bdl MI
ttic ,l|H \ ivri.mih brutlcs whiiUh or reddish 6 (n».
mhrqiMi, ilightly longei (han la twid M kmi M the
nui, \cn' rtrnwlv reiiionch v.»U?mi» tr inbplumtnc
sni,» t-L* i-^i nun kng, S-eieft; nyte luw Kmi<j|,
bwsBj i'ni-v[i i(irtl ami .ittuniaic. BmtMicr than
the nui. Nut* ohovold, obOHelj :Witi<,r. Batto
1.5-1.7' iniii ln*ij<- 1-1 - "ini "i iliJin<"Iri. Krrriinh-
burwn. ^I'M<T. tmovlh.

Prminuil. Found in wti K»il <... at
higher altitudes.

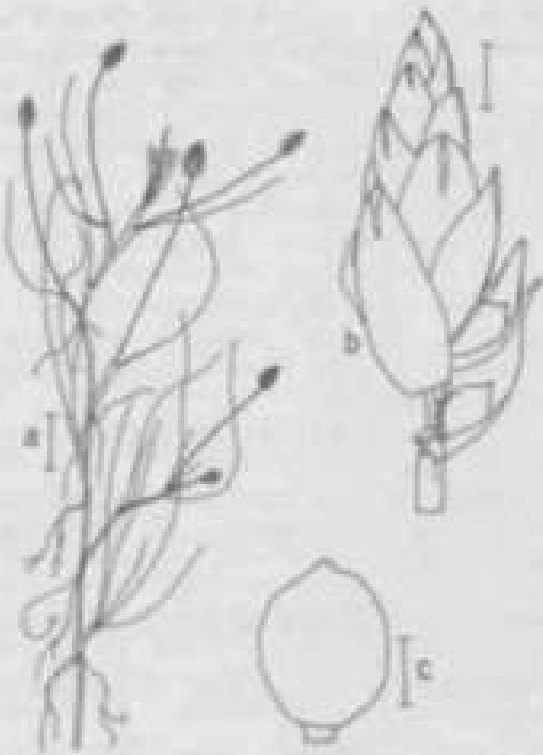
[Ryp/Ten?]. India in japan, mitfe lo Mabt>tu nml
N Aurtrtlu; Hhn (Cf, Ind. Nrp: Ar. Up, Kl. Mjt. B)
Tn.Up. ?~5500m.

*Eleocharis [SttffMtdla, hattpu pro pair Scirpus pro
parte] '»»>]r4*k**
£i<«jptNt jvitatu (Linnacuf) I iuV. [£ ... Nees]

Snt>ii>ri|{rd nr (liMtin^ . Strm* often rooting at
tiudr». Urajy. usually much branched, H4W <m



FIG. 117. *Ftmtkmi* Wn<fw* (nt J. ^Utlfn (1 mini *rrih
verse section of culm (inset); A, glume (1.5 mini; C, fn41
(0.5 mm).



fit. 1M. *Euphorbia polystachya*. a. *mhvtrptnl* l (out; b. spikelet (In ...); c. seed (0.5 mm).

OJ-1 J mm m *dianat*T, irrete. *Leave**raulnr, *h. inK JI the hav with < .,ilbry Made*, bUdefcm fchc. in wibrtrtd thr peril ... >< 1,5-7 cm k*ifl_h 0.5-1 mm with Haitian <i *tth inniixrd marfint. light green.

rrrct, rnvtd, 3-6 l-Hl mm Umg. 1 7-8.5 mm in diameter. IfIK 5- io l(> tlnwrfd, prduit* itLtir; j< ilum:lc* I V* (-11) oa 1''K *btmt* l ndi >Bw. up < ilu qiuwrn 44 Wdg *t lb< ^mkriri Fluwr* h ... without priiaillt - .: ... of leaflets. Glase l <|Kf>l. I lip IH4] to OVM*ei* 1 7-3 l-> mm Vtwg. Q ... m ^uWriuulw 1. Sc^r l 05mm kifiy. Z-m Vrl. V<<KIT>l or b) ... *< 1 ftaMcnd, otxnucl. 1.5-1.3mm long. l>7-l KIM wide. yrklHmh-hroim, ...

\nnua) uf f^rrnni*! Mo^lf nubmrfrd *.m Urtil apikelrTB bui tan prr>Mt lor .ihVkr M a Irmiria) pbnt JM lbr traWf rr> rrk v ; ... mining WMr l ... sing nun 41 ihr mwflm nf nwmr ...

2) Vu (Plu/Pc/Thp). Old WurMi ... air Inwfafid* n> tiopw j ... *mmttkm Cm*, Indl As, Mg In 1909-2001 ...

Andropogon (Scopus pro parte, including *Andropogon* and *Triplaris*, excluding *Bolbos*) t: t HO *f<

Annaloi j< ... *naloi* j< ... *ikMw* tufnt. it)) i> t m ull but uuulh RUM l' '' ... IK b<MI tmlh ... tufanki Ngw ... Uiiivwi, hairr or alarm; bbrl ... >gnu*** ... irollrd ... nhirialbi ... or all vutrtMM, Q nt m m) Inlfcintmr UHBU* ... pirudalMcn]

Milt.tr. HJ. ... *tamt&met* rrditrd M) l r*-irir, my; ... hilU ficibrtrfii. KMIJIK *nm<<l (''''''''' u>Mlh fMi Jh arranged but mmrunm dl^if* >>>> W*1 in Z ... jatrwTMfhr hwr ... Ilir kn*rr 1-4 rtnpn Priiwh briidc ... at xlfanMM. tbnr Uwr* wollrn ... I IKOM with thr tntr. ntfma* t w S. M< . Vnclrd, l

Thr. ... ICmuj^U^fMurfMIHiiprdnlagaMMpk ... Indian Clvprrar. k httr.

Therr arr . n w UVHI<H)IH ... m(hi* |f ... hmr irrnini to t>kr ibr ... ihr lumpprt.

band ... wrl pta<c* Lwi lbr mn ... wrtlaitd I) ... /i<*n ... *mtm* t i-1-..fnWafih! ... find Tn. *r.drn*m (ZolltnKrr n MnHu) M<

Net* n Mm ft n rn'ct, r- ... (Nm) Kunlh]-. /. ... DmCd F- >M iNm l (n <

T Kfinnu; /. M f n Timjii . / >*-_* * ' /> ... *M' ... ,>M,,l t Uximtifapl'' ... Ki. In: f. PMknfa Hi*h<> tde* *(>'' ... I .nlhiiniB F {*>indarfij*lii .l<<d ... * *TPw>> FIM her *| l f''^A ... Had i.. f I.MIM i

-i.n.ijaiu !/•; **iihtHm*** (Ltanaew) Vahl w* «
 * B. Clarke) .in.! In; F. *rigidiuscula* L Gwfa
darajahi: •Ind In: F. rw^ow K. Gowindarajalu: •In*
 lit; F. *scabrisquama* K. (iovmduajulu •In* fin;
 F. if **Mi ifilhlftn** 1 (MVuHlar.ijalu: • hui: Ki. ID:
 F. ***** C Λ Clarke; F. rfrisow & **Gewmdarajalu**:
 • liul; In; f. nwwpi I. l.ovindaia|a!u: »Ind: Ki. Ha
 F. **ttwmmii** Be* F. (°rf,/o/.« E. Govindarajalu:
 • tad In: A. fn,W«rAv« K. Hum.,; F. *uliginosa* Steudel:
 • Ind; F. iiiiflfiifi ! GovindarajaUi et Hemadn:
Had Mh; ft ,W«toR B)
VaW tar. Makteo ^*f*8^«f
(Unn«u») V«hl w
 •ofibtffii (Rcttiu*) v..hl v.ii

1. Nun o

2. **InflorKenoe conrobo*** ^,iih few
 3-6 mmlonjupatdemlewwwtahHne⁸¹ blades
 f. *dipsacra*
 2. **Enflore* em <- d • rfnfle W nta<l " P * ^1P * dc,**
 51 ^ mm lonr l.m induced w btoddeu *e«i«

1. NuueffinoUal »«ho*«cu»« (not paiaBeW

5. **Sdgnuu 2, «yk Rtt, owrffi haiiy; B« Mcowe* n**
 pl.ini«itn\fv. ulmin-%^iir;tliifv«'« halJOWI
 4. Nut with transverse ridges cauUne leaves
 to Wadc-kw .heaths; inflorw <>, < id *>gk
 5. **Spikclc. rrect, el,**
 2-3.5 mm • ,. nut with
 5. **Spikdei I oodiBnf. tmAA w bro**

4. **Su, wll»m. VMMM IM Ii' ^- I ttIHne te«W will,**
 oi without. 1-ui.v inflorwc«e« pMkuten

6. Calyx strongly flattened, 2-ridged
 6. **GnliMMCim»girfi>**
 7. Glumes
 8. Upper flow* bearing g>um« «U««« «
 ^ u t t with 1 »fc. ..l-n,,,-,-

TV

lilt \\\

7. **Ghimei <An<- bo ocbfe ulai. it-^ tban tww e .t^ k>g**
 wide (inflore* em a muaOy <>! may sljjVci

9. **I igulea iini<<'oi bainm meabranom**

10. **Niu imoodi throughout**

11. **Gtumes ^abrous; bnfioretence bead-tike,**
 with 1 or 2 (3) spikt-ti-> F. *thtxnoids*

II, **Glumes hairy, ;n leaf in the apical part;**
 inflorw si cm (- corymboae, with S or man) more
 sjakets

12. **Lowei theathi leatbery, tbinng brown DI**
 reddish-brown; !).tdcs of cauUne leaves t.tlicr
 ihord up to 10 * in kmg, 0.5-1.5 mm wid
 famolucral bracti iktually ibortei than the
 iritlni glumes pubescent F. *femiginea*
 1*2. I,OKI! ^I^(*.th^ liri b,i< (o!i>, Stfaw4tkc OT
 brown; blade* oi caulue leaver long, ap to
 I i rn kmg, IJK-2 HUB wide; loweM involm l.il
 IJLHI usu.dh oveitoppiag flu- infloescence;
 glumes dense) hairj F. *siebtriana*

14. **Am wiili kmgitudinal stripes on eithe i**

13. (.lunics wliollv pobcacent, clothed with short
 bain F. *pubisquamn*

13. **Glume* gtabrom**

II. (ilumes white at base and ahmg die margins;
 Min bearing warts F. *aiboinridit*

14. **Guinea lim\Mt with green keel and hyaline**
 margins; nun without warn

15. **Spikdets i-IJt (-2) mm wide, somewhat**
 angular; glumes BMSnbranous, 1 "t-innn long,
 tharpl) keeled; style 0.7-1 mm k>^: nut
 0.3-I mm long, &.5-0.6 mm broad, straw-
 coloured

1b. **Leal sh< id bladei glabrous; nuts**
 with !>> longitudinal stripes oa eithe i (ace
 < ufani F. *hisumbHlaia*

16. **Leaf sin .nil- and blades clothed with**
 bnsik bain; nuts with \>~'M> longitudinal
 stripes on eithe i; cu bw tsjcd

F. *htrtutijolifi*

15. **Spikrii-i\ -i ran wide, glumes**
 chartaceous, 2-3 (-l.r») BUB long, oiist tin l\
 b d nut 1-1") earn long, 0.7-1 mm bn
 whitish oi straw-coloured, rare!) brown

17. **I-it li fn e it! nut wiih \2 or WN longimdi-**
 & tom ^i horizontally arranged i
 (appearing a* pits); usuatt) perronal; tipe
 oi out minute, less than > 8 mm long

f. *dichtoma*

17. **Eat fi x of nut with 15 oi move longitu-**
 dinal towi of boriiosjtatty an unged ceHs
 (appearing as pits); abans innual; stipi
 tint distant \ 0.3 mm « more long

!• *tiumrvtata*

18. **Edges of dnc** nut ornamented with a row of white, club-like appendages (dwarl annaa) with filiform leaves, iquarroae >|ukf!<ts und longswraed ^iit

IS. Edges >>t die ma without •pprndaj
19. Spikckru t-4 mm wide; rfaiaomMom peren-
20. Nun td ... ryWndrV :!
(longer i than wide); * ulm !^a^re with bhdei
/'. rymuto

20. Nutt milky jreSow; ipH\eleta globotc or nearly so iboul ;ts long a* wide); culm leaves widUXM blades f umbtUaru

19. spikeleu 1-13 an wide; wtuMmumdb
21. Intlon - once a head-like htttei rf teafie >|iit lets; nut hi usually obovoid or (^orbicular, ±0.5 mm long asH! wide f. antnlea

SI. Inflorescence of nun ... rdspikeU
A eBlptoid to obovoid, oanaljf more than Snnlonf

22. tase of style fruge 'I with long, wti in, pendeni hail covering ti tea« the uppei h.iif of the nut ftfiumM

22. Bate »* mir gjUbraw «< adcroacopicafij haky
23. More or less ha rfdl ... dn> tin<c blades; sqrk bafcyat least as 'tic it>

23. Glabrous; stem ha<- clothrd with I • 2 bladeless or very shottiv I—limit sheath; style glabrous F.ffri/pihn

3. stj^'n11 ... 3, rarely in some fluw- ... 2, style 3-ang Ird. usually glabrous; nut 3-4 ded or tangled: gtui ... i ajirai

23. Glabrous; stem ha<- clothrd with I • 2 bladeless or very shottiv I—limit sheath; style glabrous F.ffri/pihn

3. stj^'n11 ... 3, rarely in some fluw- ... 2, style 3-ang Ird. usually glabrous; nut 3-4 ded or tangled: gtui ... i ajirai

23. Glabrous; stem ha<- clothrd with I • 2 bladeless or very shottiv I—limit sheath; style glabrous F.ffri/pihn

25. GtwMN denseh reddish gland dotted; h of blades very narrow, acedkvtkie or almost so, 0. • O'l m n vMfir, spiketets up to H.{h>wrrci but usually less

25. Chinses n^t g tand-d ... ipikelet* OSvM)

25. Spikelets 3-7 mm wide; nut 2-3.2 mm long; 2«. Inflorescence with 1-1 (-0) large spikelet

27. In! Inflorescence usually of a ^in^lr termi al spftelet rarely 1 or 2 peduncled spikelets; spikelets glaucous yellowish to yellowish-green; low slender plant with culms 3-40 tall, 0.3-0.8 mm in diameter F. ...

27. int! Inflorescence « (2-) S-4 («4>) p ... \piki t< ?s SO aw coloured to brown, tall robttSI p!«"11 wkh culms 30-80 tall, I-S mm to diameter

26. Spikelet is 1 '«< nun wide; nuti 0.6-1 nun hmg: (tnflon ... with riihrr | or 2 ... with wrrci " to numerous spkceji

28. I ... I mm wide; inflorac ... with h = W al lonumri ... spikelets Lt; culm 10-55 cm all /' ...

28. Leawea 0.5-0.7 BUB wide; Inflcwetcenm wi or 'J ipSt ... kIOan till F. ...

24. t.iumr* ipfarsfly sirmnged; ipifcefc ... angular, not strongly flattened

It. Leaves with a ligule; ligule a row of short hairs or at least • dbdntc line t» between the she *o and bhvle

SO. Spit< ... very small, 2-4 mm long, 2:1 »» wide; gWinWCI i 1 nun loaf; style 0.3-0.75 m "i k»Og

StiSpflu ... larger, at least >nBnloMg» U-SL 3 mm wki glumes 2-3 mm long; style 1-2 mm ang

SI. infl> ... compound, with many spikelets, cud ... 2-4 mm wide; glumes 2-2.5 mm long; nut wjti ... 0.7-0.8 mm long K ... p

Si. In! Inflorescence simple oi tu-,sl\ so, with fm spikelets; culnu 1-1 '» mm wt.ir. glnnir< 2.3-3 ma long; nui <n>w;lhrt-4.^ wmi.laiiM

29, tx-ave* «Ub ... a ligule ^Itr.iths rut the DMM) ... ulu*«th paMsng »nt*» H;<«<»

it. Culm !• ... bearing H. 0-develop. • blades or AV rhr ir.nrs hj^1 (ctllflf without bladeless sheath)

3\$. Infto ... a cluster of 3, free spikelets / ...

33. In))- ... corymbos, of many more ... 3 spikelets

34. M ... dar • brown M blai k; H ... i) ... a ihit*« ... leaf blades and g^1 ... F. ...

S4. Nut* psJe yrllow. stra ... coloured nrwhit*''' spikeleiK wilitary or pairs I tm» »f» " ... leaf blades and glumes acute

35. Leaf blades 1-1.3 mm wide; some spikelets paired; fttmCS 1.5-2 mm long; cu ... 10-50 tit Mil F. <rv««e*i««

35. 1 *.<! Si,irir* I , »ttl w>|> *pikrh~<* M>tttAn. |htnw ... 1.0-1.7 mm tt«nf»

32. All culms ... reduced to bladeless sheath; at least, the upper ... ilm k<4.< sjfl f. dmttifiy**** K «"!

36, AH rtitm leaves blade. li M

37. CMm iwtm\ 3-sided or subterete; nuts with
rows of cells on each face f.umMlirit

17. Cbtm (4) 5-ang {W. winged or grooved; nuts
with 4-13 ru* of cells on each !4(1,

5U. Keels on the glumes 2-3-ang b
uncaring ih -nd 0.5-0.7 mm

E* .irmriv <rtj wth 4-6 vertical rows of cells
on each face; tolim dcttdy tufted F. apyfla

M. Keels on dM |lum<< prooUncoi gMng
long, smooth or slightly warty, with
rows of cells on each face; culm usually in a single
row along the rhizome

38. Culm usually hairy; spikelets 4.5-6.2 mm long;
glumes 2 V* mm long, with keel projecting *-> J
nerves, anthers 1.5 mm long

F. *umbellata* subsp. *pentaploca*

M. Culm* uUfanwa: •0*'^^1* 3.5-4.5 mm long;
glumes 2 V* mm long, with keel ending some-
what b, k» •!,- ipeK ^ h r y 0.7-1 mifl bj

F. *subumbellata* subsp. *umbellata*

M. Lower i iilm vAYrt with 3-5 developed blades

48. Spikelets ovoid-globose to almost globose,
1.5-3 mm wide; culms 4-sided, below the inflores-
cence flattened with 2 sharp edges, leaf sheaths 1.1-
1.5 mm long, with a sharp dorsal edge; keel on
"T»Wy - *umbellata*

40. v , 2-1 7,..m wi.tr. .Ulim^,urh
Spikelets ovoid, 1.5-3 mm long, with 2-3
single I. hrl«v, the Lolta
winged, keel if ihcjhht «\1"

glumes extending beyond the
apex as a small mi

F. *subumbellata*

Stemly rhizomatous. Culm
1-30) cm king. 0 5-I "i"l hkl
3-or+*nj]feil Leaves tt^lh -• tctii"^\
ihntht«witli 0»),....

Info
lull, i*Ulr. Ji

Typical, oblong
3.5-4.5 mm long,
to acute, warty
2.5-4 mm broad, chestnut brown above, sides usually
without nerves at base of spikelet becoming many-
nerved above; keel green, with 2-5 (-7) nerves,
Stamens 2 or 3. Styles 2-4-lobed. Rat. less than 0.5 mm
wide, scarcely expanded at base, hairy above. Nuts
obovate, with obtuse edges, broadly obovate or orbic-
ulate, 12-111 mm long and wide, sometimes broader
than long, with I, 2-8 wing, transverse, warty ridges, yet-
terose brown, shortly stipitate.

Premital. Open wet and muddy places, marshes,
rice fields. Wii *r*d rhrt

49. Culm 4-sided, below the inflorescence flattened with 2 sharp edges, leaf sheaths 1.1-1.5 mm long, with a sharp dorsal edge; keel on

glumes extending beyond the apex as a small

mi

F. *subumbellata*

40. v , 2-1 7,..m wi.tr. .Ulim^,urh
Spikelets ovoid, 1.5-3 mm long, with 2-3
single I. hrl«v, the Lolta
winged, keel if ihcjhht «\1"

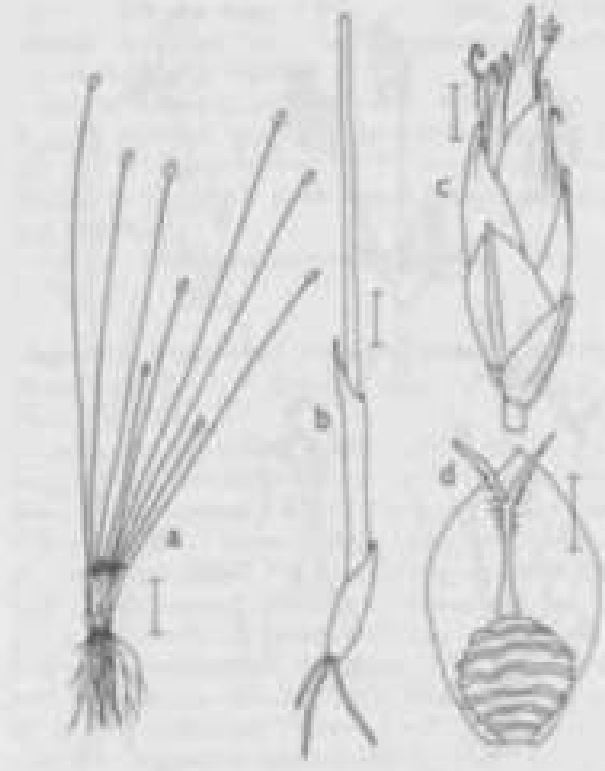


FIG. IX* *F. umbellata*. A, whole plant (2 i m); B, base; C, spikelet (2 mm). H. Hun w,ih
(glume < 1 mm)

(T«u)/H«l InHomil.i r« Mtttdng IO thf
Philippines Bar, < ^ lml \K \v f.|.t>*. Up. M. Ki
Sk. Wb. 0-1200 m.

F. umbellata (Rrum%) Vihl |im hiding var.
reticulata Kent, vjr i««mrd<<ibf* Rotilum, fu
sup. (Trimen) T. Sorensen] Fig. 1

Ittn <im*rh lultrxl. vrv tkwlrr. irurnmi, 2-)0
(-10) fin long. 0,5-4)3 mm In diimrlti. haii. I
obovate n i r II-!) IOVMI in* >iih ii (iniv ligiilr j lMt-it; Nwtr >
filiform. up m I' < > m long. M>T(h \ wry. w h h; iir
nurgin*. Imnlutial »M*ri* up H» A. tomr fmriippiiift
the inflorescence, the .HJCM k-^fhkr. up \u 4 rni
lonR. Inflon hi« mntifl-lllr.
Sptkricu cm>id tit *k*i|[iv-0'void₁ X-* t-7) mm long,
d.tui 4-1.M mm wktr. (Jumr* ihinh mrmbran"
t»«fc, up 1« IJJ mm long, p i. hmwi io p
ptri^imi, iklrt wirtuxt iK-m*. nuHftiru hy*UiK.
ptilatr wilh si *hi>n nm [unmin
3-nerved. S«mtii 1 s*yU% *««Uh m long
hairy above. . . . ylc bur p
hait* Nut« he •
inf. smooth and shining, semi-transparent iicni. bordered
UIIII r«icu Ulr.



FIG. 110. *F. papposa* s.l. a. flowering branch (1 cm); b. leaf (1 cm); c. spikelet (1 cm); d. fruit (0.5 mm).

Annual. Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs.

Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs.

F. papposa s.l. C. B. Clarke: Fig. 111

Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs.

Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs.

F. papposa s.l. C. B. Clarke: Fig. 111
 Like *F. papposa* s.l. but the ligule is fringed with hairs. Like *F. papposa* s.l. but the ligule is fringed with hairs.



FIG. 111. *F. papposa* s.l. a. flowering branch (1 cm); b. leaf (1 cm); c. spikelet (1 cm); d. fruit (0.5 mm).

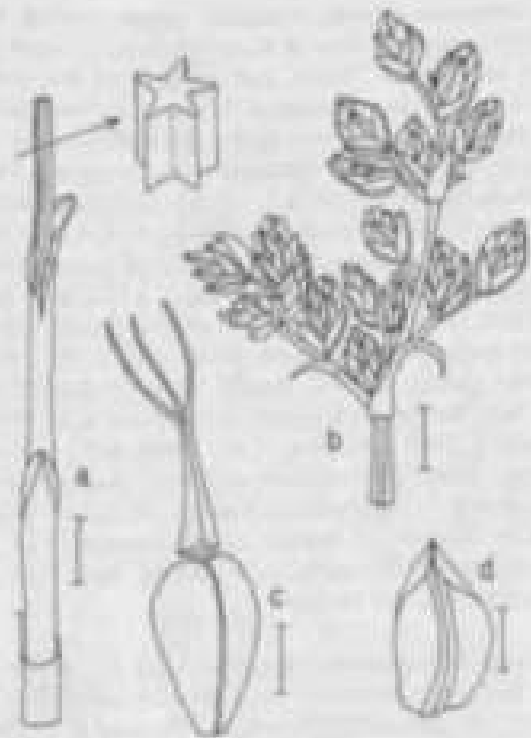


FIG. 102. *Ai<feiu>/i «Wfa a. btut at <ulio ('i nun) ... ten* ... b. ta/tenmwm ... MI»; c. fnui (0.7 mm); d. glume (0.5 mm).*

0.6-0.7 mm *Urn**, *demxfr w*m.* with i 'vertica' «*• "I <*lb on *atli fair; cufan* dourly tufted (Ter./ If, i, (,,,,, ,J ^ .1 s.Wri.4. In Sumatra tw (icijhp* ninhnfn in Ania: **Iml** Hfh 6 500-2000 m.

Flabrythia argentea (Kuntze) Vahl f % 199

< U/BH dooieJ) tufted, very slender, scaccens. -10 1-20) cm 1 ... Hjiirur.i. M5-0-7 mm ... Ugate ... Q3-0.7 runt wklc, glaucous, hain on (he mtik< ... t-, ihc U>wrM mmlt ... tnlitvrtir ... diameter, whh (2-> 4 10 < 'o ... BpOwlcU liiMill <>W(Mie**< *1 >^ ... J-JO mm Jooff. **IJ-JJ** mm ww*r. rJu ... ± I mm ... ro*n. ttttuitUir Mill * ihrtti vacra; 1<l jprtn, St. ... M>.7mm ...

edges, ± 0.5 ... i litrij(, U.4-O.i mm widr. pale yellow, smooth or slightly A.U1'. M mi-tfmaiptraila ohtciiJ ... reticulata, the i Hi •tipn^tr,

Annual Gram in wrimpt pi ••• JC the drying ctlgni of op'm wmiar. In dried-otil ii«« Rchb, oiim <m n ... jdl »nd in damp holltmri by ilic Ma ilinrc. li |g nut exclusively i wedjiiij j>U>t *ta& a (bund m gnkadsadi •nd Miiulndct.

[O Hd/Tcn], IndvnuUvst i Ban, Cey, Iml: Gj, Kl. Ki. In.

*Ftmbritytu bt*uml*Uota* {Pan ... the bull |f jxtUrutiu iKovdiMichi Kc4 v i' difhoUma •rtinu <;. B. (J;ntr. turn Vihl] Kiv. IM

< tUagi .If-nwls Mfted, S-vidcd. (t.5-) 7-10 i-2f>> i:m loogi O.VI .2 mm ihh k. VIMKMII, gLihntut. ieja IJM .JLI* WH>M: liM-mbTiiltfui*. I-J t m ItHlg, him, i4JW-Cqkjwed ui brown; li^uic J driur fringe uf Uitrtrt hain. htiwfrt ffj i or HMnriiik i folded, &5-I mm Wklr. with trvrria) ctpul Mrrct, It^ln frees, |lilwinn in t>"i* •ent, wals -I a* iht- J|HX. Uwoh* i>l InJ*u 1-1, }un> M ilir hue. tJir ... IIMI in lightly mrrtapptng ijn mltn. ... rytthCMe, rtfelj aintplr at i ouifKHind. ... ui iti iintirt-likl: i luvttiv 1 f~4l «mkrtri»; piinury r>>> V-lu SpQ^eU <>fiuiv dMonf>o>rid to nunxmh

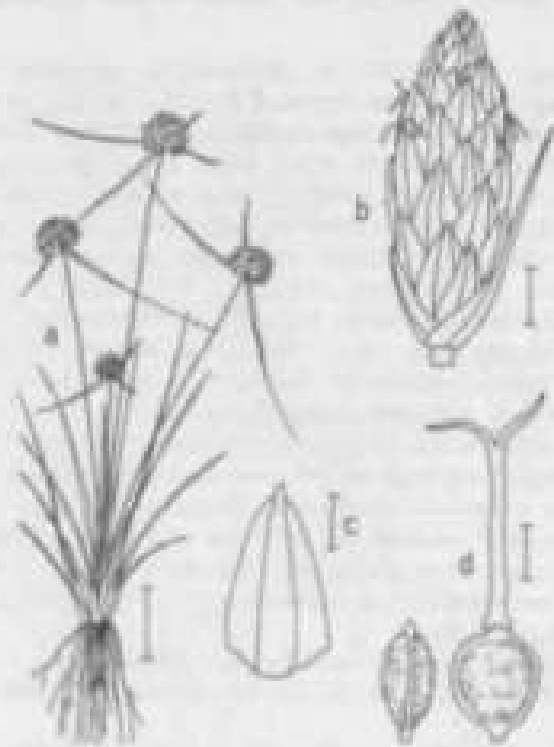


FIG. 111. *Ftmkntifki itgmtHm*: 4. whole pUni i2 m)t h. spikelet (0.5 mm); c. glume (0.25 mm); d. fruit viewed from side and face (0.25 mm).



ffcj, 194. *Ftmnitthi. tt,mmi>Uts* a, *h>fc plant {V (m)}, b, spikelet (1 mm), c, fruit (0.5 mm), d, cross-section of base of culm (2.5 mm) (mm).

oblong. d<>rtrr M> B *MlowM*ti. aubterrrr angular, acute, >Unw tw< WM. X** j 10 mm long, 1-1.5 (-2) mm wWfc, rachilU cktoffang b fruit Gl unu membranous v browti acute, acum. : 1-1.1.H mm long, 0.7-1.2 mm broad, glabfitut. »wlr* without nerves or iibiruirty tirrwrt. !<W>imm, margtn\ beak, cap p-cUtr tejth a UMHI mwiu: krri ihwp. gtrrn, 3-mrmL Stamens 1 M>*T> Itat. Wi mm long, 1 left, 1 nrv above. Nts DNOfttli WHMNQ W DnMGLJNBvOt (1)..VJ^< mm long. 0.4-1)7 m n broad. « U lotgitiMinal <>ipr» on rtihr Bk, straw-coloured, outer layer transparent, shaggy stipitate.

Annual. At the rdgr> «il drring piHiU, in t.n bushes, springs along stream i and rtw n OB <and% nwt ban. It is also a common « nd of rkr Arid* Stn»H plan tt mat itieiablg *F. ...* i but ihf* b<w n<u with lanKitudinal stripes, large plants may resemble *F. ...* but they have spikelets and glumes which ii ur MnaDrr <nd

(D) ... (ir.ifw < and iubtn)jf*c» Cey, Ind. lit. B, K, P|Rj. S I I p Ut. UMWO.. in Africa).

Fideiathyia dimorpha (Vahl) Kunth (*F. ...* var. *...*) (W) C. B. G. (tkc): Fig. 133

Glumes creeping, woody, 1-1.5 mm diam. Culm solitary, slender, smooth, 25-30 cm long, 0.5-1 mm

wide, thickened at base, ... and sheaths brown at the base of the culm. Spikes absent. Leaf blades needle-like. ... tout half *» kHift a* tb tuImv 0.5-0.5 mm wide. ... wrfttcml bni ... 1-2, needle-like. Tram UMHTUT ihin to twrti)ip(iif the trifl«M(nrco« the IOTRM up iti 4«m k«OK IritlmnrrtKT rompoumt. 1« - with Hunt *jnkrlriv SpikcVt* **|uu|. *IWIMIR ... J * H tmrw, *i ... itwl. fewflowrrrd. +5 mm long * 1 mn> wide. Gl nfiw* in J ram, ihmh membranous, ovate-lanceolate, acute, ... rnnatr, 17-4 mm long, 1.5-2 mm broad, llabnwc t»»in with in) ... without nerves, leaf sharp, ... 8*HMT« ... 3. Setae 3-lobed, glabrous ...w<jn for the Khoffth- hair pyramidal style base. Nts 3-lobed, ... iih corner <dc^ obmwrtd to obkmf .^<...NI 0.7-0.8 fon tot*. 0-MJ.7 tr»rlk*fl<h to ... «*n. warn. fmd> tnwwrtr b»»"i *arty stipitate. Perennial. In swamps and marshy ... I Fit. t«H »! ... focr<tis i ... locally abundant. (Ten/DieU) N. Australia, S and SE Asia, Cey, Ind. M. Kt. Kg, M! Tu. 0-1200 m

... glumata (Retz.) ... (*F. ...*) var. ... 1. ... *... Kuit. ... tt:i ..i tLtw- ... Fig. 133* " *... Cutni*.Vmrh tuftrd. qtuiti* angular at the base becoming flattened.

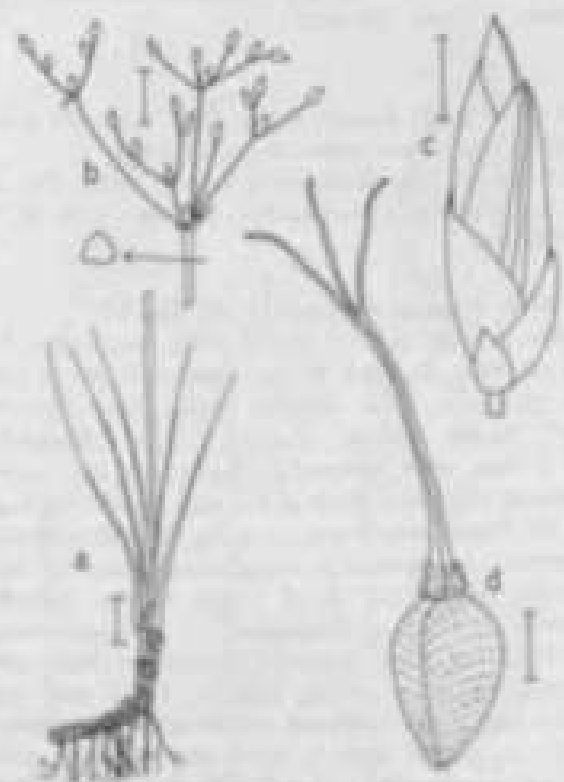


FIG. 133. *Fideiathyia dimorpha* a, base of culm (1 cm); b, spikelet (1 mm); c, fruit (0.5 mm); d, cross-section of culm (2.5 mm).

fTrn/Hell. J*am rpsic itlm, Bin. («» Ind. Paki An, Ap. As, Hp. KJ. Ki. M| Mb, Nf, l'i Sk. Tn. Wb. ik-11001



FIG. 136. *F. amptamitij* (a) base of shoot (1 cm); (b) spikelet (4 mm); (c) spikelet (1 mm); (d) fruit (1 mm); (e) flowering branch (1 cm).

riwtoiljfc i WM^MUIIIJ Kunth 11 tonntfiens Thw. <> *F. amptamitij* M w . Jbau»M<tr(IV t bike]: Fig. IVI Like *F. amptamitij* tun Ctffatt IWIIIWWL 1-1 'i mm wide U ihr d.ji. U A *)ir;iih'. i<tiMilt-d on ibc hark or slightly' kerled; iraJ liUdn lumtw, I--! nun Wl(U ihr cas line octet mnrtimci mmii ntlinvil, tnftott simple 01 iiru/K vic, jllinnr* br^rr. (Z.2-) t,S-' \ mm long: t 2 mm vtde; •niben * U mm '<»<< »»< 1.6-2.5 mm U»'K' " «l MiiHkili, larRrr, 1-1.2 men ±0.7 mm * i'.

PermiHal. In wn y-iiwl-inri*, mramp*, ringing Ukr nsrgint; oAca donlmni and Forming large i luinp*.

Tri i iii-ii s Aftka, MKii|p**r and irapkal AaU: Cev. Ind ISO tSOOm

F. crystallina E. Gevink: Fig. IS7

tnlm% rlrnyk lufird, rrrct. rigit, 10-20 cm long, 0.5-0.8 nidi in diameter, W angled, tuiHiii Leaf sheath in YSMC. ol i ilm bL«<tri»*. ru|v brown, membranous >'l.<dr» Ibi. nr^rh IU Wng u thr iilmv I-IT.



PIC 137, *F. crystallina* (a) flowering branch (1 cm); (b) spikelet (2 mm); (c) spikelet (1 mm); (d) fruit (1 mm).

dm u pan. 20-90 I (20) cm long, 2-4 "J" wide. (the back, the lower Leaf sheath one* hbrk<i; Ifcule a (fan* M^HF of about hairs bUJe* Hit bHow. beoM^BI * OM.... up, l-M cm l. JK. J-ftnwJ «'*** Bhtaw* abruptly acuminate. loMlucnl hnwi 2-4. mart) MM pirIR ihr mil... '»' l'wlt '.* CB long liui crescent, , uffH>lrs,h compouod, l««« »» primwi "iri fbilewd. ik> •" 7 <m Ion*. Sp taiy ^,,1 luualtj *.<r>r rluOmd. ot^rtijf^ did so narrowly oblong, angular. i. »• ste. iiii Imiwit, S-B uttti long at anthesis also n,!, illa elongating ... rruii China membranous.

• 1 ft mm bnwd. *horOt ha- (the s d" wh.' and WUbottl mnrt. nwq|in> (yellow; leaf straw-coloured, glaucous. ^tirrwl SumeH ^ St>u, 3-angled, 3-lobed, 1-1.2 mm long. Numbel, broadl * d 0.7-1 mm long. 0IMV.7 mm br««J. *)ny or rmth « " « * • « * or straw-coloured becoming brown later, sheath rugose. Perennial. Grows on river banks, swamps, rtee BeMi but.t »• not confined to wetlands and ** common OB hmk JIMI on «illumed <* rftawW ground.

wide, *tiff. 7- to I.ViKTvctI. *M* ur» gbfarom, roarfjm u...
 eneri tuid tni»>itt 'lii-nmhoiit inviitiKTal |VMI% 2 ^3),
 IHH m*»i'ij»iHIt! <"* tntI«*r*rrw<- teflon - (!««-
 pon ed, constracted, urnhrMilc. *««th 10-2S tpil. det.
 MJII< ,1 S)>ik«lrti wiliuiv l»l in pain, narmrly ovokt-
 t LlifHoid. M 5 intr long at nthcalv, becfininfj up u>
 8 mm l>Hn m lrmI. 1-12 llllll wiftr, 6- u> 8-flnwrcd,
 mm bfwri. eODTtplcaotalj .m^iUf hciuuur ui OM
 itiiicirni LrrU GiMBMH m/n*hr <**4ir, I H-2 mm
 long, stls. l'imn, ^lif>miiv acute, tidei WUIMHU nrnt,
 mi». *Stylis* 3-lobed, glabrous. *mfie*bate pyramids
 long as style.

0.6-0.7 mm kiftg. *0.3... tI<*m, shadly-
 yrlkw. vrrtkalh; %ndgr«) , v ... TtK uiptutt.
 UIMI SewHtaJh wrt pltcn, nanhn, UMUI\ on

(J) Ten/Hell. • Ind. An. To. 1000-1000 m.
Fimbristylis gymna MI H Brown I* *glomtmtm* Nro,
F. spaldingii i fUHh. t ^fctmi Nrn|: h.«. 138
Rhinnes *h«m (iilini rirnrK titUrti. HattrnrI 10
 Vtidcd or %atrniMc*. lft-Mi on hm^ t-2 mm



FIG. 1. *Fimbristylis gymna*: a, whole plant; b, three spikelets; c, glume (1.5 x); d, glume (1.5 x); e, glume (1.5 x).

numerous, leaf sheath... hrctwn;
 figure absent. blades flat or channeled iWIhris M...
 thwtr (tun ilx ,nl ... 1-2 (-3) mm wide, scabrous
 along llir trMTginv ^y sharply acuminate, lvsula ^
 bracts 2-5, short, 0.5-1 cm long, usually not
 ping th- inflorescence. Inflorescence compound,
 hxttr io vrn drnar. mcnnimr* «Jmo< i>...
 primar* r*y» S-H ^... mn «» <
 *ng ... M» mm to<l| ... 1.2 mm wide.
 (Humr* membranous, broadly ovate to oblong-ovate,
 obtuse, nlum mk(h. 1.5-2.2 mm l<m^ 1.2-1.7 mm
 broad, R ... bttwn with P
 •Hit mwgmv krr) m prominent, 5 or 6-nerved.
 .MM |S M*fr* BM '.. i..i^I" ...
 glabrous. Non ... V»wtr.l absent.
 0.6-0.7 mm long, width ...

to black, shortly stipitate.
 Annual. Frequently found by the sea in ...
 lil'Mtvum! beaches, wet dense ... i.yw*. ri^>
 and m». dly places in mangroves. Inland U Ri
 along the margins and embankments of ponds, pe-
 and watercourses. It has also been recorded near but
 *prirtK« h i characterized by having a dense rosette
 leaves.
 (Ten/Hell). *Pangasinan* X liwl, I*«t An. -*p
 Go. KJl Ki J A, Or, To, Wb.

Fimbristylis densiflora f Gunderbach Fig. I*
Rhinnes absent. Culms densely tufted, 3-lobed,
 ribbed, glabrous, smooth, 15-40 cm long, 0.5-0.6 mm
 wide. Leaf sheath in-fm-rtvf|. (*lspely truncate;
 UHlt* flit. S-l6r<i km«. 1.7-2 (-2.7) mm wide,
 XU|ou< ... «r«brh) Bl up L
 to 1 mm Mi 1-S-5 -|J|
 lax. " ^
 15-30 spikelets ... iv pni
 to oblong-cylindrical, subglobose, acute, ... i brown-
 3.5-5 mm long in anthesis, elongat. ... 12 mm in
 fruit, 1.5-1.4 mm wide; rachilla winged, diverging to
 (run Glumes membranous, broadly ovate, rounded,
 ... 1.5-1.7 mm long, 1.2-1.3 mm
 ... without nerves, margin
 hyaline, lvsr distinct, 3-nerved. Spines (2) 3. Stylis
 3-lobed, 3-lobed, up to 1.1 mm long; stigma V On*trr
 than ihr «vt*- Nut* 3-lobed, obconical, t 0.8 mm
 u 0 mm htmitt ... <u ... h i pale
 straw-coloured, shortly stipitate.

Annual. Found ... In
 (Ten/Hell). *Ind: KJ (Atakapas, Muletef,
 Pangasinan).



Fig. 144. *Ficus stipitata*: a, whole plant (1 cm); b, flower (0.5 mm); c, fruit (0.25 mm); d, branch with a fruit; e, branch with a large, flat-topped inflorescence (1 cm); f, branch with a large, flat-topped inflorescence (1 cm); g, branch with a large, flat-topped inflorescence (1 cm); h, branch with a large, flat-topped inflorescence (1 cm); i, branch with a large, flat-topped inflorescence (1 cm). DMJ

Mr u M v 4 - * * * IW - * fcr lct F « . I »

Rhuomr Jthvur mc»u rilmntt. «uJm» tutIU' y or ruford. rigid. * utr h 4- «r S'ugW-d. IU-3& cm hmg. 0.5-0.5 mm widr. the baar ckithcd wah I or X ahtMV blarlRH thrachft vrji tw-jMhi oliiidikjl; 'ift d n ihrtu. leaf bhdt s fbl, rather rigjkt cunrd, km lhan haW; a long «» the i uittM, 1-5 nun wwlr. ahrupik m IIIIIIII I I m r g i n ««hrifl tutw m V the tip. Invca%Mi«d he JH * 3 • w 4. l i c r i c h l i k e , m u c h s h o r t e r t h a n t h e m i l l d r r a c r w r . t h e t u t o r * u p t o 2 5 c m b a g I t i l i r r a m p o u n d , n v r y l o r w r , w i t h t r v r r a l I D n u n ? t p i k r J c u S p k r l r U i d i n a r y < l a n g a e v a r . i m n g h I U t i r n r d , H - t u I S - t L n w r m i . 4 - 6 m m b o g ; t 1 5 m m w i d r (* I I M I M - « m " : N M V i h u i K i m e m b r e f l o i i < m a t e . J H n t h e s e m i n u r y a p e r a t e j u s t b e l o w t h r « p c » , I 1 - 2 (- 3) * J I M I I ! - 1 . . . » 1 . 5 m m b r o a d , g b b r H i * . w i t h u n w h n a i r n v f u . w i t h d n n w k r r l < h v > S u m n t t I (1) . I n S a i g t r t V I r l t K J a e r o w . K f V N H T a a i ' i p [i n a m i a t m g i n a i m m h t h o r t t t h a n i B c a W * » • • 1 M i « f a - l ^ a l i w n a a V a c o n d e d t o n a r r o w l y o v a l o i d , 0 . 4 - 0 . 7 5 m m l o n g , 0 . 3 - 0 . 5 m m w i d e , w h i t e o r y e l l o w i s h , w a r y , s h o r t l y a p i c e r . A n n u a l . I n m a r c h e s a n d m a y n a s s i d e l e d . I n a n d i n g r a s s p l a i n s . L i k e F . s u g i n a t a (w i t h A I M)

Annual. In marshes and seasonally flooded areas and in grass plains. Like *F. suginata* (see a with AIM)

iperlrt) btit jjun.il with fibuHii KHJIV |<J1' .. lades 1-3 mm *ni c. spikelets ± 1.5 ana w«|»:- n IIIInr11 *****? in 2 opposite rows, thinly membranous, waxy. 1.5-2 f—23) mm long, rmitutrh jpt<nUtr Jii*t below the apex.

(0 Ten- / Hd| S& Aw Bur. IIMI An

***Ficus stipitata* (Ficus stipitata) Vthl: rig. 1-11**

Rhuomr Jthvur mc»u rilmntt. «uJm» tutIU' y or ruford. rigid. * utr h 4- «r S'ugW-d. IU-3& cm hmg. 0.5-0.5 mm widr. the baar ckithcd wah I or X ahtMV blarlRH thrachft vrji tw-jMhi oliiidikjl; 'ift d n ihrtu. leaf bhdt s fbl, rather rigjkt cunrd, km lhan haW; a long «» the i uittM, 1-5 nun wwlr. ahrupik m IIIIIIII I I m r g i n ««hrifl tutw m V the tip. Invca%Mi«d he JH * 3 • w 4. l i c r i c h l i k e , m u c h s h o r t e r t h a n t h e m i l l d r r a c r w r . t h e t u t o r * u p t o 2 5 c m b a g I t i l i r r a m p o u n d , n v r y l o r w r , w i t h t r v r r a l I D n u n ? t p i k r J c u S p k r l r U i d i n a r y < l a n g a e v a r . i m n g h I U t i r n r d , H - t u I S - t L n w r m i . 4 - 6 m m b o g ; t 1 5 m m w i d r (* I I M I M - « m " : N M V i h u i K i m e m b r e f l o i i < m a t e . J H n t h e s e m i n u r y a p e r a t e j u s t b e l o w t h r « p c » , I 1 - 2 (- 3) * J I M I I ! - 1 . . . » 1 . 5 m m b r o a d , g b b r H i * . w i t h u n w h n a i r n v f u . w i t h d n n w k r r l < h v > S u m n t t I (1) . I n S a i g t r t V I r l t K J a e r o w . K f V N H T a a i ' i p [i n a m i a t m g i n a i m m h t h o r t t t h a n i B c a W * » • • 1 M i « f a - l ^ a l i w n a a V a c o n d e d t o n a r r o w l y o v a l o i d , 0 . 4 - 0 . 7 5 m m l o n g , 0 . 3 - 0 . 5 m m w i d e , w h i t e o r y e l l o w i s h , w a r y , s h o r t l y a p i c e r . A n n u a l . I n m a r c h e s a n d m a y n a s s i d e l e d . I n a n d i n g r a s s p l a i n s . L i k e F . s u g i n a t a (w i t h A I M)

dull btonn, S-10 mm long. 15-4 mm » side. Glinr* Hibchatucroiu. matr tit ctbloof, obtiHr. ^p1***

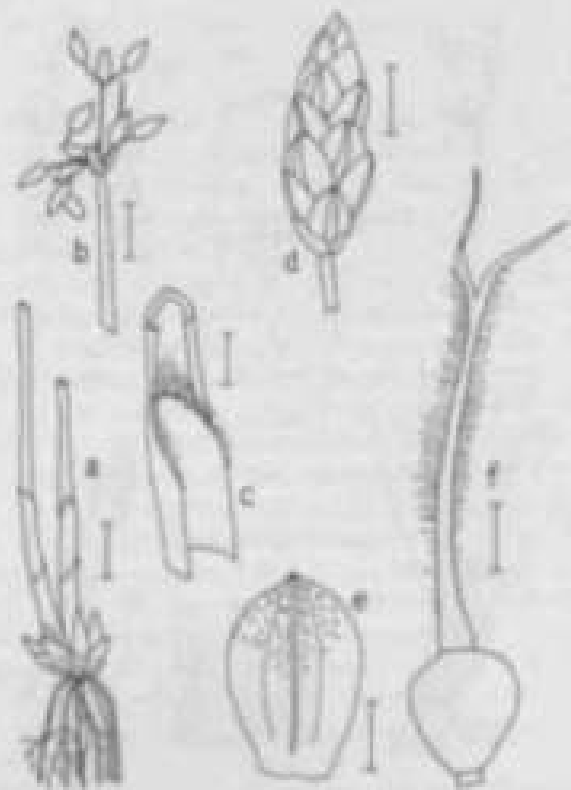


Fig. 145. *Ficus stipitata*: a, whole plant (1 cm); b, branch with a fruit; c, branch with a large, flat-topped inflorescence (1 cm); d, branch with a large, flat-topped inflorescence (1 cm); e, branch with a large, flat-topped inflorescence (1 cm); f, branch with a large, flat-topped inflorescence (1 cm). DMJ

3-4.5 mm long, 2.5-3 mm wide, sides ie.1 -hi own without nerves and rikordj bafcyai < >pt<< edge, the apical pan apprcMed-paUrvleu wfea h! baki M rarely lubglabrom; kc.i obwure. i-n-m-i Stamen S. SqrIM Bid We * . * ! .". long denaeJ) hairy. Nuts bkenves, MIIIIRIV Battered, obovate III iilkmf mMt 1-1.3 mm bog, <.7-l M broad, smooth, m>wuuuuniii la brown, ibardi

H untile! Aflu JMBB Miirtjini marsh> pi... <.th wii.lv CM . l.msh Mtt. H mav gr<v, standing m rriiaBon ma rod li wnwilwi Bound to ***** iMt) m-u the an rhe piiwHi in Bailiff ofiheuppa lull oi the ftemet it < m<<t daiftoaili i haw m it ! dote io / .ir^nrui Kunti* i.ui ii dttaguahed by nc reduced lr.it btadfli

ilivp i.ni PamrapkBGef, l'<t. i>k: \n, \p. iw.iJj. Go. Kl. K<. I k, Mh. f, R). I... I p. Up, < * . M W

Fluorid % . 130

Like; < ,>(< < * but niiHfoi'v l<l< («!... («-) 10-S0ca long); leal ibaadMi tubular, op m ^<>< 1(,)>>R: cauHne leaves whhoai bhdea < bhdei minuw; style

I.lining Animal In *ci nr swampy places, nui !).inks. edges of lakes .ind i>>> ftekk.

U-in. Bengal, Myanmai ..>! sK^asia: Ban,¹ Ilur. lad: An, A*. 0-700m

ttrnrfrwMu Mr>h/o/ia l (kwtodarajahK Bg. l

likr / bsumMlnl, hut OIOM Wded ami (.it riieadM and btodei <u.du-i ta biWj bain; leam .mi. h ihorto than the < aim l M «.» '«>>!. < > f¹¹¹¹ Hide); involtnr.il hrai-In muth UnMiri than the mu,,i,-s. |,s batrj throufbout; ghmei dbjbtI) longer (± 2 mm loaf) and iridi «> wogei nucra (0.3-0.4 mm lnun); nut! IUghU) bufei M) 7-0.8 mm lonf. 0.6-0.7 nun wiict. jfcttowUt-brown, «itl< 15-20 loii^ini.iui.ii Mripei on * .< (

Annual. In scuonaD) MM^< <]>I' IO Ten/H.i' . lIMI Kt [Mali|ij|Wtni Dtarkt).KU

Fhmbrutyti* UtUwhi f ...(. h.mil [* . lim n aUct, BOB , i , , mucus) Vahl, see Baker, i lottrnal ol dM Arnold Arborttua 33: 217 (1950) Hi l <

QtdnM .IUMMH limn iii< -«MK >] btaded kawes, deaad tufted.erect, 10-40 (-100) timall. i-t...> thkkbeiw, ii.ttirii.-<t. Mded vMth t ' . l' ! ! < < < < . wMJoth, iloied at IMM wui, l or 5 bladew riMBthi iv.<v.ii leave* (« tcawiofMrnIr riMOM) wnh dwadu HO i m long, ti> Miut.ii M.l<- splitting .«<ti>- < nka IRMM; Hguh bbdei equkani btfBMra% Bamwirri, 10-80 cm la 1-4 am WHII . MM \ » * bag M <' eaceedtag ti>- culm. i. utc tip c uim jimm-Mnliu<-d to hlade-

low straggling; riirmrtu laaTaHy Batasned with a sharp dorsal edge, brownish, the oiiiliir obUquid) litint ate, li'ahnc on the m.unin. gndttaBj tapering BEDVC n> tuiMlrlikf clongadon up to III mm l<m^, tin oppcnnoM ih.ih (S-) ti-12 (-18) tin long, the lowest ,%tale-like. Involucral bnca -' - 1. fiRid, brisilc-ltkc. oM rwfittppang die inllorescncce. Inlloreaence cna>pwmd Spikekn <i-Ai.ii>ui;H io globular, <!.>> 8-8 (-6) naj long, 1.5-3 mm in diameter, ruatj brown, denoe^ maty-flowered, (iliimr* ltrao.lK ovale, 1-1.3 in in IOIK. OCM B mm wide. bCIMotliprii. ObtOM .it ajM^X. incmbia- oout, reddtah-brown, the ride* with whin- byiHn* margins and i iihoiit nerves; bed l- <r :Vnervefl, ending below lii<- .n<-v l'" Sertfic glume*) Stanwai l. Btjnet ft,03-0.7 mill lotij;. ^lalitrins; Mmc DBK pvKtmidal. Nut isKl.il. obovoid to broadly obovoid, 0.6-0.8 mm lonR 0.4-0., "nun Wide, » tc.iiti-vclliiw. [lie MII tparw;w;rn p.ntu nlat\ 00 the rfmga

Annual, bianbti <> perhaps omctlmei perennial Found in wci places, ai the edgd -it drjctg pooU. in rice liel.N. along MITJMS and ai th<- edget of pin.l>. Often very abundant and totallv dominant In main



FIG. H1. AIMMIIM " .OWOtI * . OBM nl plant (1 cm l with IT.III^IM MM ii-u ri leal lAMC II. mllloM v MM t (l O l) Wkfe BOBMOM MH ti'in it « ultn «it. , yltrlfi il BOB] <l ii>>t (0 Bi

Indian Sarikb work* (hit ipetiei brar* the name
F. lutfa: I urn, ihnri. Mr MM < *iifidrni thai all thr
 clard] distributions records are correct. Mv impression
 i* thai ll » coiniimii in ihr tmitli white granule
 t miktam u common in lite n< > rfh (t h distinguished
 from / wuhMiM ht. tpikrlru gtdtMMT: i tiltn flattened
 and 2-*mjt<l: leal thru ha flat; leaf blades tl.ii,
 titrm. ttittuHti pitifiiiiviii fiiniftb
 (O. tm nnial or perennial 'Irn Hrl). Iropn A\ and
 warm unqmaM irgkHM of the WtrRH: Bhu. Bui.
 lml. Ni-p. Pak: Ap. A*. K\ I ; 11> | t. M. KI, M({. Mh.
 Mp. K*. < r, Pj. RJ, Sk. Tn. 1 p. V, 0-100 < n.

Festuca microscopa P ma M» [F. complanata
 var. microscopa IF. v< m Mtu-ll. i * K Cluir
 "microscopa" in Hook R l< *t, > AtihiflnMi (Linnæus)
 Riw - huhei nr. wnw< v < F. *nn Miirllrr)
 Kükenshall: Fig. 145

like *F. ampimMt** but anniul: tulnu HV-V) i n> t> < {
 < p>ibr< t> \TIV unalt (the untdInt in the (CfM
 2-4 mm bog. * 1 mm wide; glupm i l mm long
 < M lutling the i iHf: ntle O.S-O.7S mm long; mil
 iniintirh warii, O.S-(J.> nun IOOg, < f ***)! mm IK< ud
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 nurgtni JIHI HI «. li h wrmr|io< irmfuirtl
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 poorly know.r. I haw teen malrtul otiK lrfim
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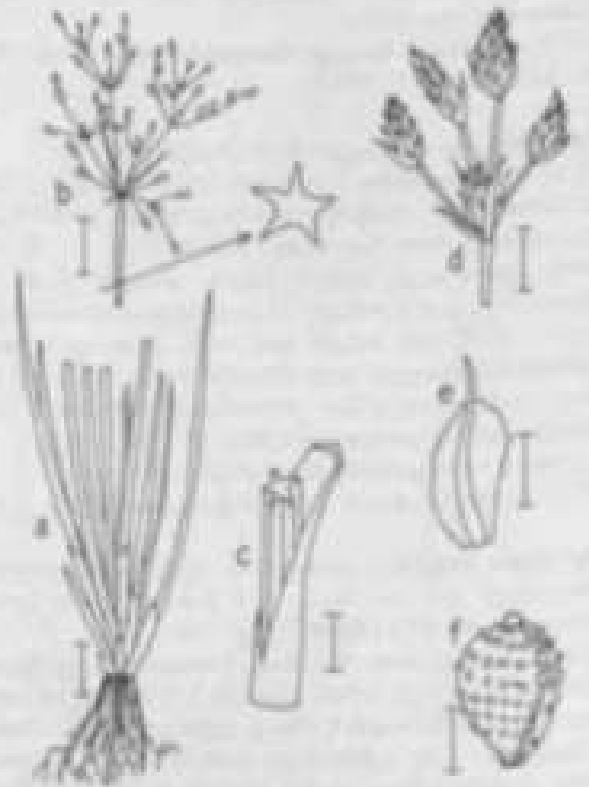
Fim+rutykt mMmnm < Linnæus) V< hl [f
 ttrtt (Vahl Kunilij H< 145
 Khuomrt vrn »h< »ri. fthnni* Culm* arising
 fn*m lbr < ih ol blfdr leaves, densely tufted, erect,
 (5-) 1V70 < lit uit. I M . 7 mm (hh) below, scatchy
 (4) 3-angled, smooth, ch ih*d Jll
 ftaul tr#>r< (or l r m * of rtrrilr ibutHs) with
 the>ih< 1-7 rm Umg, the vrntnl wfe ^ilHtm^ w the
 culm pom; tijtule ibirni; Miidr* * > * - usually
 flattened, 3-30 n (.m^ . l' ^ m m wMe, WI. m u.ok
 as or even ih>k ihr < tilm Culm trMCi rediMi
 khruh*. thraih* cMhtrrv. (MU- grefl IO
 umt, ihr vrnii*! »> MM- Add pair
 leafish-brown, thr onlitf oMiqueh truncate, beak
 on thr ni^Kiii. tltr ujil)crin4Hi < hraiH H-1N t
 ihr ki<. it scale-like, lous. ir< *l briMTb V, ripl.
 bti%iH>kr. i much shorter than thr
 inflorescence
 Belets oval, 2-5 mm
 long, 1-1.7 mm in diamer if, ru< t> iMimn. deni*! ?
 20> in -UM1<<<cn . Clu nun o>>r, ll H nm kmt.
 OH- I mm < *Mtr, lita< Mh4qirtl. niunded << mi*n< v* < e-
 murelous, yellow ot rusty brown, the sides pale
 brown and without nerves; leaf 1- or 3-nerved.
 Annuis 1 (2). Styles 3. idrrf. 0.5-0.7 mm h< a< t.

glabrous, 3-4-let, style base ramidal. Num 3-sided.
 obnvoid. (0 4-) 0.6-0.8 mm long, 0.4-0.5 m wide.
 i frxn-% . i : h, r < VTJI IV

Annual a bkmtal >>n.t n>>ripbc
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(© ot btrntaJ fet / * < l. Old World tropic * .''''
 NAunnilU, tutunili/ni in hwi:..>... Ihu, Cr. l''
 \... U, Ul' Hp, KJ, Ki. M<. Mh. Mjp, KI- >> -
 Up.

Festuca ovina (Retz) Vahl fr< rr < FIR. > 29
 i... (13-) 25-40
 (-70) < n
 s. broadly im l d A tr n M. 3-4 mm M>
 strap-like. 0 Wi.7 mm irt< Jri out. mih 3-5 (-6) trans-
 verse ridges.



I. MI *Festuca ovina*: a, base of plant (1 cm); b, culm
 small inflorescence (cm) with transverse section of culm
 (2mm); c, culm emerging from sheath (1 cm); d, leaf
 (1 cm); e, glume (0.5 mm); f, spikelet (0.25 mm).

Pr.r.....1. CNW in t»mp Modj I'''-''- ;
bottom ,, fern* man W* il»t1 ;il*o » lint
*4tlL.Illul

[Ten/Hell WJIII JIH tropical A»i» «« i
Cry. Itul: An, \v Mt. In (1

Fimbristylis acuta (N. L. Burmann) Kern. [*Cyperus acutus*
N. L. Burmann] *Fimbristylis acuta* (N. L. Burmann) Kral.
F. moMtfwApu (Ijunacm) Hawkarli-

» ulnurirru ch tufted. B 10 (-OT) on tea* O6-1 mm
in diuiM d ami haitirnd .t bMC. IlrxutiU*.
ikfee.l v,1(,,i L ni ibemihi penbiriu. ...- grey »
dark bnmi. "ii, n wch « M
lctr 1)1- flat bitt with o»ualh taroBw inaruni*.
.....*h .,un,. IMH ... KM| H ih< "iin.v up i- -> "o'
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inOomcMwc .t l »r rardy ^, ir.m»»i ipikri*t*.
Spfc
Baocaol b«low. !^IS mm kxt|(*i Kitheri*. b«otnJ
up i.. 30 mm lon* iti fniil; S-li mm wuli- Utimrt li
cnpodt. be...fag «P*»» « « .

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with ihon rttbonc x mwooo MM!
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ISOOm

Fimbristylis acuta (N. L. Burmann) Kern. [*Cyperus acutus*
N. L. Burmann] *Fimbristylis acuta* (N. L. Burmann) Kral.
F. moMtfwApu (Ijunacm) Hawkarli-

» ulnurirru ch tufted. B 10 (-OT) on tea* O6-1 mm
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ikfee.l v,1(,,i L ni ibemihi penbiriu. ...- grey »
dark bnmi. "ii, n wch « M
lctr 1)1- flat bitt with o»ualh taroBw inaruni*.
.....*h .,un,. IMH ... KM| H ih< "iin.v up i- -> "o'
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inOomcMwc .t l »r rardy ^, ir.m»»i ipikri*t*.
Spfc
Baocaol b«low. !^IS mm kxt|(*i Kitheri*. b«otnJ
up i.. 30 mm lon* iti fniil; S-li mm wuli- Utimrt li
cnpodt. be...fag «P*»» « « .

ate. 4-5 mm IOTfl, * 4 J'
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eKcitu

12 mm kmg, d. ibawo
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cowfrfi tibemiUw nteep on

with ihon rttbonc x mwooo MM!
Intmdwvl

nanfe Intmdwvl

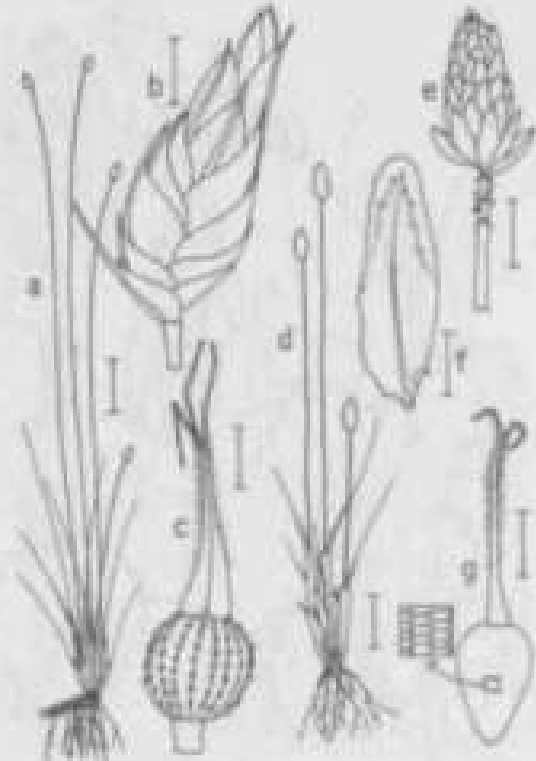


Fig. 144. *fiaJntnlri nuata*: li whole plrni 11 i B
(1 unit, i i... (I IMB] H p*hmii# all {Ami
|| rra); c. «p*trkt (t mm); f. RIIIW (0.1 mffll; R. Ir.m
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ramLIDIUC. alt oihrf ((lumn «WMNM OitH»
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OLS-OJ mm wdr, RTT* »T htw ki*h-bfo«m, ihr
i^hth Mttqr. Hiih 1 'V MMKJII «iipc» on
MOorm

Found »t itui
on ultnr mwl rif und>
I « 2
glume* with *rvri4l n r n n and * B D

I(C) Ten/ Hell Old World tropics Bu?C«y.tad
Gy. Jc. Kt. In Up. Wh

Fimbristylis prnkim/ma Rent U
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Cuktu drnfch difti <l JH«»rh(Sr«*dfL *-SJ tm
0.5-J | MB itidr, wnootli, ^Uucout irrrii I*awn X-5.
luul; ihrsih^ 1-10 cm hrtig. bewe, atenfannoia, with
nil hair* mi the nuupiiv 1«ul< 0.5-0.7 mm long,
te. h W « IIMWnf d ^tKtr.I h..ll m ihrec



Re, 146. *F. subundata* subsp. *undata*: a, dire* (11 nun). b. «Junw (0.25 mm); c, fruit (0.5 mm), ft (0.5 mm); d, glomer (0.25 mm); e, fruit (0.25 mm).

quarter* tlw trnftlh I' the culm*. 0.7-IS mm wktr, gtabfou*. KbuceMN *trnt, Midlrnh contrwd at the •Otmctiir *p*. Inwdmnil bract* 1-1. Ihr tmr« lr*f-hkr. owfwypiny thr mflorr«r*m(e Inflomr< p or cMnfwuml. cwrybow; priOMiy iavi I Sptkrfeu onld to tm*W*p«o*ii J8 wtwvlh ptibrMriK: IM hilU rl'ini(*im>j in friin > - mem In irnwn, *mr la bnndK matt*, whatuir to tulv ulmwe. I S-'Zl aa IIM|, tt.A-t.4 wia brawl, whllt i tb4i IkatrV drpp nm bn^ vilate on margin; bractes; L... dicit. Stamens 2. Anther bas, 0.6-1.2 mm long, 2-left, sparsely hairy above; stigma shorter than ll>r Mtr V us bicor- vey, obcord, 0.5-1 mm lon 'small, shiny, > 8^9t MM u* hri ^[c>n it crib wi «nbe» hut.

AnnukL Al (hr H||BI ''f ditiitit pwrk m i> • fclth. ID wt fhabn, often found in «onr mantic* and oprn granulated by a f. rounded lta. K I, n/Hcll NM*ih«ni IHII* and Ind «lma; Zan, Gey, Ind. Tr.

F. subundata (Nees) Kiittlh subsp. *undata* }'. foliolos MMTIII. F. *Aspungfressa* T. Koyama] Fig. 1 ... Rhizomes short, cobs ... clothed with writr UitrtriUur acalrt. i dntms close WfCtb in a single RM t» dw rln^.iw. (4-t ^^ngttfl. wing*^ ** grown, 30-75 cm long, 1-S mm In dta»< glabrous. Leaves on culms reduced. Maleleu ihrath*. ttw Un ii*-*tu M;»le4ik*. ooir to oblong-ovate; th- upper sheath uibuUf. hcriwcrom, up »' 15 cm long. brn«m. obliquely truncate, b ijC" membranous; sterile shoots unknown; ligule absent. Involucral bract» 2-V bnervUtr, up to 7 cm *W not overlapping inn the influr*. a «i|< r1.nk^rt1 • remned. wtnnoui p>iin^ Inflo a corynbcMK-. too*. or rather « BM Spil. or «ntr«>li clustered, br *IW orakl tu ellipsoid, 3.5-4.5 mm L, ug. 1.7 u wide, angular, obtuse, brown. (•liimn mrnbrmimt. OMH <' mwe or muooni n. 2-2.5 m.1 lutir. t 1 I Hi fwxwH. gl*t>''tlv the «ida n m r l n, w».m.U. ««h hv^Unc m«ni''«* 1h c



FIG. 146. *F. subundata* subsp. *undata*: a, base of culm with panicle; b, leaf; c, flower; d, spikelet; e, fruit; f, transverse section of the culm (1 mm).

back trddi<h4rown. J-wincrl; krcl rtubnjj jniwwh.."
1* !m ||M v Sumcn*(2» 5. Styl" Vang""* *.«'''

• Imm to* it'-l'..... Nl''» A*kfc(1. m... iMrt<ll<1
OL8-1 inn. l...ffc'. " ->"? nun broad, unootb or ifightl)
wvtv eplderMmd - etti *»»15 vrnkaJ row, *h m r fi <
bnmnith. ibortl) iaA<d

I In u. t .jk-d p U n . mar»b«. ** «up* anrt
Common it high diiiudrv Rather tim.bi
r n»jki//d liui .s .L..i -> by having darkrr
H>ik<-l,iv jiipubr lrt rr«0ll wl (t»n, keeled ulumrvitK
tliRbth M «rr ghrtta, ihr numbr of .umen. and th<-
m»rkiigi<>l ilir nut

[Ten/(Hd)] 1 »>t Bl A»i* B»r- llltj M A
900-

Fimbristylis subandula subsp. *novi* (i^h.a fNt")
T. Kewana (*F. javanica* Kunth) - Fin p : 40

like tubu.; M ^ - J M h<i .aim* imiallyv b*hy;
K l' .-<i* tnm lonR; gtttinei 2-V3 mm long.
p keel projecting as a mucro, ilben * 1-5 nim
long; unisulcate - ltovoid, l -1,2 mm king.

Perennial Found In ^ "lll** ***" mi»r»hc« but not
confined to wetlands and also found in grassland.

(Ten?/Hcl) Endei Sri Lanka and I India-
•Cey. •in.l In. tl^HH) m.

Fimbristylis moWriwi NeeC Hg. 147

Like *F. .w.ujbtH / libra* M.... (h llatictidc, Sedgert
k*f triadci R« wilh lomelinw* incurted m»rjpn»,
*-5 mm wiflr. kmeM uivnlmivl btVCU »» l<ll | .'
m rtwpIM (t.r inflorea cm « v&etea *-T (-12) »»»
IM,,«. -J .', mm wfck; glumes white, spatulate,
3-2.7 mm Jong, t13 nun side, distantly keeled; style
fl«, 2-cleft, glabmii* «« scarcely papillose; nut HOOD
vrx, Mrak-clntMtTcd to j p y

noTbkei
fin. tHel sKA^tflUii !mi,s--il..u Mgr

Fimbristylis subandula (Rrtxiutl V»hl) (*Scopus leptostachyus*)

Roxburgh 1 Fin. 147

i..... l^itr... 5-50 cm long, 0.5-1 mm ...
dian.. u... cross, slender; often swollen at the base. Leaf
the Ltai membranoiM. fril*«iijh "> pinkish-brown,
inflated •trnr; Hyitr r^... fine fring, ...i short hairs, leaf
blades flat or inn.llrd, nn>ul l h l

Num. Kabrtd luwwdi il* *
plnu IMtun l... lateral bract 1 or 2, glume-like or
still as li. .i hi. mm

li.ti... n.i... uh <i wtab

t.« l lateral pcdtalCkd... thr pedunc
B pr<m, l



FIG. 1<>. fimferti/Wit l.-VTTIM L biM «< [l>»nt (l i
l. HilUttrictur c.'imi... M.ilrl.i j? mmt. «l. (nut (l mm)
will) mribfC pHTen lii.wn / nkar*wi4n. r. trtutic plant
• 1 itn); r. tpilrki r* mm); K, fruit (l nua) «««h Mlll
(uurnn (bnct).

m wh[lorKMe. 4-8 mm long 'i jntlicm. extc nding tu
lb nun htir in lhiil, W mm wide Gllinea very
bnudh .IU.rl.H ril.t ObtUK, 13*4 tilth l'U£.
V5.fi tnm rtoad, gtrfWTli (MIB »H»WU. wnn ran)
ncrvr* MIIM 11 bctomc In* dktinci lowwll itu ed|

ncrvr, leri inilivtim l MAIK in J. Mi...
2-cleft, hairy «>»vr, flai, Mk Uiw pyramidal. Nm»
bK«iiv>... «bom<< !*!ICIIIMI. l VI H mm IOIIR. 1-1.2
wide, wKuiih In amin^ Urmii »»i matuhiv. wiKw»th ami
glony, thr Htrfhca tint-h wiliir. rrmublc, »iipr
ll.%Al.h mm kmf,

Vmuij IM Uwxilnwd pnrnnuJ. In wei uriw pUcrs,
rtuitlirt, irMOfulh¹ inundaiH arm. n* i tliir luttU ..(
ponds, itraaBU and in roadtktr drain*. S»>...
fimfiul In ri... fields. It is sometimes gregarious mil
fbnM • < lixrd tuui. J.ikr h pttjtrtkmdn *»lmh lut
glumes with a single nerve only and
ilw mil.

(C) i... (Id) l Htpiral Axi* JIM AuMclita. *
Hu*r<) in N »>... Cey. lml. l'ak An, Av Hli G.
C*. Hp. kl. K. Ml. M.i. M_B. Mp. Pj_r Rjt L'p. Wb.
0-3000 IB.

Fidicrystalla immanula Boeckleren: refer to P 144

1 ik< £ *pobtnrhtdn* hut culnii al-... a single
Himm.il -pikftrt Withotll ni%c1inr.il fanCSK Dftlltt
abicui; Kluino ihonlj lml li.-nn. iK imi. i-maic;
Migmitt milch th<irtr ilun Ac *nU\ BMMwlh ± IS lonjf-
lluilml.il ltrpflton rilhri litre.

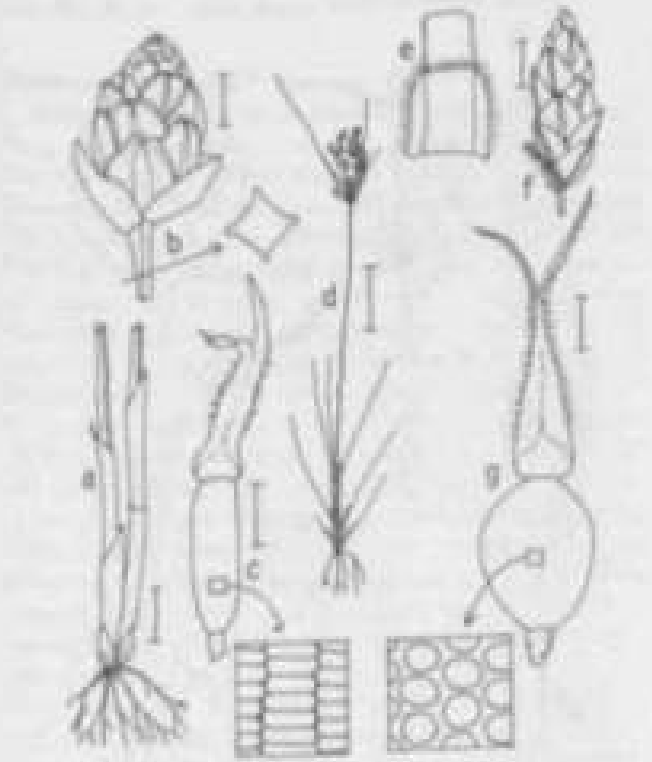
Perennial « periMpi .«i*« amwal AIMIIB; Ufc< »tioir<
Ktd in Fimpt

(197) rco/Mri) findte, TVII—rt~i Indochina and
Malay di iv.ui Bur, lwkAi, l p

Fidicrystalla immanula Boeckleren: refer to P 144
F. *feftfcmapiBoeckd* *feftfcmapiBoeckd* *feftfcmapiBoeckd* *feftfcmapiBoeckd* *feftfcmapiBoeckd*

(.....s lufted, 10-40 (-60) « km. map *fck,
i MI.U-i lwmkrt n l iriif"J ' toedto
thelibransous, yellow- i> .. brown <> | rce shes'h*
Involved bracts ab «ni «f nhnw^lkr. Inflort*
i iriiiiiut.il nMI<l.-l Spikcleu ioUtturr. obwmkal to

7(iiin.) diam Btci Chmei oWoBg* *obkmgj*
timate, very obtuse. Ufa rounded «po. 3-r» mm
faqq :-1 Ban hnuu, gtafanMu. il>k. > !'»»»»» w l^1^A
l>r,mn. uric* wilK many nhwun: nOVM. «t<t.



fto. IM *Fidicrystalla immanula* Boeckleren: refer to P 144
A, spikelets (2 mm); B, fruit (0.3 mm) i *iri< w * w
C, whole plant (3 cm); D, spikelet (1 mm); E, fruit (0.3 mm) with surface pattern
(5 mm).

3-nrrvcd. Suiitrm (1) 2 (5), Style* I- or .Wlrfi, hairy,
«v|r J<w pyramidal NiiivmlHctrif. »iih (Mralk-I *»»
vjiufl't ^>MH<1 to alnui-n rpHndrc 'l. up to 'i mm i.m^
and •>.' nun ID diameter. = liitMi IO ycliuw ur grcr,
Mirf.K i -i tn ufattc, with attipc up in l mm twig,

Anmul Of OOOMOAtt] i* t> iniul li 's olim Mind
in >ftij(<m MBtr U U Alut gnpn in tnanho. af...>l
pooh, <»ong nrranu, fiududc drafaui dhch^a jml
M>ij<-i)tiiri in Her lirtU, It UMIJIV urimituu* unlr-
WAirr aind llnVtrrv a» lltr wjin ii.*:crif*

(197) T m/ (HrU) rropkal Aria and Amir.tiu. Bt>
Cry. hul. Ncp: Bh? Q, Go, K1 K< Uh, Ua>Up, Or, K|
T I W D 1 0 0 0

Fidicrystalla immanula Boeckleren: refer to P 144
V\$TM l f. affimt Prni. F. *peduncle*
Nem et Meyer, F. *Mpntia me. f4*>nkt<-*

f. «MHIUI forma MWWIMI (Vfthl) Obwt, >
MitMp. *po4marpii* (Ncirtrt Mryrn) T. K"v'') *po4marpii* *po4marpii* *po4marpii* *po4marpii* *po4marpii*

IjKc Z: rfwA#rfo«MI hill .Ju./v .inn-... leaves c .nut'
strongly hairy. •piLrku rtm-cotowadi wrk uxiRtw-likc.
Ebttencc, HIJ'lu.tlh tapering from lij<- to
V. tt>iill<ri uvlr luv- i>l™ uir; nun tlm Llv IM<
orfali ufarolMwiid, l li-1.5 mtu lCmtg, 1-1 L' mm broad,
with 1T»-24 lonstKHlm.il row* << l>... 0 <-HK
(appearing M 'ii*> **ii VIIIK < bCK. cream-coloured
sometimes rrrrMUalh (uininR bfOWIIMI, »(tp<* otxt<4
(•ml, - i>1 mm long. H.VO.H mm wi*ir

AMIIMI. In wrt aiul ni^riliv j»ULCV IUIUJK in die-
tUltwd li-tiii.Ks MM.II » fhinii M rittr luntv, roudade
dilchn. <JIUI* Mtl utig4ir<1 vablr Lnd. It is particu-
i.niv r g n u. ... < k i k<

(197) T m/ (HrU) S .lid M \4U, htritrk, IUHU^11/(.t m
NAmerica IUn. Him l, L Pak j>. v_h A». Bh fi. ki.
Kl. H<. Tn. Wb.

fimfco^yiu tn^tra (UtUMcua) Sthumwhcr *Stumwhcr*
Wihutnui <-|privtdti Rr-/iuv .Unitignartt *Unitignartt* *Unitignartt* *Unitignartt* *Unitignartt* *Unitignartt*
11 tliliji if • \U VKHkijiiuJ: F^g. l'II

Stumwhcr *Stumwhcr*. HIKII, til>lj(iiii i.i horizontal,
5-10 mnt thh k. f lolticil Hnth rntu ... of leaf dth uh*.
Cul>ii< iMUIHj ntlivl. KW*Ottu long. 1-3 mm m diam-
eter, i hKrlrldi JI KMC. Mill. iiiiHrrrlr, ^ (u. ^li. ghit-
... i- i- ... -11 II Al. tS • m toOff, hfimii.
vmirally liiAliiir, l^iilr* arMrnl, If jf hLwr% with u<> af<
... margin*. lull in one than) <t lon^ <> ihr

p
mcence. InJlorr<icncr <| t2> 5 <>r 4
iiuiv doofjaM^ototd. mnnih>i
llaitnrnil. MMf.S mm • r>^ ^ JI anil ' n|;irk<t; la
nuh niiii • I mill mid-
nurr imfubr mn» btn<dly~o>ir to
buw i< * luvpufoir *pr*
ir, Klj.f.nu, iluiutroin, pair

(Tren.)/Hertl. in... i Asia and Pacific Bur. Cr. Ind. Neg. An. An. ... g. 9-1000 m.

Podiatylo ... t H. Clarke [R ... in.1 nonl * ... long. ... in ... inii. ... memfanmHW liful ... P...K ... •Wr.liwk^T ... h ... Hfto * ... fc.Mh.K, In ...

Podiatylo ... A ... r%*rp<< ... III) tUl ... S to I? (Wrtr,! (Jumrt in * f(W, ... Uln, *...». S.5-5 *... wkh >>><*" new i»w >><*. •par^h hairy un hull . tli*tr .MI *hr mutiny ^rri tbarp. Stimrnt I. <tw<< MJ mm kni|, ^l ... i 0.6 mm t»ti< N<i ... mm ... Miltuli ... trliuwth-faniMi. Annual t»n ... OTrn.'HHI



FIG. US. /-i-lwiifiJii iffWmvai: #, wl<4c pUnt (2 cm), b, if>Lfl< (2 mm); c, fruit (0.3 mm). F: ijfaiwni: il. whole pUflll-.no. ...

Forme t 50 i>cctr<<: uupn* <<nd Htbtropkt, nta*i in Aftfa ... itrd IN with *w<jrf> c n<<-piii\$ ruhotne*. Cuinw wih IMHVM and trmn ihnm#h<*ii their Wiifph. leai ihen||l wlkirwkJftn). ck<<rd. H 1**<< I>»UJ1K bUdek^: UguW iuUikt-V-<l Marirn-• ... Of compmind itinrmb* n4 •pikriru- SpftrleU m ... r, m*nWl<wrrd; im h>IU prnwHrm. ntrt winfriL wrucalh clontc^cd piu. Fknvcn hW-xtut *Jiimr* ... iU. dM ujnr i mih bhcuwl Ho*wr». Pcutnth of 3 brMW and 3 v<<ial^r jiuu alien nmed <<*tr>, iif d hrb-lks <M jihvnt. SUNWi' ... u-ouk, nnt willrn at the liwr, Hi|(nuk (2) 3 Nuts VwVd. oburtwl Of <<wi, felting <iH rrwlrani Hi ihe pmanth whrti |xr* ... tomftlt i<< (>rir ... i ^neralK tonMdVrrd m bf fim>I M d H pluili but r>>rrh gttiwing in iugr ... bonk Vui<i_f V. l> Tuonotim <<ud) <i< <M ... Itottb from India Journa ... of the Univer Hf of ... Bciwcc S<< lioo 40: lflft-1 ... I I thh wnri ... r*ihr tn* nmjJcir and nut up t>i flatr 11 to high • ... i Ind

I, AJIIIIUJ. without 41 *h*itome, with *t*ititotu fruits on, >
 2, Awn iin glumr i' curved, strong kind iln/nii
 prrunth iriiri t 0.5 nun wide *F. tm^itHm*
 2. AMU on gbMK ± maifhl, wfi. 4ni<Irf, not ih.
 hkr. prriinth M.itrt t O.t nun widr
 t |*11 mih Kahi with bladr tubquadratr, contain
 or hastate M ihr hur. with A mtnuir trrih *i ihr
 di* exactly the trnr4 apci (α central tooth ;hr
 loogrvo. Kliiin* I.S-2.5 mm lot*. excluding a
 t-1 "> mnlcMigawTt *t* ribaria
 7. Prtunih (fair* <nh |>|* <lr acmklulv n
 hl*de wth thr '! UJWTT kihrt ritrnHutif rViMim^rd*.
 capsule d ihr apr> .ihntMi jip^KJiiiifi Vfc
 glomer 1.2-1.3 mm b>|). nt liKfinj(a 1-13
 long as n *f. trilobata*

1. Pi : *Mtk KMMMi* *maia*, creeping rhizome
 1.i *alma* (4-) 3-angled; perianth <nth **k+ WIIIW-MIW- with
 A wn tburt <ulk / *umbellata*
 4.i *alma* 3-angled or rounded; perianth scales absent
 trf WIU) IOC
 i. Perianth absent

* *Ctllrm 3^kktl* with ohwurr leagitudtail nd|[rt,
 nur> V<Mtnl. with * <h>iiii* t VuntiliMltn^l nd<r\
 broadly <li(i<M<l. 1.2-1.7 mm long excluding
 ih 0.2-0.5 mm tiHiK boul pan *if thr
 0.9-1.2 mm <<v>r. win or rarely brownish, glauc.
 mx rn%(rtl ix furr<NHrd / *pubescens*
 t. * *alma* hMpl% tvnuUH, mit< V4drtt, inth
 *h*ip Aitffrt but - without distinct longitudinal
 future rlfh>*»»' 0.9-1 -mi lout rtdiwlinit
 i Z mm W>((h*s*I p^ii of thr <rtt< 0.7-0.8 mm
 wide, dull white >> li^ht hrnwn. r*rh <
 spiracularly HVftad irith > 7 ^ffgftriJBr^ i . .
 • nu(t *h*m irKtwi I* twijr* *umbellata*

5. Perianth >|tKtk* with of wnhrrmt
 7. U4l hUdr> with nm <f haln M << th* *lutea*
 leaf and adaxial groove; spikelets greenish-black *pcfi*
 with or 6 brttl. n. r<rh Horn, wth (backwardly
 directed hairs *F. monoph*
 leaf blades glaucous along the leaf and adaxial
 groove; spikelets greenish-brown; perianth of
 3 bristles and 3 scales p perianth bristles linear,
 with hooks *h*arlic; perianth scales
 like uMr u-nnt* faato tmit *hastate* at the base, as
 long as or exceeding the oth *F. tenuis*

Festuca capitata A 1 tltirmntu t > *crassa* (F. *acut-*
nata (Willd.) < *arab*); Fig. 154
 Culm tufted, obviously 3-angled, ribbed, hairy w
 rarely glaucous, (4-) 2-30 cm tall, 0.8-1.2 MI
 leaf sheaths hairy; ligules 2-1 mm long, brown,
 membranous; leaf blades soft, flatish, 2-14 cm long,
 3-6 mm wide, profusely hairy on both surfaces, with



Fte. 154. *Festuca capitata*: a, rather small plant - with hairs
 removed (2.5 cm |. l. spikelets with hairs removed (2 mm);
 c, glume (1 mm); d, one perianth scale with two perianth
 bristles (1); e, leaf (2.5 mm).

several nerves, tnkwrvt rnt< of 2-4, 2 glaucous clusters
 ul <|mkrllr< <h* 2 distal clusters perianth, IK"
 remaining 1 or 2 distant; clusters 6-17 mm in diameter,
 with 4-20 spikelets; spikelets sessile, <|,iw4iUt
 (2-) 2-7 mm long, 2-4 mm in diameter, >. -run
 alternate to oblong-elliptical, 2.5-2.6 mm long, ex-
 ting a 1.4-1.6 mm long incurved down-like awn, glau-
 cous green, hairy between the nerves, the leaf
 3-angled, the sides (2-) 3-angled to 3-ribbed, 2 of
 which convergent to the midrib, the nerves yellowish
 turning dark brown. Perianth bristles 3, 0.3-0.5 mm
 long, reversely scabrid; perianth scales 3, 1-0.5 mm
 long, 0.5 mm wide, the blade almost circular with a
 >|i.>t<>rrtl apex and a short (2 0.3 mm long) stalk.
 Nuts sharply 3-angled, oboid to subglobose, 0.6-0.7
 (-1) mm long, 0.4-0.6 mm wide, also smooth, light
 brown.

Annual or perhaps sometimes • WU • hard perian-
 thial. Forming tufts in open hot habitats, often abun-
 fcwtt n. rice field I* iJwi the lun rti
 IOC) Fl. G. Fed. • Sri Lanka and S India. * 27.
 * Ind. 82, 1-tli < > 11, 0-000 22.

Fuirna nliion. (LbwaCW) fewburfb [F. «fe»wwi" Lamarck, i mMkaWNecs]: Ky

bus slender, mtird. V «H Wded M ••'<* the infi., uUun <n»Vrt itrtate, tain M< •bow), (5-) 10-50 (-76) u.i ull. 1-9 '»»' wlfir Leaf dM |M11K-MHH. Bgufeï *Ofi (1-2 mm long); branoua; teal l>l.«N Racdd, Oat -- »-8 mm wide profittcij h.im oi M lea* cfflam "it marsim. wltñ 9« '• (7) prtwdneni «en« Bghi green I. HWM «•.,• m i-s.ienniiialchmertofipiklc^withi and pubea ew peduw 1- "• * « "PP«f " J j *.

Spiked. . . ue oi ,lh|.-.i.i.i. MI '-''' long. *- * »'»' tadlam«ergreyW^grc« Chime, obowte » oblong QbOMte. 1.5-5/- nun bog. eKCfcdtag • l' • nnn ^ bair) dwotajbouï Perlanih lirlrfei ». «ed me « rrrfutrtl. t, ahcmlim* to ahno* aawoth, ai kw| .honr, d rat: i»-''-«li w* « 5, dtoOnctI) M.,IU,(wquadraie, up u 1 :l ma lo I '»". i,((. p, haaur -it t»« >'• ***. it nmillr tcrih.u tbedtednctI) dikb hairy at the *pa Nuts Innyt), |hbrotM w mttmtclv



AC. 156. *Futrrtut fr.* ba« "I [ti.Hit votli h.ui- OOlit (1,1). li mil. 1 i in' whh hain omittMI ^mi .i tI,iti» •.ii ui i nhii (tnHt] C, \>ll.t lfi witti li.ntv .niitlr<I (S mm); d.gluiiM' M urn.i. c nut .u-, nuiii / mamjk t. nui nfiinfb briata <I BNB) ' Immub ^ mM ^uti two briata aad (wo |X-IMH11 • a\ (193 •) .

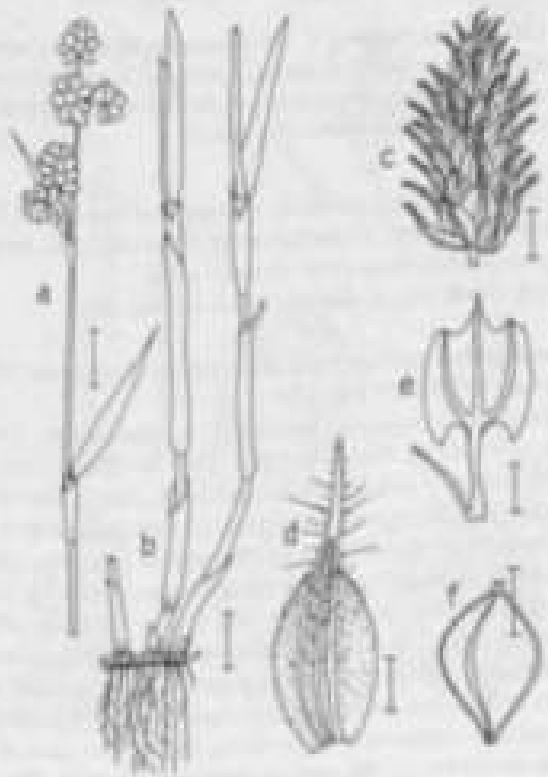


FIG. 114. *Fuirna nliion* with !,, , ...nmrri Kh«rolpU.. wil» inihhrtMlc [O.Onun) | »• •" <" »•»

suhsii.tt pK lanflfirt. ohriTnW ni ettpaid 0.7-1 on long. QJ&-QJB IIIITI wide, the ndri ihinj IHH mrinkled, yellow in dark brawn

Annu.il riunimn MH.III dompiCM Mfb fan open wn <i miuu) pi.i. the i banks, I,>.H!MII»- ditel HIS ..i ponds and in rice BHdi [G Tcn/(Hcl)]. (i)ci World tropic* and mbUtpka i.MI \n, \>. Ai. Bh, K). Ki Mh Mp, < k R|. 1 •. I -ji. \1>. 0-1000m.

/utrrna/Hiftr»rrni Klinill h« 1>6 Klti/tniiii limy i recping, - > BMB ddek. tlrnvI\ M I \stii scales < Him* tum%. erect, uittrd M iriatef ai t 1 cm interval* along ihc rhi/nmc, .tO-M) (-I(K)t i in (mil, (1-) (Mt mm ilui L. Mded vtiili ohm inr UHIKIUII. n,t) ridfjatj lil.ilii.uiN i Inn aMMNhajM II.IIX |IIM IK-low thr ln& • dwadM nanaBi |tahraai of vDinrlimm ihr »I|I(KI our* ham. li^ulr FeddW hairy; 1* ») bladn > '»« m l<in^, 4-9 mm wtdr. glabrous or ham IH-1. and al the lip. Infi

upper leaf* btll laBaa% murr ha''' lllHmrw nur t4
 stalked, clusters of spikelets, each three fr with 5M*
 »pii«em. Spikelet rd WMIlr « 1 *ptkHrt of a ch>orr
 stalked, on nl, 6-10 trim Urt g. 3-4 mm in diameter,
 brownish ••girrtrt ('unm hru <ih DI te-ellipt • at.
 2.5-4 mm lonn -schidm < ihr 0.8-1.7 mm long J
 hairy ilir,...n> mrr. Pr lanth UUKU-* «n<l K«krt
 Nuts 3-angled, with 3 distinct longitudinal ridges,
 hrawitv rlllptotd, 1.2-1.7 «<m bmg nuuidinftr ihr
 0.2-0.5 mm lonn H baui }Mit td ibr »>•, 0.9-1.2 >nm
 MVIT. gl'''«y. * hrr or frr h trwnmwh

Perennial. Found in w-4*«TOJK IUfnrtl mr^ <i, m
 wet or MMRfJ place*, lrjfrlojotrd m wih nwd
 fields. A rather ^rteblr •prciei »ocral vahrtin have
 brnn rincribnl I h»r «rrn no material: ihrn m:ofd*
 Iurtaii' on Vatak (P 1<

(Tsu/Hell. W. in irf Hint *4 Fun if ir. Africa ml Au
 Minor, extending to (he I litiulnw 4i*1 W tit ate Ind
 "(. R. P. Ts.

Falcula serrat >r Cestodiaripth t«|. !IW
 Like / ^ttawnt bui U ii bladn w»h nm» «4 hak«
 along the kret and ad^ua) ajoown; •ptlu'lfu pvrtrtb-
 btark. prrUnlh *>l <• Kt-
 mrdH iliintcd bartw, the fcwrr 1 farimtn aa lottg m
 (her on, the upper 3 lirMtn kmftr than <• m, iula
 with « *Ldk t a quarter ihr length •4 ihr i.
 Perennial. M
 Iflrlj tifirm (• India • Ind: Ts (Madras District).

Falcula trilobata C. B. Clark Fig. 157
 1 iKr / .IJUM* hut. gi-tKI*** MUfr Urrnfrt *m1 l m
 hairy gl MI uIM>t- . 1.2-1.1 Mm krtlg m lIMuif> J
 1-1 ' www long <*>n. prw>jnlh hrithi bn«
 hairy •h*w«ct than ihr out. piri—lh « JW-> dHUi
 stalked, with « trntKtntUar ID lunjfr aiaar WHh tl
 lower lobes xu-tkrfinn 4uw—ink, MMfmU" at the
 apex, almost 4i(^ir«tng \t<.4w«L Of IA tcttg.
 gUbma Nuts ellipsoid, 0.9-1.1 mm long, 0.2-0.4 mm
 wide, ntnilll< tuberculate with very faint horizontal
 striations la^ht vrllnw in pair IM.P
 AIM of W. «^0(C4l gi—lind. mr l
 • l«n* Hnawji «mi n*cr%
 ID Hell. Ts 4rmk to tvnUMubw Indu #li<i
 R. Mb, i..

Falcula serrat Uf tlwJifr t9A
 I ikr f ^waricwu but j^fiaaU. with 3 bracts .."!
 3 scales, perianth bracts linear, with back-
 directed hairs. M!LM«J« ikrm. vtth
 Uhrr intnn (*•§ bul ha«U*r «• .i*^ ~, 1.1.3 ...*
 long, as long as or exceeding the .ii



FIG. 157. *Falcula trilobata*, a, inflorescence with hairs omitted
 <l tar. h kmaptkrln
 4. (tuMT (It.) «U>I. V, nut surrounded by one perianth bract
 det and two perianth scales (0.5 mm).

Perennial. UWH grmitKI. nw..
 AUihrtiIn nutriut *4 ihw tf»
 ri Ma prm ttul rarr n* / fit>wji.
 UIRU rjMtnnk IOIWIBK «ttttL Cj. Ki Mj.

Falcula trilobata (Clarke) [Falcularia trilobata] Wight
 et Arnott ex Nees, Fig. 157
 Rhizomes creeping, with * I 9 «»<" lhuk . . .
 erect, solitary or few together, (5-) 50-60 (-100) cm
 tall, 3-6 mm thick, nodes J'W^ like at the l ^
 sharply (4) 5-angled, glabrous except for
 inflorescence. Leaf sheaths long . . . the culm
 usually glabrous; V. de trilobata, densely l . . .
 leaf blades
 (-1. . . . 3-15 (-25) . . .
 at base and on the margins, glaucous green. Inflores-
 cence bracts like leaves. Inflorescence of 2-20, stalked,
 «M»p(MMHI ctinrml
 mold i" unaid-ellipsoid,
 4-1« mm long. } MI «MB tn
 Glumes obsolete to unaid-elliptical, f-f 3 a* long
 including a 0.2-1 mm long awn, . . . short and long

base three-angled, ribs 10-12 (rh brtata tawd!) dactyl; $\sqrt{3}$ with $\sqrt{3}$ scale-like, not or very dmnl) »Mil.'-ll. $\sqrt{3}$ <w itljknik. a j". long *» ihc nut* $\sqrt{3}$ n**vrd, apex $\sqrt{3}$ (it rOOOded *nli .''' BridMb fmn**nih r- ntm hi • iliuii anil afcimhir i ... * faded, ellipse ... bim* l .** in. Jv wrinkled. O.ft-12 mm $\sqrt{3}$ hiding a 01 mm Uma p*W*iM>l >i*k y ^-"Jinni widr. wiefckfc when y $\sqrt{3}$ becoming brown JJ

Found In viu-iulh HFF*1<l pbee*. In opm wn tic M >> localities, water loffl¹

•rtl tw tti W|T ** <<w* ftsuiftcti • i.tni* ^rw| U-J and t n | r H < (*HM <ilk <l) pcrianlh rirr. H A*. KJ. Ki. MK. Mil. Mn. Ng, Pj, T». W>i <MM> m

Festuca subulbana Kunth 158
 I kr hut ulmi *ti*ijttv 5*i<l<^, hotkm, lift ttt t' > t in b f' 1 nun in rtunk-u-r. $\sqrt{3}$ 2-sided, tut r 1-3 (-5), terminal



FIG. 158. *Festuca subulbana*: a, base of culm (1 cm) with a section of culm (inset); b, inflorescence (1.5 cm); c, panicle surrounded by perianth scales (6.4 mm); d, panicle (6.4 mm); e, spikelet (2 mm); f, spikelet (2 mm); g, leaf (4.25 mm).

clusters of spikelets on short peduncles; spikelets olive green; miu l-«kl<i, wjrh $\sqrt{3}$.JUK**** t m HiitwHii di- t m l t <n<ktiu<tiii4l ml((c-«. cUlpcakt. 0.4-1 mm long McliKli»K tlu- / OJ rtmi k>fl| tMHd pail *)/i lite n $\sqrt{3}$, 0.7-0.8 mm wWJr, thalkv whur in lijttn htmaid, rkch >idc oamarioom $\sqrt{3}$ rced ->nh * -7 lixtRittwdiMi $\sqrt{3}$ H4n«vcrv ridgrt.

I'rirnnial. »jnk of ste yu and unks. tcuunallv flooded areas in I inmi |>jMiirr IJHI

Ilirl t<». Endemic to Indu: •Ind:Ap. ki. Mh. kj. In I p.

Festuca | J J ± 60 (pniri amut crmoi

Annual or pnrntul. <ulm> S-Mdr.) I CJM ru rwdly rwlkid. kjJ41kr Iriviilutnl hnci* »U.< 1.1 hi w •!) the $\sqrt{3}$. UHUIK .1 umijul. kiDf and lorfifct Inflon» Ce>(< trtnutUil, hc-JHt-llk' of 1-3 1-4), »*wf- t liuWtt of ^MkclrU. nth dnttrty twitr>|t man spikelets. Spikelets npindly wniced, >anous ite. biri4ltv flattened, 1 w l w raurlv iinur Inuring (Un>- rachilla (JiiiH.m* n » wlvtr Ghi $\sqrt{3}$ distichous, clearly in tuppuiMe rnvo. nrvih jwlr vlriiuh UJ yrlbm HI (jircn. Ir.M<r(with an JKIMT- k**r| IITVITT I nr J glumes 'tciilr, OH- next mtrtrndmg btiantul H<» $\sqrt{3}$, the uppermost male or sterile. IVrianth (HMictah* •• Soincn* (I-) S Sitgmio 3; MVJT HIM Hwullon u the tvue. Nut* *»im|(H I)4lirin'<L <'III|IIMMII. MMtMTInm iif titLijU i oitfjumiiK "1'v CTidiMpetm.

Excluded 'In iullnv»nit(iprcin arr tonirlinir^ found mi MI-I -'MI but tlir> are at efl ider 4 to be h>di sphyra XjUingim hmifntim RuitlwU |MI. tttttttmim (Valkenberg-Sunngar) S. Hooper, *K. kymhmm* tv*hl) I Kiiyama \Cffrrui kymimui Vjhl. / ^ o w $\sqrt{3}$ (Vahl) Down, 'iwrtiUs^Mb V^iiv (Vafat) Ballard, *Cyperus* ^w<uf<t JIM I III d., DON $\sqrt{3}$ (Lamour, *Mertensia* $\sqrt{3}$ (Aninrnnin |; K m t m l i i ^|. R. ri (>, Forster) Danl> « HutchinMm rt Oatfirt I $\sqrt{3}$ *nrmmtih**. R d G, Fomcr, A ^mxi^fcavn RiHib#II, *Cyftmti kylkmg** tudlnhrf |; Jt wfiJi Ho h • • • Sit $\sqrt{3}$ | K fi <*kl*(a Vih|L K. *idirmtm* ViW Uli $\sqrt{3}$ (Wight) T. Koyata; *K. polyphylla* Willdow ex Kuiuuh | fc $\sqrt{3}$

I, Rhu $\sqrt{3}$ erect; culm $\sqrt{3}$ naetj nn- $\sqrt{3}$ ml1otr*(rin f HMMIK nf * brwU; tpi^U I* toi n xtrr rli.ui » cum k>wj; itiinl ind hmiih RUIH' $\sqrt{3}$ (IUIV mm W>nfi,*-!>...tn iuwp K IMH^JM 1. Rln/iMu** f^ijj^i. creeping; culmii wliutv $\sqrt{3}$ <in^|i- nm atoivg fltr rhunotr, Miftorr - $\sqrt{3}$.ijllv trt 1 tir<rl. ifMtrlrti 5 mm m nwtir t. $\sqrt{3}$ and fourth gl. >ft? ^ mm IM ni4nr Uwig, wild 4 Miif $\sqrt{3}$ cup

118

CYPERACEAE

Rhynchospora **ixkutruut** I luag wd art newthr surface : kwnl imolitrcl bt. of attracting at maturity: mm 1-1.5 mm long, 0.5-0.7 mm * wide

R. brevifolia

t. RhmMmt <ir< unit win ami wuoth. now iii4< out: kww*i invtdurni) bract UKlftlh- rrtlcircf al iuiuvity, mm 1.5-2 m long. 0, <WhK mm widr

Jt *multicaespitosa*

Rhynchospora brevifolia Ker. • MI \##*m illicitnMfanib#II> Hooker: Pg

Khuorqn MokHiifrrtMtt (Uwj{. cccvpinftrnml r>c*i the surface). 1- I mm m duimiri. i UnKrd with hrotrm <t air* C ul<m «4iur» or ln a mftlr roar, 5 IBJL (OJV-) 1-1.5 awn th>* I Leaf 'lirathf nrnbfMMQtt term to p. rplc, the kMvrr oor» AIUWM hurt-1 Mail trvrlnprd on upprt lr<<r<. H#f. »h<Hlr n or « lamp at the IUIBH, 1-5 {-*} mm wdr h^tvlurrtil fanra 3or 4 (-l>l. the hiwil uMuth rtrri IH BprvaKting. ' itHkr utu*k> ipcradmf v<rd. 5-1' (-20) 'in kiqf, Inflo<< (rwrh. • *xmrtn. pair ftrrn bennmtlf «nwsia4<> in r\U*H*1. 1-4 mm long. 1 1 nun >»*



FIG. 128. *Rhynchospora brevifolia*: a, whole plant (1 cm); b, inflorescence (2 mm); c, spikelet (0.5 mm); d, nut (0.5 mm).

i>)unm WMU|MKJI. membranous, 5- or 7-merous, ... cupulate JI apn; fknj Jlad irnmd gkunn up n> 1

long. retainmi jhimo S.^-1 mm kmff: krri l^1^ . KIK hnond ibr |himr a| m inio « fti^; ...

I. miuuih or ifunrh «p*w tmwd» ihr up SMIBC** 1 or 2 (3). N.IU ubcMjlr U> rlhptMAI 1-1' - n « n W » 0.5-0.8 m -m VKIT, brwnth.

Perenn J A HTdf plant not cvnAnrH to but Ofefl trtuiMi along uiram* and stems, at the edge of swamps, in the ... trf puuk m minht trr^M^I Uod »nd rro,iM n< «' around hn- Art (ten loom an > mmnttcw?

(Hyp. Herb. W. ... of the whole world: Bur, Blau. .HI. Ges. Ind. \rp, Piii Bb £H. Mi I', K, Sk m I j- W, 0-2000 m.

Rhynchospora multicaespitosa Nees [Cyperus multicaespitosus (Nees) Valckenaer-Schimper, K. Apoll. Moqart]: Fig. 129 Rhynchospora decumbent, woody, 2-4 mm in diameter, the surface, clothed with brown scales, very aromatic. Culms close together in a single row, (20-) 50-170 cm tall, 2-5 mm thick, sharply 5-angled just below the inflorescence. Leaf sheaths membranous, brown to purple or almost black, the lower ones bladeless. Blades of upper sheaths if present, very rarely more than 3 cm long, much shorter than the culms. Intercalary bracts 2 (-3), spreading ... the lower up to 20 cm long, up to 6 mm wide. Inflorescence a single head (rarely of 2 or 3 heads); head globose, (2-) 5-14 (-18) mm in diameter, pale green becoming more ochraceous or golden-brown at maturity. Spikes lanceolate-oblong or elliptical, 3-4.5 mm

k*.F 1-1.5 't * wide. Glumes ovate-elliptical, ... rt.Hr* more first and second glumes, 2- or 3-nerved, 2.5 t mm long; remaining glumes 5-nerved, 3-4.2 mm long, cuspidate at apex. kr*1 ... the glume ... scarcely spiny ... (1, 2) ...

1.5 . ' mm Umt tt W) • HW mdr. hinmi w W>*&^ Perennial. In or near ... in swamps, near a, swage hollows, nut* • of floating vegetation and wet ... places. The plants are strongly aromatic.

PUnu pmnn< in water lend to have well-developed leaf blades; they are sometimes recognized as subsp. Apoll. (Moqart) Kern.

II, in Herb. Old World tropics and subtropics. I Ind. K, K, Ts, Cy, 0-2000 m.

Rhynchospora brevifolia Steudl. [Cyperus brevifolius (Steudl.) Nees & Meyen (Rothsch.) Endlicher, K. Indus. Ges. Ind., non Palomb. de Beauveril]: Fig. 130 Rhynchospora short, erect, without rhizomes. Culms densely tufted, slender but bulb- or cane-like at base, (2-) 3-15



FIG. 140. *Lycopodium subrepens*: a, base of shoot (1 cm); b, inflorescence (1 cm); c, spikelet (1 mm); d, root (1 mm); e, female flower (1 cm); f, spikelet (1 mm); g, inflorescence (1 cm); h, female flower (1 mm); i, root (1 mm).

(4-5) cm tall, 0.5-1 cm diameter. * a stout, light brown; blades well-developed, linear, flat to plicate-clavate → the culms, 1-2 (-5) mm wide. Involutaral bracts → becoming reflexed at maturity, the lowest up to 10 cm long. Inflorescence of usually 3 (rarely 2) spikelets; central spikelet globose to oval-globose, 4-6 mm long, 2.5 mm in diameter (the lateral ones somewhat smaller), pale green to greyish-white. Spikelets oblong to lanceolate-oblong, 1.7-2 mm long, 1.0-1.5 mm wide. Glumes ovate-oblong to lanceolate-oblong, linear; first and second glumes 1- or 2-ranked, 0.3-0.5 mm long, remaining glumes 5- or 7-ranked, 1-2 mm long, cuspidate at apex, keel not or hardly extending beyond the glume apex, without a cup at most submicroscopically smooth. Stamens 2. Nuts oblong, 1-1.5 mm long, 0.5 mm wide, brownish.

Perennial. Common in marshy places particularly at banks and streams but it is also found in wet or damp grassy

(Tern/Holl. C. tropics and subtropics: Blm, DR, Hp, KL, K, MS, Mp, Oc, P).

Ej. h, i p. Wh. 6-1000 m.

Lycopodium 1 t]***k

Lycopodium onicmhta [lfettbtt) Domfe [l., numi.i 1_ (Rkturd / - ttmpmsm Boerkrirr. / Fig. 141)

Khu. »rw% crtcpfeift. w o * . **P«° r r i TM,» kmΛ***min in duni' (er, clothed with scales. Culms close together, arranged in ft ran •k»f the chlorome, leafless, erect, <fr-) 50-100 (-1W) ton Bfl, ii-~ mrii In **^t<- severe, glasn (in* ((ffrn. mnooth, boUoH and BI severely separate. Leaves .^iurH KI J frv scales and ihr<th* ai HK: ba^ <r fihc Mrtu l m<-Kurul bfMi crctt. exceeding the BIOTItWM, t 4 cm long # | f K a*a...iitim. stem of the stems. Inflorescence a solitary.

10-50 cm tall, 0.5-1 cm diameter. UB loc. iMtnm lo Wark J(HMWMI V Spftaltf mim, ^u.,iu ananfed, tutucndcd Ky «v*tc. obcu hard, nil ghtni-like head i CM x scales, (or the nlfcelei i p p g * w 1 M

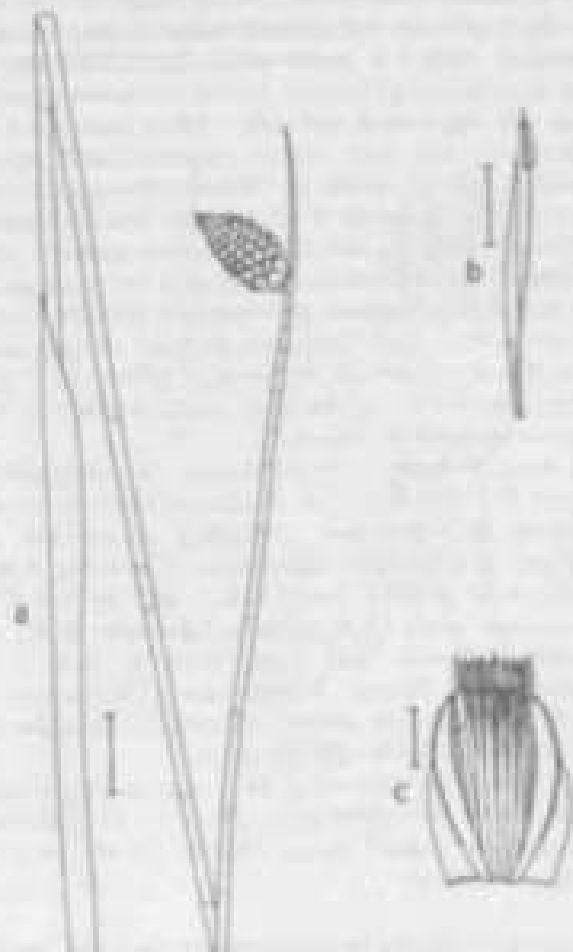


FIG. 141. *Lycopodium arundinaceum*: a, flowering shoot (2 cm); b, male flower (2 mm); c, spikelet (2 mm).

ufcr, feather) -6.2"mm k<>g, 3-6.2 auawid, chestnut to purple-brown, not serrated, with hyaline margin. Flowers unisexual. Male flowers numerous, each with 1 anther 2.2-3.5 mm long. Female flower terminal (terminal), with up to 5 scales (glumes) and 1 ovary. Style 2-3 mm long, 2-lobed; stigma 2. Nuts brownish, flattened, oval to broadly obovate, v-1 mm longwfd a 2 0.5 mm long beak, 2-2.8 mm wide, 7- to 9-nerved on each side, brown.

Perennial. Grows in shallow lakes, in swamps and in saline backwaters and marshes. Cultivated for fiber which is used for mats and as packing material, in nutbcm China Un junk H

(Ten/Hyp). From Madagascar u throog S Asia to New Caledonia: Cey. Ind. ->Ta

— (Hemiclapha, Isalpis pro parte, Bistula): 35 species; pantropics and subtropics, more in Africa.

Annual or perennial. Culms erect, ± cylindrical, glabrous and smooth. Leaves basal; sheaths rather short, closed; ligule absent; blades linear, flat or rarely involuted, glabrous and smooth. Inflorescence terminal, leaf-like, with 1 to many spikes, surrounded by 1 to few, spike-bearing or empty bracts, the lowermost clasping, the uppermost scale-like. Spikes composed of a cylindrical axis with many well-developed spikelet bracts in a dense spiral, the lateral spikes each with an empty spike prophyll. Each spikelet bract subtends 1 n. several spikelets with 2 small hyaline scales, 1 empty prophyll and 1 flower-bearing glume (in some species the prophyll and glume are reduced). Glumes obovate to spatulate, caducous, with a short to long apical part. Flowers bisexual. Stamens 1-3. Stigmas 2 or 3, styles not sessile at the base, totally caducous. Nuts broadly obovate to ellipsoid.

I have followed the treatment of Georghebeur, P. and Van den Berre, A. Studies in Cyperaceae 8. A revision of *Lipocorpha*, including *Hemicorpha* and *Bistula*, Wageningen Agricultural University Papers 89(1): 1-87 (1969); Datta Rekha and Varsh, V. D. Taxonomic study of the genera *Lipocorpha* R. Br. and *Bistula* Kunth, [sic] from India. Journal of the University of Poona, Science and Technology 48: 19-32 (1976); these authors consider *Lipocorpha* in a (!*) lected sense with only 2 species.

Excluded the following do not grow in wetlands: *Lipocorpha hemisphaerica* (Roth) Georghebeur [*Hemicorpha isalpis* Nees, *Isalpis bistula* Steudt.], *L. pycnantha* Kern.

1. Lower involucrel bract always strictly erect (axis of spikelet bract 0.4-0.5 mm long) *L. squarrosa*

1. Lower involucrel bract obliquely patent to reflexed in fruiting heads

2. Spikelet prophyll and glume absent; axis of spikelet bract (0.7-1.3 mm long) as long as, < longer than the lower expanded part *L. kerrii*

2. Spikelet prophyll and glume present; axis of spikelet bract shorter than the lower expanded part thr

3. Nuts without a beak, remnant of the style base less than 0.1 mm long; midrib of the spikelet bract decurrent beyond the bract into a cup or short awn. *L. rotatif*

5. Nuts with a conspicuous beak, remnant of the style base 0.2-0.3 mm long; midrib of the spikelet bract not decurrent beyond the bract of U-vl

^ Spikelet bracts almost as long as the nut; spikes dark purplish-brown to almost black *L. sphaeroloba*

4. Spikelet bracts 2-3 times as long as the nut; spikes whitish, silver or pale brown

3. Leaves not more than half as long as the culm; spikelets whitish to silver; nuts narrowly obovate to oblong, 0.8-1.2 mm long, 0.2-0.3 mm wide *L. chinensis*

3. Leaves as long as or longer than the culm; spikelets pale brown; nuts oblong, 1.3-1.6 mm long, 0.3-0.5 mm wide *L. cyperus*

Lipocorpha chinensis (R. S. Beck) Kern [*Hypocorpha cyperus* Vahl, *Fragaria longispina* Robinson]: Fig. 162

Culms tufted, 15-60 cm tall, 0.5-2 mm thick. Leaf blades flat, one-quarter to half as long as the culm, up to 40 cm long, 2-4 mm wide. Involucrel bracts 2-3 (-5), the largest up to 15 cm long. Inflorescence terminal, with (1-) 2-10 (-12), subequal spikes. Spikes oval to conical, 3-13 mm long, (1-) 4-5 mm in diameter, whitish to almost silver. Spikelet bract oblong-obovate to spatulate, 1.5-2.7 mm long, 0.5-1 (-1.3) mm wide, acute to apiculate at the tip, white to pale yellowish brown, often with red tints and a green midrib. Spikelet prophyll and glume 1.2-2 mm long, often with reddish stripes. Stamens 1 (2). Style 0.2-0.3 mm long, 2-lobed; stigma (2) 5 about as long as the style. Nuts weakly 3-lobed, narrowly obovate to oblong, 0.8-1.2 mm long, 0.2-0.3 mm wide, brown, with small style base remnant.

Annual or sometimes perennial. In marshes, seasonally flooded places, ditches and rice fields. Common and often abundant. Superficially it looks like *Elymus* but differs in the spikelet structure.

(10) Ten/Hell. Old World tropics and subtropics: Bho, Cey, Ind, Nep, As, Bn, Hp, Kl, Kt, Mg, Mb, Ms, Mp, Mr, Sk, Ta, Up, Wb.

Lipocorpha kerrii (Raymond) Georghebeur [*Bistula kerrii* (Raymond) J. Ravenel, *Isalpis kerrii* (Raymond) K. Lee]: Fig. 163

Like *L. squarrosa* but involucrel bracts obliquely patent to reflexed, most parts generally larger; culm

Annti.il Terology H.IIMIWI IHII pi'dtuUv in wet places.
(C) Tenz/i lelrl. End* mic to S. lodia *»n<| Ap. Ts.

Lipocarpus p... {Vttit} Kn.iili |/. innp*
(Ri)

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lx>r hlwin Hat. tlnlghl, oiMMjuwin to lluc<i|Uilui
u <MIK M "hr nilni. up » 251 in Umg tmt imallr nw h
lra. (3-) l-2.2 mm v.tit'. huwkuni tw*-t» 2-S, ihr
larger n> >> l. on long. Inllim . once in itlliu. volli
(1-) 2-3 (-5). ^kfk « (no 4ii to come |J,*-8H
leaf l.?M Rim in tluwin. uuulKdui [Hjt]i4r-btoMin.
Spttckt bnd ub mt. 13-L7 BIB nani
h. UtonJy AT<| i m m -1*^1 pan 0 2-0.4 mm h nf,
pale lu wtkiwuh4*<Ti*Ti. rnlldUMmwrn 4l» del
l>...|iis1l iiiiwl itlunw l,l-|.Afmn krn^, O.K-l nun m
Sumritt IM . l u 1 nun kmc, 5<kft;
± O.iK mm long, nfub »*drtt IJMAOMI U>
l-i.H mm UHIR. IXVOJ mm *ttr. i k k IKHH K W*k.
cmiipHiMMi "«" wp; > il tOJ nun
\ni. (we firMft md HB
Lw<» Hi*1 tUil-i oloured bewfa me a dta M>



FIG. 162. *Lipocarpus obtusus*: a, whole plant (2 cm);
b, inflorescence (2 mm); c, spikelet bract (0.5 mm); d, seed
(0.5 mm).

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Atm.MI OB »>d »< *."idrt Oi (KMfa »d unk*.
Flowering in the water rice
(C) Tenz/Hedl Tropical Africa and India. Ind. Kt.
Mio? Mp.

Lipocarpus repens L O *repens* (L.)
with. var. Fig. 164
Like *L. spicatus* but with recurved or obliquely erect
culms with curved leaves longer than the culms;
spikelet bract 2-2.5 mm long, at apex rounded, without
an awn; spikelet prophyll and glume 1.8-2.1 mm long
more oblong, 1.5-1.6 mm long, 0.2-0.4 mm wide.
Annual. On the edges of rice fields.
(C) Tenz/Hedl. Endemic to S India. Ind Kt, Ts.

Lipocarpus repens L O *repens* (L.)
with. var. Fig. 164
Like *L. spicatus* but with recurved or obliquely erect
culms with curved leaves longer than the culms;
spikelet bract 2-2.5 mm long, at apex rounded, without
an awn; spikelet prophyll and glume 1.8-2.1 mm long
more oblong, 1.5-1.6 mm long, 0.2-0.4 mm wide.
Annual. On the edges of rice fields.
(C) Tenz/Hedl. Endemic to S India. Ind Kt, Ts.



FIG. 164. *Lipocarpus repens*: a, whole plant (1 m);
b, inflorescence (2 cm); c, spikelet bract (0.5 mm);
d, seed (0.5 mm).

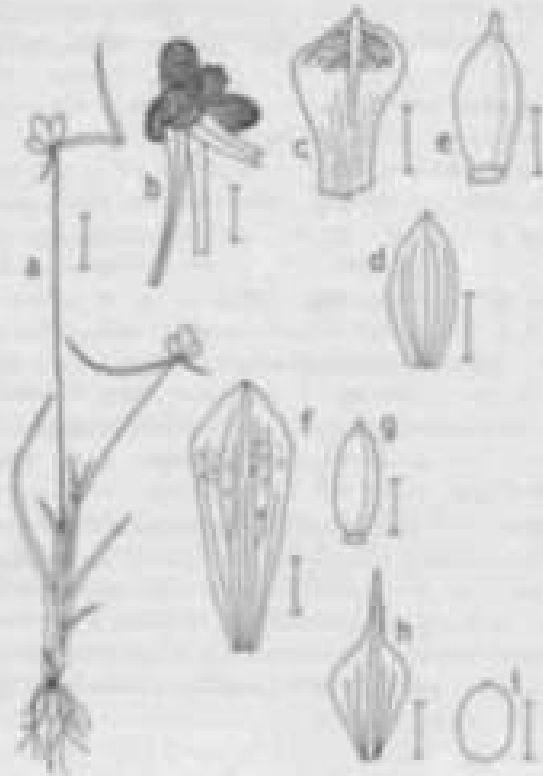


FIG. 164. *Episcorpha ovalis*: c, spikelet bract (0.5 mm); g, nut (0.5 mm); e, nutlet; h, spikelet bract (0.5 mm); l, nut (0.5 mm); *E. sphenoloba*: a, whole plant (1 cm); b, subventral view (1 mm); i, spikelet bract (0.5 mm); d, glume (0.5 mm); f, nut (0.5 mm).

Episcorpha ovalis (L.) Kunth, *Bot. Bot. Afric.* 4: 150 (1845). Africa: Bot. Bot. Afric. 4: 150 (1845).

Episcorpha squarrosa (L.) Gussone, *Bot. Bot. Afric.* 4: 150 (1845). Africa: Bot. Bot. Afric. 4: 150 (1845).

Stems 2-10 (-20) cm tall, 0.2-0.5 mm in diameter. Leaves 1-4 (-10) cm long, 1-2 mm wide. Spikes pale to red-brown below, yellowish at top, 0.4-0.5 mm long (including awn). Glumes 0.4-0.5 mm long, 0.4-0.5 mm wide, usually recurved at tip. Spikes purple and glumes white. Stamens 1-2 (-3) per flower. Awns 1-2 (-3) mm long. Nuts oblong, dorsally flattened, 0.4-0.5 mm long, 0.2-0.3 mm wide, slightly curved.

flattened, 0.4-0.5 mm long, 0.2-0.3 mm wide, slightly curved. Usually in or near water, fruiting as the interwoven mat. Often forming a closed turf. Also found along coastal lagoons. Sri Lanka, India and China, naturalized in America: Bar. Cey. Ind. Nep. A. (0. 18, Mp. if. 11 KJ 1 f. Wi. 0-1800 m.

Melicaria religiosa (Springer) [Faint text] *Melicaria religiosa* (Springer) C. C. Smeaton, *Bot. Bot. Afric.* 4: 150 (1845). Africa: Bot. Bot. Afric. 4: 150 (1845). *Melicaria religiosa* (Springer) C. C. Smeaton, *Bot. Bot. Afric.* 4: 150 (1845). *Melicaria religiosa* (Springer) C. C. Smeaton, *Bot. Bot. Afric.* 4: 150 (1845). *Melicaria religiosa* (Springer) C. C. Smeaton, *Bot. Bot. Afric.* 4: 150 (1845).



FIG. 165. *Melicaria religiosa*: a, base of plant (1 cm); b, top of subventral view (1 cm); c, spikelet bract (1 mm); d, nut (1 mm).

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long; pollen polyphorous

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(Ten/Hyp). Warm to tropical regions of S, SE and
E Asia and Australasia: Cey., Ind. An, Mg.

Majaniia (*Pandanusphylla*) 2-45 species, pantropical
2 rather similar wetland

Robust perennials. Leaves **ik**
Involucral
Inflorescence a terminal head or reduced to a single
spikelet. Each glume subtending an abbreviated cyme;
the cymes consist of a single, terminal (central),
fwkrtl any surrounded by 4-6 glume-like scales
(squamellae); squamellae mostly bearing a single
stamen, lower pair of squamellae opposite and lateral,
folded with an acute keel, dissimilar to the remainder.

mostly found as undergrowth in humid forests. It is
mainly poorly collected and there are numerous tax-

mmm problem* i« hr *nhrd

Excluded the following have been recorded from

India i. i v
M. cuspidata (Miq.) Urdem [M. *cuspidata* F. VII] An;
M. cuspidata var. *angustifolia* (Urdem) Urdem; An;
M. cuspidata var. *perfoliata* (C. B. Clarke) Urdem; An;
At *M. cuspidata* (Hornem) S. Swaled) F. v. [M. *cuspidata*
I. B. Clarke, *M. albertii* C. B. Clarke]

1. Culm 3-5 cm long, clothed in scales for nearly the
entire length, bears at base of spike with linear blades,
up to twice as long as the spike; glumes and other
floral scales 7-8 mm long

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spike; glume intei and cHer tlmal tcaln ± 10 mm **long**

Majaniia (*cuspidata*) (Thwaites) **Bcttdwa** n C B. Clarke
|*Pandanop**|U*m rmmum **HIWIIIMI**; l'm lt*

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^jnkir wiih hnc4t l.l..!> up to twice as long as the
»pikc; fttuim-t ami «*!*** **flooJ** *c>lo 7-tt mm

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i it (**laifccfhxttSE**Aria

(Hyp). Endemic r..Vi Lanka; Cey.

Majaniia (*cuspidata*) (Thwaites) (ThwmiK v< IV ntham el C B. Clarke
(f *cuspidata* (Tliwwtn) Mk)url): F« 166

Rhizome* thon. ki>olt>. w m !
5-8 cm long, 7-10 mm **mdiaa** **rt** **brawn**, (-n)m*
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J<i rm k>*^, lnuhcry*. bbuln **I M V**, **moth** Um^rrthan



FIG. 1W. *M*fm>m* *cuspidata*: a, whole plant, somewhat the
grass-like (1 cm); b, glume (2 mm); c, spikelet (2 cm);
d, bu (ft mm). *M. cuspidata*: e, culm with inflorescence (2 cm).

culms, 60-110 cm long, 7-20 mm wide. Involucral bracts scale-like, ovate to ovate-oblong, 1-1.5 cm long. In flowers a single terminal spikelet. Culm sheath glabrous to glabrous-elliptical, 1.5-2.5 cm in diameter, pale green tinged with brown. Spikelets shorter than the glumes, with 1-staminate male flowers below and 1-sterile female flowers above. Glumes and glume-like scales 6. Perianth absent. Anthers 4-4.5 mm long. Style 11-12 mm long, 3-cleft; stigmas 3, 2-2.5 mm long; style base slightly thickened, 1 persistent on the nut. Nuts obovoid, terete, 4.5-6 mm long (excluding beak), 2.6-3.2 mm in diameter, brown to yellowish-brown, smooth.

Perennial. Often near water or on moist ground in low-altitude forests.

Hyp/Ten/Hell. Endemic to Sri Lanka and S India: Cey., Ind (I have not been able to confirm the record for India).

Morweui [Cymatocloa, 'Cymatocloa' orth. var., *Andropogon*, excluded from Cyperid]; ± 200 species; pantropics and subtropics, most in S America.

Ajrt Annual or perennial, tufted or rhizomatous. Culms usually 3-angled and erect. Leaves mostly radical. Involucral bracts usually long and leaf-like. Inflorescence terminal, simple or compound panicles, with branches bearing clusters of spikelets or sometimes contracted and head-like; bracts at base of culm (prophylls) keeled, tubular at base. Spikes cylindrical, ovate or globose. Spikelets flattened or subterete, 1- or more-flowered; rachilla with a joint above the prophyll and falling before the glumes (the whole spikelet falling in entirety). Glumes distichous, clearly in 2 opposite rows, often imbricating, margins usually hyaline; keel distinct. Flowers bisexual, all fertile except sometimes the very lowest ones sterile. Perianth bristles absent. Stamens usually 3, connectives often crossed. Style 3-cleft, not swollen at the base, stigmas 3, nut 3-angled.

Excluded, the following may sometimes grow on wet soil but they are not considered to be wetland plants: *Mariania cyperina* (Retz) Vahl subsp. *cyperina* [Killing] *cyperina* f. *retzii*, *Cyperus cyperinus* (Retz) Vahl (subsp. *cyperinus*); *M. cyperina* (Retz) Vahl subsp. *indica* (C. B. Clarke) T. Koyama [*M. imbricata* Schreb. f. *ex* Nees]; *M. jamaicensis* (Humbert) Merrill et Metcalf [*M. albicans* Gauchichanal-Beaupré, *Cyperus pennatus* Lamourk]; *M. bahianensis* (T. Cooke) Scribn. & Sm. [*M. subrotundata* Nees var. *subrotundata* C. B. Clarke]; *M. pedunculata* (R. Br.) T. Koyama, *Cyperus unguis* Rottbott.

- 1. Spikes globose or nearly so.
- 2. Rhizome perennial; spikelets cylindrical, linear, 3- to 14-flowered; glumes obuse, not mucronate.

M. compacta

- 2. Slender annual; spikelets averticillate, 1- to many-flowered; glumes acute, mucronate; averticillate (developed nutlets).

M. cyperoides

- 1. Spikes not globose, distinctly longer than wide in some cases; sometimes if sessile wider than long.

- 3. Culms with 3-angled nodes; inflorescence simple.

- 4. Inflorescence a digitate cluster of cylindrical spikelets.

M. dactyloides

- 4. Inflorescence a single hemispherical head; nodules absent; spikelets with 1- to many flowers.

M. dubius

- 3. Culms not swollen and bulb-like (but sometimes bearing woody corms) at the base; inflorescence compound or sometimes reduced to a single spikelet.

- 5. Spikelets with 1 or rarely 2 fruits; glumes averticillate, moniliform or rhizomatous perianth.

- 6. Spikes (10-) 20-40 mm long, densely bearing very many (25-150) spikelets; greenish-yellow often with a brownish tinge; spikelets whitish-green, spreading at maturity, mostly 2-3 mm long; plants rhizomatous and developing nodules; inflorescence usually compact.

M. paniceus

- 6. Spikes 5-15 mm long, densely bearing up to 40 spikelets, light glaucous green; spikelets green to straw-colored, some panicle ascending at maturity, mostly 4-5 mm long; plants rhizomatous not developing nodules; inflorescence usually umbel-like.

M. rotundifolius

- 3. Spikelets with 6-25 fruits; glumes with recurved awns; slender annuals.

- 7. Inflorescence a simple panicle of 1 or 2 sessile spikes and 1-7 stalked spikes or sometimes reduced to a single hemispherical spike.

M. squarrosus

- 7. Inflorescence of 1 central group of spikelets and usually 1-4 stalked, digitate spikelet clusters, each with 3-15 spikelets (each spikelet with a short axis - not true spikes).

- 8. Glumes 1.4-2 mm long including awn, keel green with purple stripes, the sides rusty to reddish-brown.

M. pectinatus

- 8. Glumes ± 2.5 mm long including awn, green with red streaks.

M. undropunctatus

Mariania dactyloides (T. Cooke) T. Koyama [*Cyperus dactyloides* T. Cooke, *M. bulbosa* C. B. Clarke, *M. panic* Nees] Fig. 167

Rhizomes short, with nodules, nodules up to 10 cm long and 1 mm in diameter. Culms solitary, (5-) 10-30 cm tall, 1-2.5 mm thick, 3-angled, smooth throughout, the base thickened and bulb-like. Leaves 3-7 to 2



FIG. 167. *Mariscus ciliaris*: a, whole plant (1 cm); b, spike at midlevel (5 mm); c, spike at summit (1 mm); d, spikelet with nut (1.5 mm).

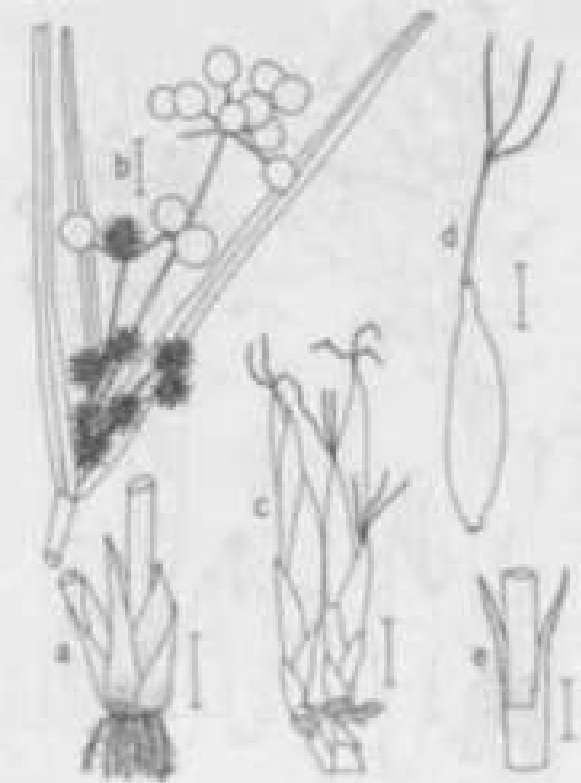
culm, sheath cylindrical, dusky brown, wider than the blade; blades 7-20 cm long, 2-4 mm wide, faintly plicate, channelled, glaucous green. Involutel bract 5-9, spreading or reflexed, the lower ones much over- topping the inflorescence, the longest 10-20 cm long. Inflorescence simple, often congested in a digitate cluster; cluster 1.5-3 cm long, 1.5-3 mm in diameter. Spikes cylindrical, often subsessile, 4-15 mm long, 5-7 mm in diameter, glaucous green, the rachis hidden by densely disposed spikelets. Spikelets spreading, lance-olate-elliptical, sessile, 2-5.5 mm long, 0.7-0.8 mm wide, bearing 2 glumes and 1 flower. Lower glume oval or narrowly oval, 1.5 mm long, 1.5-1.5 mm wide, sheath to acute, conspicuously 11- or 15-nerved, the

miiUib grtwn and slightly keeled; upper glume lance-
bie, acute, 2.25 mm long, 2.12 mm wide. Stamens 2,
 Mvlr 11-2 mm t«nt- uUll u] halfway down. Nut
 .il.^.(in*]lItt«i'nl
 * HHmmwMfa. muzzling dark brown.

Perennial. Stems, HIA1U H.I«K1M1 }« ni on wet
 sand in river beds. It has bulb-shaped stem bases like

w juiWkt but ««Jt*
 (Tom. 167). Endemic in S. j | , r l . . . 1 IW
 « K, In < I W

Mariscus ciliaris (L.) Boldingh (*Cyperus ciliaris* L.)
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 Kuntii. C ././«*«* V»hL *M. mtcnxtplltiu** Ftttd]: Fig. 16H
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ffc. lift. *Mariscus ciliaris*: a, base (1 cm); b, part of inflorescence (1 cm); c, spikelet (1 mm); d, base of ray (0.5 mm).

Pcrrnnul In »hallow l water, > seasonally ltnu led
[, wtinpi wet rice fields, maiUir*. diniir*. ii
bulks, often gregariou» *nd tormina ti*nd». DfaKingi*****1 b* thr URkr. irtldith-biov » ltille >cv
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Mariania cyperoides iK<>il>tti_ghi .V Dietrich ((*Cyperus*
rntt: (Linnæus) O. Kunze is a synonym of
Mariania iwMfmtm tft' (Rural); *Kyllinga cyper-*
oides (Rochburgh) Nees,
Indonectaria cyperoides (Rochb.) Dennis et R.
Cyperus pseudoheterostachyus Kükenthal) h^ 100

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about up ; 2-8; rays 3-8, 1-10 cm long. Spikes
globose. 4-tV mm M» duiivriit 4rnw-K U.n tang 4-12
tpikr-ktk, Itf(hi glaucous green. Spikelets stellately
dt\r(^rni. l- oi : flowers. «• (3-) 3.8-4 : mm
trmg. t.H-I. lmm» r
C4umr* rlltptkai. 4 mm tang. wll**ri>h-um ^<^h.
green -tit Mmtigh Hirt{**d ttiulf il) inn)* h recurrent in
a 0.5 mm long straight or -eltTK cun+d mn
Nuts linear-lanceolate to linear-oblong, 3-sided, 2.2-3 mm
long, 4-03 mm wide, maturing reddish brown MTI

Annual. Seasonally wet places, swamps, temporary
pools and rice fields, not found only in wetlands tiAMI
tim m apt* w MJHI
«| (trld* 41td RifiVit* I It
iHhci 'peroville plants by the combination of
vertical spikes and winged glumes. Some authors
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pro parte]

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Baker (1908) *Flora of the Malay Peninsula* VCM
Al rfiywi funth, At U<tr. C. McGinn; Fig. 170

1V40 (-701 im tall. OS-J mm ihki. S^tiinl. * * < * 1 < h
throughout, thr hM, thickened, **tai bulMiLr Lrt^**
several to a culm, sheaths somewhat inflated towards
the base, blades much shorter than to almost equalling
ihr • An. 3- W|4t}iMiI<|J- & (4) mm wide, flat
or with incurved margins, soft, pubescent along the
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first to reflexed, the lower ones much overlapping
ttw milli irrt. rttc r. lke taMAMt ft-M * m
center a dense, spherical or 2 lobed head, head
ovoid-oboid, 3-5 mm diam., greenish-white to
dirty white.

broadly ovoid, densely bearing 8-24 spikelets, light
subulate, up fc. > mm
H"kc<lets spreading, ovate to lanceolate-oblong, in
to slightly fl (2-) 4-8 mm long, 1-2.5 mm
wide, bearing 4-8 glumes and 3-6 flowers. Glumes
broadly ovate to lanceolate-elliptical, (2-) 2.8-3.8 mm
long, (1.5-) 2-3 mm wide, pubescent to acute, conspicu-
ously 11- to 15-nerved, pale brown, the midrib green
and slightly keeled. Stamens 2 or 3. Style ± 1 mm long
stigmas 3, shorter than the style. Nuts ellipsoid to
obovoid-ellipsoid, 3-sided, (1.2-) 1.6-2 mm long,
0.6-0.8 mm wide, maturing light brown with bevel
angles.

Pcrr<nnul In seasonally flooded areas and in
pockets of - * 1 irt>.. la. Not confined to wetlands and

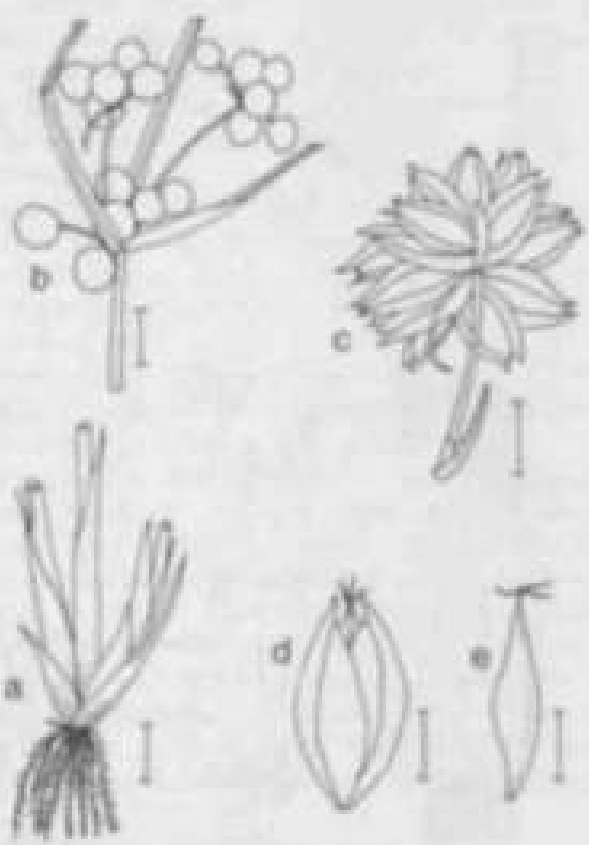


FIG. Mfc *Mariania cyperoides* a, base of shoot (1 cm); b, small
inflorescence (1 mm); c, flower (1 mm); d, spikes (1 mm);
e, nut (1 mm).



Fig. *Mariscus dubius*: a, base of shoot (1 cm); b, inflorescence (1 cm); c, spikelet (1 mm); d, glume (0.3 mm); e, nut (1 ft. m).

sometimes found as a weed in fields and near the sea on sandy beaches. Distinguished by its greenish white can...

inflorescence up to 20 mm in dia
b) bracts up to 9, 2-6 mm wide; have been var...

ii, foioo

Mariscus sudanensis (Willdenow) Sappor [*Cyperus sudanensis* Willdenow] Fig. 171

Like *M. squarrosus* but inflorescence of 1 central group of spikelets and usually 1-4 stalked, digitate spikelet clusters, each with 3-7 spikelets (each spikelet with a short axis - not true spikes); glumes 1-2.5 mm long, green with red streaks, 3-nerved; Stamens 1 or 2.

Annual. In seasonally wet habitats and shallow soil on rocks; also found in damp places in forests. In many older floras it is considered to be a synonym of *M. squarrosus*.

[E] Ten, Heli, Tropical E. Africa to SE Ind. Ki.

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«K'll it* * «tate contracted. Spikes white
cylindrical or oblong-cylindrical.

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Fig. *Mariscus sudanensis*: a, whole plant (1 cm); b, two spikelets (2 mm); c, glume 4(l.»mm); d mini mm)



FIG. 1. *Mariscus javanicus*: a, whole plant (1 cm); b, spike (1 cm); c, spikelet (2 mm); d, glume (1 mm); e, glume (0.5 mm).

Stem sterile, reduced. Stems 2 or 3. Style very short, 3-angled, 1.8-2.2 mm long. Spikes 0.6-0.8 m long, maturing yellowish-brown.

Perennial. Seasonally flooded places, marshes and mudflats. *Mariscus javanicus* (Linn.) C. B. Clarke. Differs from *M. rypwmdn* in being shorter (40-60 cm tall), culms shorter (1.5-2.5 m tall), leaf blades shorter (1.5-2.5 mm wide); spikes sessile or subsessile, shortly cylindrical, spikelets finally spreading horizontally; third glume only fertile.

(Tern)/Herb. India and Sri Lanka to Cochinchina: Ban, Bha, Bar, Gray, Ind, Nep, Pak: Ar, As, GJ, Hp, Kl, Kr, Mb, Rj, Sg, Th, Wb. 9-2000 m.

Mariscus squarrosus (Linn.) C. B. Clarke [*Cyperus squarrosus* Linn., *C. arvensis* Rothbl.]; Fig. 173

Rhizome absent, root system minute. Culm solitary or caespitose, (1-) 3-10 (-20) cm tall, 0.5-2 (-3) mm thick, 3-angled with almost wing-like angles, smooth. Leaves 2-5. In inflorescence, sheaths membranous, greenish stained with purple. Spikes 1-2 m long, 1-3 (-4) cm wide, flat, soft, gradually tapering to an acute point. Bracts 2-4, upright, overlapping the inflorescence. Spikes 3-8 cm long. Inflorescence a simple cylindrical spike, at first green, maturing reddish-brown at maturity. Spikes broadly elliptical to subglobose, 3-20 mm long, 1-2 mm diameter, echinate, with 20-60 spikelets, light yellowish green. Spikelets densely crowded, 1-5 mm long. Bracts 1. (Villd.) U, i-vi V (5) m, n-rir iiv^{1*1*1*} Mm^{*}, 6-lla 13-6 wins; r*l*^{*} -»^{*} -'***** elliptical, erect and recurved towards the tip. Length 0.5-0.9 mm wide; sides yellow to reddish-brown, with (2) 3 or 4 nerves on each side of the midrib; keel strongly exserted, forming a 0.4-2.3 mm long, recurved beak. Style 1.5-2 mm long as the ovary, 5, shorter than the style. Nests narrowly elliptical to almost linear, 3-sided, 0.6-1 mm long, 0.2-0.4 mm wide, dark greenish-brown.

Annual. Often found in seasonally flooded areas, usually flowering as the water recedes. It is also found

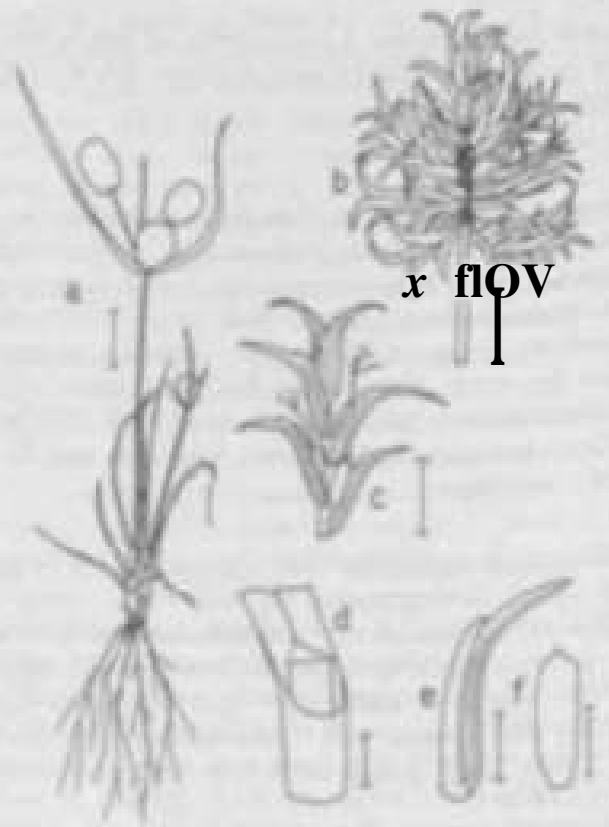


FIG. 2. *Mariscus squarrosus*: a, whole plant (1 cm); b, spike with involucre removed (2 mm); c, spikelet (1 mm); d, glume (1 mm); e, glume (0.5 mm).

at the edges of tanks, pools, streams, ditches and in rice fields. It is not confined to wetlands and may be found in relatively dry places. It is easily recognized by its short crowded spike. The rachilla are not always bearing recurved awns. The rachilla are not always bearing recurved awns. The rachilla are not always bearing recurved awns.

10 Hp. W. Ki. MI.. IT

Merisus nanus (Retz.) J. Ravn [Killingus nanus Retz., Cyperus nanus (Linnaeus) O. Kuntz, Scirpus nanus Linnaeus, Killingus nanus Retz., M. nanus Nees et G. B. Clark]; Fig. 174

Rhizomes short and knotty, woody, clothed with short hairs. Culms solitary or developing culms. Culms solitary or developing culms. Culms solitary or developing culms.

Inflorescence simple or rarely sub-paniculate. Inflorescence simple or rarely sub-paniculate. Inflorescence simple or rarely sub-paniculate.

Spikelets sparse or dense. Spikelets sparse or dense. Spikelets sparse or dense.

Glumes 2 or 3. Glumes 2 or 3. Glumes 2 or 3.

Perennial. Scarcely floccid. Perennial. Scarcely floccid. Perennial. Scarcely floccid.

Introduced in the Indian, Bur., Cey., Ind., Nep. An., G. I., M., S. (1500 m).

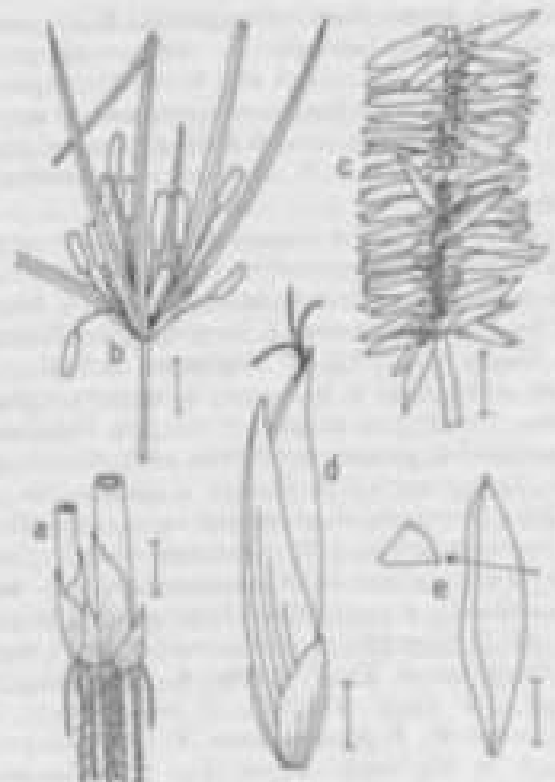


Fig. 174. Merisus nanus: a, base of shoot (1 cm); b, inflorescence (2 cm); c, basal portion of spike with some spikelets removed (1 cm); d, glume (0.5 mm); e, seed (0.5 mm)

Parus [excluded from Cyperus] 270 species, pantropical, most in Africa.

Annual or perennial. Culms usually erect. Leaves mostly radical, well-developed and leaf-like; blades flat, channelled or grooved. Inflorescence usually long and branched, often overtopping the culms. Inflorescence terminal, rare; pendulous.

et*1, MmpJr *if (ompourol i huri^i.i\%(proptnilt) b

or black, OLU'n »pw

t v, hided: *Pyertut fimmenm* (linnarut) Reckhenbact] [*Cyperus fasciatus* Linnæus]; a widespread species from warm temperate regions of the North Hemisphere, reaching the Himalaya* but does not extend into Peninsular India; records from Peninsular India are usually referable to *P. stramineus* or sometimes to *P. fasciatus*.

The following species may occasionally grow on wet soil but they are not considered to be wetland plants.

- *hul* Kt; *P. cwvibrotjvaha* (E. Govindarajulu) P. Singh et V. Singh
- *hul* In; *P. dtapHunu* (Schradler ex Roemer) S. Hoopci et '1 Koyana [*Cyrtandra diaphutnuy* Schradler ex Roemer] « *hutm*, *C i*tt#*f* (Boeckeler, *C. pseudohemula* Boeckeler, *P. pseudohemula* (Boeckeler) C. B. Clarke, *C. latipennis* var. *pusillus* V. G. Renthall, *P. daphnusa* var. *linearis* (Renthall) Nairthani et Sas); *P. daphnusa* (Salini et Nairthani) Hooper: * Ind; G. *P yucinrfwHi/uhn* V. S K [P, d*T. *hul* (E. Govindarajulu) P. Singh et V. Singh] *!n<l Mb. *P. latotitgtmitus* (E. Govindarajulu) P. S et V. Sngfa »!nd In: *P. /<n<fe* (E. Govindarajulu) P. Singh et V. Singh: *!ml tit. *P. ffiala&ani* C. B. Clarke: • *Imi* Kl. *P. ptumb*mmcru** (E. Govindarajulu) P. Singh M V. Sii: • *Ind*: »n; *P plwnWrfwii* (E. Govindarajulu) P. Singh et V. Singh: *!nd; K; *P nJtghimxfu** ft • < (Govindarajulu) P. Singh et V. Singh »!nd; T; *P »m<r<Wj<iv* i (E. Govindarajulu) I* SM»^1 et V. Singh: • *Ind*; T; *P. submissa* C. B. Clarke.

j. <itu> spikes at least 3 mm long; spikelets lanceolate or oblong, somewhat tergit, more than 3.5 mm wide

*P. wt*Wf *rt*

t. (Glumes less than 3 mm long; spikelets lanceolate or oblong, somewhat tergit, more than 3.5 mm wide)

2. Glumes with a furrow on each side of the keel; culms decumbent, few to several-noded below the im*tdl', the <wrr |.art decumbent or obliquely <t ruling |x t - h >, tint '<>atfM M loWl fiodd uMniK tU.ihitil loi otM <ju.ut<! : i lull i\;-: Irnjth by leaf sheaths

P. impuioleuta

J. Glume- culm a furrow on each side, culms without nodes above the base, erect from the base, not branching, not rooting, leaves only at base

1. Glumes truncate to emarginate at the apex; the midvein excurrent beyond the glume apex into a recurve less than 12 cm tall; slender annual

P pmmitt

2. Glumes acute to obtuse at the apex, never emarginate; the midvein not excurrent beyond the glume apex or if so then only minutely so and the micro not curved; culms usually more than 15 cm tall; • *ntuA* *n prrtiriMi

4. (.h. nms with a very *ti*!tnci v>hnc margin iboui 0.3 nun witle. the Midrib Mop) ng before the white margin

*P, macn*taeh\<**

J < • m' • *i ;! ,1 wffagC tnaursui **t whitr and hyaline BI) lowardt i' spe- and less than 0.3 mm wide. the midrib ending beyond the blade margin

1. Nuts narrowly oblong, at least twice as long as wide

P. polytachym

2. Nuts ellipsoid or obovoid to orbicular, less than one and a half times as long as wide

3. Nuts with 13-17, discontinuous, undulate, transverse wrinkles; epidermal cells longitudinally oblong; glumes without any hyaline margin

P. stramineus

4. Nuts smooth or minutely punctulate; epidermal cells isodiametrical or hexagonal, usually appearing dotted; glumes with a narrow but distinct hyaline margin towards the tip

tkrr-

5. Leaf blades channelled, grooved and folded, 2 needle-like, 1-2 (-3) mm wide; glumes ovate, 1-1.5 mm wide; rachilla obscure for glumes at maturity

felonf

ujred bj

P. fasciatus

6. Leaf blades flat or plicate, 4-8 (-10) mm wide; glumes ovate-obcordate, 1.5-2 mm wide; rachilla visible between the glumes at maturity

P. punctulatus

Pjwmw /bttWwi (Rrt/) (T. Koyana [*Cyperus fasciatus* Retz., *C. capillaris* J. König ex Rostk., *C. globosus* Allioni, *C. strictus* Rostk., *Pyrene globosa* (Allioni) Reichenbach, *C. villosus* Hochstetter ex Steud., *P. capillaris* (J. G. König ex Rostk.) Nees & C. B. Clarke, *P. huli* S. M. Almeida, *P. immitis* S. M. Almeida]; Fig. 175)

Rhizomes inconspicuous, roots yellow. Culms densely tufted, smooth, (3-) 8-80 cm tall, 1-1.5 mm thick, obtusely 3-angled. Leaves few, shorter than the culm; sheaths elongated, tinged with reddish-brown; blades channelled, grooved or firm, | . n » j 1 often needle-like, up to 15 cm long, 1-2 (-3) mm wide, gradually acuminate. Involucral bracts 2-4, the lower 2 overlapping the inflorescence, the longest up to 25 cm long. Inflorescence simple or partly compound, open or rarely contracted into a single cluster of spikelets; primary rays 1-6, up to 7 cm long. Spikelets ovoid to broadly ovoid, up to 2.5 cm long, pale or fuscous, with (3-) 10-15 (-40) spikelets. Spikelets spreading, linear or linear-oblong, parallel-sided, strongly flattened, 3-10 (-30) mm long, 1-2 (-3) mm wide, with 20-40 (-60) flowers, reddish-brown to purplish-brown; rachilla straight, persistent, single-3-angled. Glumes oblong-ovate, 1.5-2.5 mm long, 1-1.5 mm wide, membranous, reddish to purplish or

Ki. Mg, Mh. Mp. NR, Or. I'j. R| Ik, T\ Vp, W> 0-2800 i>

Pyrene nana J Uanwt*. H aUwMTpnafiir Nr<]:

Fig. 176

Rhbotac tbrnm Oulow isilaf) "• tufted, 15-90 cm U. 0.5-4 m frkfc, gl*br«u». ^ridrd. I lew; J d (I'W n cwrcfirtj ih# |<mtrr tng pierced by <Mnn^en(100U «iH iww IM blades tt.it => folded I W cm k»nj i »» no «rk< Involurnl Uacis V7 >c •pc««>dinx. i » longest 2*95 <-W> cm I*HK. It'' a simple or compound ujmu-1 hkc pwnkjc ol Ui^c *] primary my*. +12. MWHi »p I 13 cm I'nj5- Spikr

flatictirel. 7-24 mm lung.] 5-> mm wide. Mtdl IS-^4 flmifiv p JHIUJIK KANwrtd to jui <CM> <H*^ ^Odrn r«|drtrMKM»n, t^Iniiij fkuouA umrnt) wing Glume* abovae 2-3 tnintoitj; •! *....kWUe,ROI to ied-1MiwMi inJlurn wn dtorfwti aAitw, lqnttM



FIG. 176. *Pyrene nana*: a, whole plant (2 cm); b, glume (0.5 mm); c, spikelet (2 mm); d, flower (0.5 mm); e, glume (ft* W) with transverse lines (inset).

hkk. the ride. nerveless, involucre... narrow and only towards the tip, the tip obtuse; level distinct, green, narrow. Same; always 2. Style... longer than the... style. Non-beavers... elliptical or obovate, (0.4-) 0.5-1.2 m... stipitate, spiculate, maturing iLul. brown. a i * p'i

Annual or occasionally perennial in permanently wet habitats. In open, wet places, swamps, marshes, margins of pools and ditches, in rice fields and other irrigated areas. Often forming large clumps. Locally very common. It is very variable as reflected in the... but

nfiMrd h, the

>>-<'''

It has... been confused with *Pyrene obovata* var. It has... been confused with *Pyrene obovata* (Linnæus) Nees & Meyen, but this species is very different with transversely wrinkled stem and in

- It occurs only in the western Himalayas.
- (C) Herb. Warm to tropical Old World.
- A, Bur, Cey, Ind, Pak, An, Ap, Au, Bh, Gu, I

as

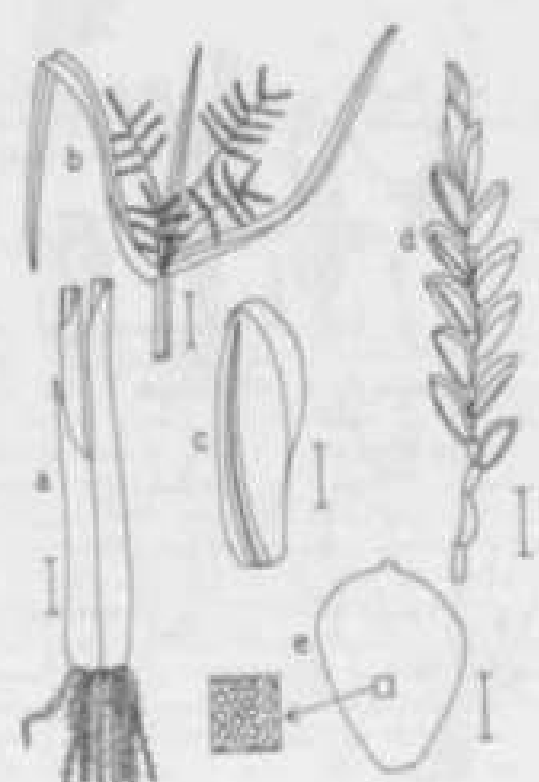


FIG. 176. *Pyrene nana*: a, whole plant (2 cm); b, glume (0.5 mm); c, spikelet (2 mm); d, flower (0.5 mm); e, glume (ft* W) with transverse lines (inset).

± 0.1 mm *tn^t: i>r up* rounded; turd dmiiu i. green. Served, *^*->p.ng tir* are the white hyaline margin. Stamens 2 or 3. Style deeply 2- or 3-lobed. Nutlet hex. *irnUf fuitnrd. (tbfcmg mohontr. L4-S mm kwtg. O.fr-I mm wwfr.* stipitate, spinulate, mature *ni (gr^* >urt*r with mint- papillae in dis. ^* < l loagtaict- nil ra*

Annual. *Ma^H* found in neaiotut? *Itaudrd wtm, la pooh, i m a m and htflaJo walknn tommon m > ice hrl-h. In \<n pUtet il vwfc iw br rathrr ***** <nd lotnat ^nd tn tkntd tomunv*

(C) Ten/(Hed) I nuiimpir<-Bitr.liiri:kl,KI.Mh

Pyrene polystachya (Roth) Poir 4k- Bearded *^yhtackr* orth. mm. *^11. hling var. laifera (Bri thian) C. B. Clark* (*Straggles glomer.* var. *^mossae (Rolle) Nathani et Moh.* *Cyperus polystachya* Roth. C *^mossae* Roth. *Pyrene siliqua* Urban (not the same as *C. ^mossae* Linnaeus); Fig. 177

Rhizomes short or absent. (ilftM ililTot .! M . in , l |(ML)><Mifft'>wmui 1-2 (-5) mm thick, smooth. *Soided hexanun ^*n<U^i JUU twL^TM (Kr nil* *^nce. Leaves few, shorter than the culm, sheath*

reddish-brown; *hUdn IUt at* slightly pliate, 3-40 cm long, 1.5-3 (-5) mm wide. *Invloccal bracta 3-5, at base ihr b>- not* overlapping the inflorescence, the longest up to 20 cm long. *Inflorescence loose or romp^tt* panicled or contracted in a subglobular or irregularly lobed head-like cluster of *^Tolens* primary rays 0-8, spreading *up * 7 <m* long. *Spikelets ^*c^* rarely arranged, loose to linear-lanceolate, flattened, (0.3-) 1-2.5 cm long, 1.5-2 mm wide, with 10-30 flowers, gradually narrowed to an acute apex, yellowish to *i ^d^ron; r* achilla flexuous, narrowly winged. *Glumes oblong-ovate to ovate-elliptical, 1.7-2.5 mm long, 0.5-1 mm wide, yellowish to red-brown, the sides nerveless, margin whitish hyaline. ^ tip acutish or obtuse with a minute *cmfcerll* *^mossae*, green, 3-veined. Stamens (1) 2. Style 2 twice as long as the nut. *Noli MCMWn. Uwi-* flattened, narrowly to oblong, 1-1.5 mm long, 0.3-0.5 mm un <ndr. *^mossae*, subtruncate at top. *J.UIM tu uUtr**

Annual or short-lived *prtrntMI V^rw^h* *^mossae* areas, damp places, *Il^l.in ltrlrfi rtvci ^*k^* margins of pools. Sometimes found near *ilir iri m* brackish conditions. A common *^mossae* but distinguishable by culm erect, *Ir^h *Mh HtM* *^mossae*, leaves flat, spikelets linear, gradually tapering to an acute tip; rachilla winged, *cluiV^* at most 2.5 mm long; acute, mucous, without depressions; nuts with flat or slightly convex sides. *^mossae* rarely *^*U^n(, uibtrum<tr ^<* the top, minutely *^*culi*

(C) Ten/(Hed). Warmer parts of the *^mossae* *Bas, Bar, Cey, idrf^ sk ^Ac, \ . U. li M^ Wi* *Sl, Ts, Up. Wfc*

Pyrene juncea (Linnaeus) Nees ex C. B. Clark [*Cyperus juncea* Linnaeus, *C. ^mossae* Vahl, *P. siliqua* Retz. C *^mossae* Roth. C *^mossae* Nees et *^*r>ir> S*]; Fig. 177

Roots very thin and short, yellowish. Culms tufted, slender, smooth, (1-) 6-12 (-20) cm long, 0.5-1 cm wide, 3-angled. Leaves few, basal, shorter or overlapping *lhr MNftrwr Arithi* pale stained with reddish-brown; blades flat or channelled, 2-6 *^BtaM ^*lurt!* wide, gradually acuminate, scabrid above. *Invloccal bracta 3-5, erect to spreading, overlapping the inflorescence, the longest 2.5-15 (-20) cm long. Inflorescence simple or compound, of 1 axilla and 1-6 stalked, spike-like clusters or sometimes (in diplopyrate *pAHN^> rntutml to l* head-like cluster; primary rays 3-5 (-7). Spike-like clusters loose, basal to slightly base, 1-2 cm in diameter, with 3-15 (-30) spikelets. Spikelets divergent, oblong to linear, 4-10 (-15) mm long, 1-2.5 mm wide, with 4-20 (- *PJHPI* rachilla*



FIG. 177. *Pyrene polystachya*: a, whole plant, rather small; b, spikelet (2 mm); c, glume (0.5 mm); d, leaf, rather small; e, stem, rather small; f, culm (1 cm); g, glume (0.5 mm); h, nutlet (1 mm); i, style (1 mm); j, stamen (1 mm); k, panicle (1 cm); l, panicle (1 cm); m, panicle (1 cm); n, panicle (1 cm); o, panicle (1 cm); p, panicle (1 cm); q, panicle (1 cm); r, panicle (1 cm); s, panicle (1 cm); t, panicle (1 cm).

0(M8mmloi»emb<

... veins ... silver ...
... to reddish-brown, the ...
... one to emarginate at tip ...
... green or reddish ...
... the tip mucronate ...
Inr w*W Nun hkuiv
OU«TM... 0.5-0.8 mm long, 0.3-0.5 ...
wh, ... mingl' ... E

tubcfcIn. MipttJiW. *pk»tlatr.

Annual, ...
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... ..ihinh mrmhr««Mi* ...
... ..i ...
... ..han l»M hta* ...
... ..- ..il- S.....i,...., L5 WfW t«»»^
... ..han l»M hta* ...
... ..- ..il- S.....i,...., L5 WfW t«»»^

yn. ...

... ..ill 2-4 mm hh* . ^
... ..han l»M hta* ...
... ..- ..il- S.....i,...., L5 WfW t«»»^

l^ n<i _ ' : 5 jircr* 5s

... ..fr4
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SEH

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FIG. 177. Pyrus jamaicensis a, branch of culm (1 cm); b, uilJ'tt «fiur txim li 11 • in i. i. ... (2 mail:«' glume (0.5 mm); c, nut (0.5 mm).

© T«I/H> .. S India and V. Asia; Grey, Ind. W. K. Mh. Rj) in

Pyrus angustata (Vahl) Nees ex C. B. Clitic

... ..K)
... ..mil-
... ..hur: . Him bIH uvuxt> ionic*
... ..-in..
... ..rulm; liic^Ui* t-UmKiird, vr-Hvnr*fi ,»tnl (inittd .
... ..f>nii)4i\ rays 1-5, up to rayi long. Spikes ovate i tu
... ..hn. ally oval, 0.7-1.5 (-2) . rt lonf. pti' or low Mft,
... ..ID tffrr.i
... ..i frw talknl *f>i
... ..KMO
... ..f>nii)4i\ rays 1-5, up to rayi long. Spikes ovate i tu
... ..hn. ally oval, 0.7-1.5 (-2) . rt lonf. pti' or low Mft,
... ..ID tffrr.i



FIG. 17*. *Pyrus angustifolius*: a, ha* of culm (1 ml. h); b, culm sheath (1 cm); c, three spikelets (2 mm); d, glume (0.5 mm); e, nut (0.5 mm).

1-3 j, m v*wtc. with MWI fWrt*. rtd-brown: r* hill J
 ;h« pri**irnt. vrintckw. 4-ridnl. Qumr* i
 ohHjH-K rtn I or parufotit, c-
 long. 1-3 mm wlr. ihr tfele* nrrwlnk whutttt ur pur-
 plon in Mjrk.. nufKDi wtiiUth h\jlmc. Itrrl rin4m<t,
 rur>rd. iprfTi, V or Vnerwd, «Hh m hurnti OTfgn
 un e*ch «ilr Sunwtt J or 5 ilhr numbrr <t*mfe
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 nul <r|k t«iM|Mii'' ii i.

Anniul or perennial in per i*ttnt walrr Wn *»pcn
 plarr*. Mwnpt, maipin of pook, rtw h m b MHI wri
 i.r.l.L (-. >! «Mm li H rMhrr nruhk-
 and numerous infraspecific i u h«vr brrn puMkltnl
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 giuuw Mr drprtw*Ofi «» rarh «Wk; cubn*M*nUrti and
 dec. • itihrlnl M b«r. motlnf *t nwlri. ihr kmrr ll
 in h. If Irak.

(O/C) Ten/Thel <Md W.^ld impki MM! •Mbtrafv
 In K*n. Rh. Bar. Coy. Utd, Nrp.Pki \i. \<. hñ
 G. G. H. jk. Kl K(Mh. M«. M., <h rj h. Sk. Tr.
 Up. Wb IJHMO m

Pyrus straminea (Nees) C. B. Clarke [*Cyperus tut-*
stramineus Kükenthal]; Fig. 18O

RIH>I« fibrou, n-!ln*i%h tt ulTiM niUf-t. slender but
 h*rd, oftrn Wtatij nn\N. Mnou h. 8-35 CM tall,
 03-1 am i»»^K i^iMrir ***d«i. 1/j w 2 «c 3. head:
 •hratlu rkmgvird, vrttutwith and ling^l *tih reddish-
 hn>im: bUdn Hmrtrr than HI nrarly cquatting ihr I ultu
 i lunnr(lr<l. tufa***). 0.8-1 mm ««tlr. gndially arimu
 naif. *c jhnH on tN- tipper pan. Imuhirnl N.« B (1) 2
 (3), erect or suberect, the t<>« up to 10 i in knK* ***i
 tnpquq (he mlkwrv rm r lntUifr« cm t- umpk-, unu*lh
 a itnglr rlimrr nf 5-16 apikrlru tir nrrh p '»'»
 HWI 1-^ iboit rm» each bminft a rhutrt 0* ^' lott
 raw no< more ttuti 1 i m kx^f. Nf-krki rhwt' > rather
 low. Spilrkt* rrwu u» tpmdinK, btw rtJau^J***
 linear-oblong. fUittnml, <f.*H 15-35 mm I
 Lh-2.2 mm wide. *tih H-70 (kmrn. yellowish; rachilla
 straight, prruMni. ^ingteo. lJunjrt membranous,
 patent. Aitr. •OOr, rmMmubtr, t - mm long.
 1.2-1 I mm mdr_T ihr win n n w K
 R<>dm wkiw. nui^m hvMllnr. krr!
 Served. Samens 2. Syle 2.0.8 m lontr> ***K'' = 2, at
 long u ihr ml r. Nuts brown. larrs<K I Utti
 broadly rIHpttedl I. .^AMrAMhknUr.«**1 ""' long.



FIG. 18. *Pyrus straminea*: a, whole plant with culm sheath (1 cm); b, spikelet (2 mm); c, glume (0.25 mm); d, nut (0.5 mm); e, involucre; f, involucre (1 cm); g, spikelet (2 mm); h, glume (0.25 mm); i, nut (0.5 mm).

stalked dMBBf*; nrw general >mi. of tpik' lra = Uftg from |»n»|»livU tit fhr old (which diwrrU-ubir* at the unr dpe*)< Bach valuta wtaa l (or n rly more) luj! Mown jrili IIOJJUV I HMLr llowrr *)
 Glu at* ird<ii*h-br<>>n. gljwMtv afca rumm mitJuh. h**r Mrhlr giunn 2-* mm kx*g. the 2 upprt onn 6-9 »im tang. Barxual flower* with b. vibrfjua) prri-anth bractes. 4-» mm long, earh wi with rnmuir spine-like trrth. Stamen* 5; anthtrt 'Mnim 1 a| rntatn ibtnt Sttk unbranched or ilkghilv 2-lobed JI ihe lip Nuu obbnrroUir, 23-4 nun Utttg. 1-2 mm wvdr. hiim-n, ifxitrK nrxhtUi atttm stlc IMM* 4-i mm IONH ldm^rr than ihr nut), hrimn. lotlf-omi. jj wth 1 lt.n^nlm l uui gjnowe on eack d il Rao

iVirnnul A cnoimon plint j'rcmt ing in and along stream. n(i ilw U>or<<if Ukn, poobiuKI riwt>, •' lra found in the <lb>v wjrrt ln wmtap/LUKIn. fields. It H tolerant of light shade. Sometimes used for making ttMD, b

Uhj, |.n tl:l: (iin,..pm t r>.Ind; An. A*. Kl. Ki, Mg. Ng. Tr. Tp. 6- HM)m,



FIG. 181. *Syntherisma cyperoides*: a, whole plant; b, wltmt; c, flower branch (2 mm); d, spikelet (2 mm); e, fruit (1 mm); f, *Syntherisma cyperoides*; g, whole plant (10 mm); h, flower branch (2 mm); i, spikelet (2 mm); j, fruit (1 mm).

Kkynckttfam nyii (Vahl Gale subsp. *Arundinacea* (Rocmrr el Vhultr.t I. Koran* (ft *glauca* Vahl var. *ambrosioides* Kükenshal)-F. 181

Differia K heart m fNk« l« »M-IIR grtirt smaller. culm 30-70 tn tall; l.t MftdN I^T-5 t-ft) mm «(dr: Inflaramicc hraring 1. S o i • 4 cofymk <hc bmrnhn ftttfam; ^ikrlru 3-4 * n>^m km*. <>V ?<Wft b> h>lhr * «n. • » • ^ obm-41*. I.V1 mm kmg. 1-15 mm whir. t.«lti weakly transversely wrinkled; style base 0.7-1 mm long. UH if tcr than the nut.

Pr. eroidal. Usually in hilli)n occasionally »'''• areat. mar«bri, brygg places are. The subspecies n yoi is confined to subtropical and tropi i ui Anerka (Ten Mrl) <Hd Wtirid trnfikt: <T Ind: M* ^<- N- in 1000 i 1000 m.

Syntherisma \AftHumdrpm *Arundinacea* part. *Syntherisma* part. including *Arundinacea* I ± 30 species com mopatiun

La gc pc . i m tall or annual .u1 Hiullrr « culm terete, 3-angled i 3-winged, solid but uiualh somewhat spongy «en« trpu «nd meatM «ppm k often nnuh or quite lraJlr* * t m. haul, IT tonRafc »nd rtbhofwi i^wn nH.ih «jbtwtf((rti t M m fnwiucrsl hr" uiualK timtaikMI < " <f

wh sometimes terminal, single or com p and, spreading or headlike. Spikelets many-flowered, i: InLU MM not »(rd. Glumes spirally arranged, caducous ihr lone* i n n empt?. Hmirn hUritiil oent*fk IMIAIKI»V —nrlimr* <f*rt «* x*1** IUr ur t<rK «b*tni. Summt I-V Mmmi^ IMK ifutW-n 41 ihr hMr. «tvAh cwluou* S¹ *w h

MOM ur ^tuiw. rtMitih t n the birtlnm with rtrch. rtnri>[rni < ulm» Matn ^ i m *ir ««pWt»* d In wrninv. tomr r jurn

•liilr «T<T% Mfr l i m b tn «ac«bir UUHH Excluded: hr following species are wetland plants in the r llun*UiA< which do not exist 1 into India: *Syntherisma javanica* (T. Koran) T. Roy; *Nep. & *Syntherisma* (C. C. Gaudin) Palla (Nepes *Syntherisma* subsp. *glauca* (Switz.) Hartman, & *Syntherisma* *Syntherisma* (C. C. Gaudin) Druhl); *S. triquetrum* (Linnaeus) P»)l«

t MM sections appearing involucre bracts

-jj more, ir^rJikr I. U., IIK>* notl 5 mm ItM* ••inMg||iUi-

I...nd at .he L m r n n r f m p Jr <H 1 <m p

at least some .mind *piKr<H> >>

ilu Ba***b—mm wmntom p

1. mon than Smw tefr -»'•• J1

apex, glabrous or minutely hairy towards the tip on

gin, pubescent and mucous inflorescence 1, 2

or 3 times compound, spreading; terminal spikelets

mliur> .mil lkd

I. It.... r r p p

bract culm-like, erect, t< base continuing down the

culm. ... bract short or scale-like

3. ...

3. Culm ...

obtusely folded or involucre bracts IUurnrd

4. Inflorescence n., m ^ • << * ^ * f

5. ...

S. J'.ftatuhitaktpluiw-eK'r'n^" *

IVrunth

6. Kh... matus, perennial; culm robust, usually

morr ihut WI <m tall; spikelets pale to dark

brmm; ghunc* with glabrous margins

• Tdfkd M d I futa>> rarely more than 50 cm

UK; ^krfet* prmiA •

!>], ,,,> <...> Jin),...>...>••

talk, ...

7. Culm and ...

lirannr> ...

8. Thickest culm usually more than 2 mm

thick; nuts smooth; spikelets somewhat lax, un-

ligated; ...

8. Thickest culm not more than 1.7 mm thick;

nut transversely wavy on the sides; spikelets very

compact, golden-brown to brown-coloured

7. Culm and ... mil... once br-I.

without transverse septa or if culm septate 1 mm

^

Perianth bristles Mt with backwardly

directed, hair-like teeth along the margins; nuts

1.8-2 mm long

18. Bristles ...

than the nut, the longest 2-2.5 mm long; nuts

irregularly biconvex

18. Bristles all ...

at least 3 mm long; nuts plano-convex (the

ventral side fl. 4)

9, Paumh liitiirs JMTMI: mmnoi M H fh.ni l 9 mm ong; ghuTKi ntu*]]v irM than ^ mm long

II, NnlrlS tUtInird, ^lurtir* with mil

hairy iuuugtiti; tiuin itnoiiu nl bm > dunes than the , ithn

II, •.;!• <<UJLV :tMflr»J: (flumr* with rmirr margins; ma 11 bMOhtCtVI In.'i l rijiMI Di 01 Him h longer than l lh<* . ill lit

ij, dam ... w.ii-iU [noini- iwni ami HOI loimiig M mvn ni; nut* *L(11 <^B • thr MBKn<i ... rutlr*

I rvyta

11. Glume* 23-3.2 mm lms. oftrn cndhig in * short and imUninci mutro; mn with sngl ...

Schomburgkiana ~tiiml>*n ([Juiwu-iui PaUO ... aucl. Ind. n>n linnarm; Srt>hu tiuvnudur

Rayburgh, Scyph... i lutoriiru&irw) Rttubtn^h, / M I ^ I /bm- bmfte

(Linnæus) Palla: Fig. 182

Roots shallow. Culm in 1^Ji' ol VI'^1 ... I rUgl (4-) 10- Hi i-f<>i tilt Ull iulu<ling

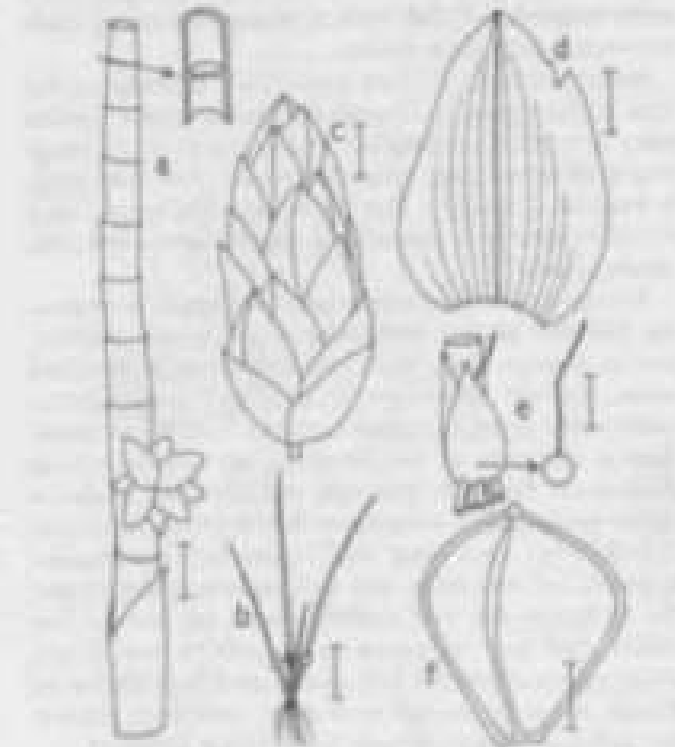


Fig. my. ... Wxtl pitikHi id i film with ... <l (m| with

b, habit (10 cm); c, spikelet (3 mm); d, glume (1 mm);

c, l>*M1 ihc-Jlh wild ti ... < mm I

bract, (l-> S-IO mm in ilintiif-irr. at hav hardened, above, ii.)l.w (ir juhi-illiril. with transverse septa
 •mrtvjh of 5-Xfl mm, unooth, deep green, Oigluk ihalf UiWei r«l mnf IB I < ! (S), bladeless sheaths, (hr kwrr mir-likr and browiu Uw upprt t *!
 5-30 • in 1'HIK imhh trkter than (hr culm, pale green bcrunitiit: srlUm burr, ithrn r<1t1t*li brbm, nuting in 4 briud l
 a oonCbiu itioa of thr culm, murh kmgrt than the i iibn propri. 6-40 Mi4l) cm long, mtnrwhai lbtrriN-d jhow v.it) very
 Mpil now imrnvrw tcpu. lull. pseudobulb of 1-30 (-60) •MHIC, apparenih/ *urrai* p
 ut » drnwr. hr*rHikr ttiitin (1-4 cm In duittirtri Spikrlru male, m«MI or obkHtg-oKnid, trrrlr, 6~IK mm k»ng. -M>ram in duintri (nr up to 10 mm with glumes spreading), suffragated grey, greenish and if-hii%h hrWII, C h m relatively Miff, dcllat- to breadth mair. («i(*e, 33-^ri mm kntg ami «
 r. »p< UUM*, tnany-nrnfrd, putr grren to p>Wf n m rrtWi«h-tm*»tv wth JI fpern anil protruding Midrib, loogUudiiul rwlgr* distinct; *krvt* KMceljr p>w«inrtit |Vri*nth tegmrou afatrt St>lc 15-S mm long; •ttgnu* S. ilmfiif ttun thr »<»* Nms 3 *iij(lr<l mill digitis Hinutt «kW, obenofai. l 5-2 mm long. l,VI 7 wide, m KMh, whilMI when vr>uitj(ltrtdmmg dark brown to bind when nuturr

Sciliur> iriimlr llo*n sometimes develop Jt the b*c tj thr tulnu in tbr • side of sheaths. These flowers have very l. i% iitibraiiithrd \\\U* (up la "• era lti
 vrUip UH*- glohul or fruits <4% mm long, V4 mm in di*nwwil Thr cacnhiultun «4 hrtrrocu-pt uinphkarpM and «r«w*ip* i* tmulh i» KMinl whl) dtvti pumt-

Anniial »f prfhap* tumrlhnn prrrnnUI In «i«w alh notidrd pbiri, ri^iwrimjc *» thr mtrr i
 •bo in -M>|w iufl ruT nrkk: «vmt times in hrackkh w>t< . Lora 'K >buinliii» li b A wn poh;tuur]thu •prt M-l And Mtav hoaninti COMMTT it m be no mare than a tynottim ol ihr Cunrikn iprrir* S w^tituu (Lil IIOCIM) P>1U (.VtrpMi tM/Mni l.iniriwl It aj*o 1* rjibri nmtU
 "wysimHt tun ihr ruiU jir Uf^rr (1.5-2 (-3) mm Umf «id mtMMHfi. ihr jti-imes U>H' (M- .rmn long) «ndwfch HUM
 the *piirl*t» arr not goldm 1HI»M OI bto«i#r but rather dull grey to green or reddish-brown. It has brnn rpptMtrd th*i thr tthrn arr UMII m nv-licine in HriifEAt — il k annual and dor« HOI hatr tiiririV i< shape it is l< - it«<M4i i
 hare u<rti

(L) (C) Hyp/Ten. V|<lttr 114/M-jn thiiMigh Afrit Asia and Australia; Ind. A. 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. O ki. Slii. Or, K; Ts, U |>, nil. 1^ MfMTm.

Schombergeria aaaoaaf / Ruth rt Runrun ri Srbulmk weah in Xixh n fcw

Stipis corymbosa auct. non linttarm, *Stipis nodulata* (Raflbiau-DdUc) Aurhmm K« Sctmcinfun. *Stipis* Arfc*K*wu 1 kx hrtrtrrr r« A RK hard) - Fig t **

Rhi/mnn hnncontal thnn. thi k and woody C:ltu in a n>v. or occaikmal! tubed, obscurely 5:1)ri1 in tlmoM irtTtr bur mth numrr> us lujitudiawl ndfr«, 50-AM) cm (all, H-Hnun wirtr brbm •> middle. 2-1 mm wide br W i),- inflorescence. pnh-lllrd. Loww tvdurrd Main ami tl>raih. thr kw<r*i -rtir-Uke MMI hbrUb and potbhrd. the uppr *ihcvh* liki <4tn> •pA«ng to give a i.iqrrw arrow thr *plil, «n»«J times ending in a »i ll. cross k ifac M>ii' i »«wl" lieati 1-3 rm km*, flttff and lnPftkrJ -> shaped and containing J in the dim tion at ihr <-ilm. Inllocr* rrrr A single or iiitpound panicle with tlmirt* «* tpik#lrf»<x) my unequal branch** m*U* braiifho up to 12 cm • krtig, bui hrfjurnlh «ih 2-5 t*n U**fl 117 btJ>nbr* up lo 4 cm Urnf S)nkrlrt* tr«il*» imwl. pair to dark bm.» 3-5 aaj kiog, 0.5-^?'' ' »™ wide; occasionally some spikelets n rpptarctt b* nvip*-ruui thoou. c^uiimnr, Z-4 mm long, 13 mm v pair m dart rrddeb-bnnm; raanrim wih^m / are nnttni> t.itv, rt JI Iran ahrrr. uuulh <lrnth set with



M 1...vHMMvap rr->hir^r a, habit (10 cm); b, spikelet (1 Hi.); c, glume (1.5 mm); d, habit (10 cm); e, panicle (10 cm); f, glume (1.5 mm); g, lemma (1.5 mm); h, palea (1.5 mm); i, glume (1.5 mm); j, lemma (1.5 mm). »t: t. <a*Hnttaw); l, mil 100 «»

spine-like h«» -i k*»t m dM t* ***** micro-like
 apex (the h, «t Riurnc |mm>u.r...h Lc, kd and spiny
 L....llghoW OttTC kfiRih». Prmnib «ffiwnl» absent.
 Sivlr* fj) !t H.-,»Ctl. vlnrllllii.- bWfUtarf MM.
 O.i)- 1 mm ..Kk. um**h. when young yellowish-white.
 becoming dufc bfmm l. bL* k w maturity
 Pnomul ln Oficfl water at the edges of lakes
 and tank i. *l«ng Mirjmt *ml fiwrt. »» nB moun
 »nd hup. OACil l-''«»'« ****. Ita A F
 •lump*.
 IHvp! < i|<|w «rU ir«pir»- tad! Kt, Rj, Up, Wb

Schoenoplectus gramineus (L.) Palla [*Scopus gramineus* Linnaeus] **a.....**
 M ro i « nl. a.....
 Sieber: Fl. Ind. Cochinchine et D. A. ro i «
 Sieber: Fl. IK5
 Stems 1-2 m tall, 1-3 cm in diameter, ending in small panicles (often growing in tufts, corn-like at base, straight). **JL i / mm**
 NO im *Jl. %-tb
 W»r. 0 7-1.....UWCM hrW* ihr
 fcwl i linnr. Sft-IN. ^
 i j | V

longest 15-60 cm long, inflorescence a large ter-
 cornish with primary, secondary and tertiary ray-
 Spikelets solitary, the terminal ones
 pedicellate. 1-10 mm long, 3.5-4 mm
 in diameter, many-flowered, it
 colour
 hMi^Hprd. l-S mm U«v 2-2.5 mm
 h bU» (M b.
 V

P«, usual. Marshy places both inland and near the
 coast, often standing in shallow water. Common and
 vigorous, often dominant over large areas. Found as
 a weed in rice fields. It used for making mats, bags and
 baskets; the culms are dried then after removal of one
 of the ribs, they are flattened and bleached in the sun.
 Differs from other *Schoenoplectus* species by having a
 truly terminal inflorescence subtended by involucral
 bracts and the rachilla becomes characteristically
 pitted in later stages of fruiting. It is nowadays some-
 times called *Arundo donax*.

Hyp/Tenl. Tropical SE Asia, Ind. Arch. A.
 h.-. Kt, Mg, Mo, Ng, Rj, Ts, Up, Wb. 0-1000 m.

Schoenoplectus nivalis (Rochburgh) Palla [*Scopus nivalis* (Rochburgh) Palla] **V»»^*u juiiuf&mu Neci.**
 K.txbutfb, V»»^*u juiiuf&mu Neci. *Scopus nivalis*
 and Ind. iii.ii Sieber: Fl. IK5
 several-angled
 ribhrd, 15-70 (-ISO) cm nfl. l~<
 gfoob, dufc. U ntt rtiimcd wt 2 or 3
 DOC* v-llr-liLe Mg bWO. ilvr upper ««r • viimli.
 5-15 rni fcjnn, nembnoitt, jialr pci
 „iu*roiiair. fiirliinniurv hLn» Mjdo inftocactoce
 bta-,n bog, ibortw tbaa ihc ipin, t-iiTr.»wed
 on the imwi ikk (ddenjj mbrnir H UM
 cttoattfp. toflortacencm |m urfoIMwwl. oi (1-) K-io
 (-12), Wttilc. »f>|J.nrnij\ Utrial ipfkelctI lB J Hi-iw
 lKIHl. |i; cluster Spikfikta onaU «» oblongo* «
 sfrrtO i 5 IM mill lung */ Jinttcm. 1<MHil>r»ilkj{ |O
 am in fnth, *- * "mi m dbuwsur. dmnril •• m
 flowered, brown »»(ti. MI.I^IMIOIU-'i GhttMitdPSdh;
 tamladf iniiii«i. |.
 Mun^QCfwd. purpibb; iwghwi whmtri) h
 lb« up. Bddrib run puinim-ni, tmcmtM •"
 not md k*dcd vi
 « U* miamott
 mucionaic Perianth brtadei 4-6, ^n» badwnrdlj
 directed. h.nriik* irttli doog ihc miit-Riiit. ibofi . . .
 KHik: iHghii) kmgcf ibj» tfw oat, ihc bagai
 mutr tIMii IS mm long. BtJ* * 2 nun lons; tt



FIG. 11. *Schoenoplectus nivalis* (Rochburgh) Palla. a, habit (1 m); b, culm (1 mm); c, spikelet (1 mm); d, glume (1 mm).

2 or **aaaaetfaaM** a third short **branch preaaai Nan** broad\ nhnvnd. um-inialK **UcomcX**, I H turn I mg. I. VI s mm wide **mid** **Uai** |>iim>r transveisc wiinkle*. vh in inn daik lit own to bl.uk.

Ammat **Vh** < **phw** l v ^ amp j, river banU. **often in** shalovi water, p.iMn til.ulv nniinioti in itiiindaii-d **riot** indls \ **rataei paljnaorpnJi aperia**s that grade* into **S = oUttfui**

[O Hyp/Ten /«llrli|. Madagauat. India > (hin.i and Auoti.iiia. **pernap i aaturanaed in Km** and **Hawaii**. Ges. Ind. Nep An. \i. lv in.. Up. Ki. Ki. **lag, lip, i'**. Rj. SV. I n. **Wb.** ik-J.ik(•

SchtxmtpLrrtm latmfiiirrut 11 h (.inchiu k I •• [*Scyphus latm/torw-* [I Cmelin, Vl»;<Hl **tolrraai** krt/m\ . *lu>Ufn*) *oryutomm* Sieudel: *tuJrfm* **aaaM dai** Katie nan l>rlilc. *Scyphus suptnu* \ **pro** |>.m< am t Ind . **BOB** I mn.irtiv *SthrnopU<tu* *utfnnut* »ub<p. *latmflorus* (J. F. (.imlmi **I Kofnaa]** **Pbj** 185

Caaat tiihtd. **itrnrllrr**. weal, angular **a** subterre. 5-30 «tn tall. 0 V-| 7 mm thi< • **Leaves** m ln<< d tn 2 or

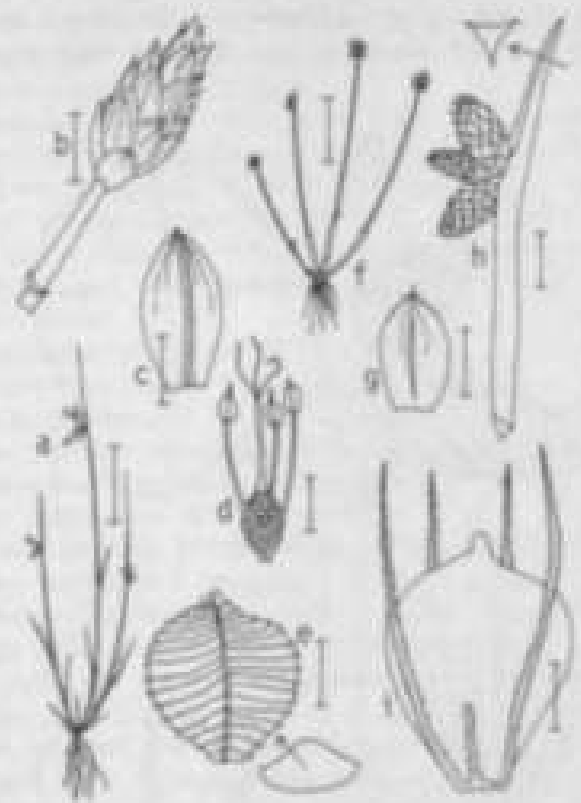


FIG. IS5. VW4.fb.fMi *Utnfnh*. a, habit (10 cm); b, **^Mkrtrt** (2 mm); c, flower (1 mm); d, **flown** " (1.5 mm); e, **hmiwriwv** (1 mm). **K. gtumr** (X mm). **inuiM^nr** (1 cm) with **i m**.

3. **sheaths** or ionuniiuv VMlll wrIW **d lilade*** sheaths 5-15 im li>{. mt-nii **pale gr***** lowi^h < r **pinkish-grey, iligIMlj Widened** < **mua** the uppei 'HH M»mctini(> «|r<-l'>pinH •' bladr. **bladei** llallciird liian^tilai, up 10 10 >m I^Mi; and M J t in wide vnili .t mtmlit.moi^ ligule Itvtvhn '•''

braca i-V die love erect, similar to and unirina.... with itu diiiti .iiw.lx diMMi.iU xhoitii **than ihr cuto prapi** 3-1 I i tn luitK, tin **aecoad and imul wae*** **anna aad apreading** i'''-1 **Spikeleti confcated** <i in .in>{ r s of 2-4" rU>ni ovate t» **ofalোগ, •ublmnu** "»H> (-15) m" ± 2,5 mm in di.uu i. r, greenish to straw-colo und <i

n ihHaa twoain Qhaaes ettptkal to onw 2-2.5 long, 1.7-2 wide, concave, y-:li>v* |> r kitrrn Ki reddwi* tnov>ti ^ith .i i« **ddftb** t'i"t< i> as the p; v<«> margin^ hyaline, mu **roa oaa** «K h.m\ **loWBrdi ine** "I' imdiih **proninenl** and keeled throughout. " <

naucro diatinci **Perian:h** s<ki **ibteni** > n11 O.Wt.K mm limn, **aajaai V I as long a*** thr uni obovnd. **BataHN** very unequally 2-3*idcd. **MJ** long, 0.9-1 Rim widr. i4>v ui.-K .t Munich itm^ **wrinklrd**. b.t< k, apx ulatr

loaalf Bowan KMaetkaca develop at thr **batr** iiiiMti ihr ,t'ih **haT vry** lor

annual (i.mm.>n m va^KialK **Boodcd** diti hts .i\ and ntlirt urt plan* It **With Mi.** hiM'Mti sl..

wfc **Wf** usually has larger nuts (1.7-2.5 long).

tropics and Australia: **Altai** 0-1200 tn.

JdbofMpfecau mtunmahu (I intnein) **Pal** **mwnmstv*** I mu > **rpni** /•*''••'^

Khi.niKs h **Malm** it tufU d IM ii a row along the i hi/ 441-100 | -120)cm tall. .»-) S-9 mm »od. •• low the middle, deep green. Leaves reduced to 1-5, yellow to brown, bladeless sheaths, ihe l«rt*e*t **atale iik-** brown, the upper cylindrical, **kanfled** .m<i In bnwiti «> m|Tularapr v **laato W** center bract as firm i>prartng as a continuation "I^h, tuiiii hut tinaiv **often pan** i to reflexed, very >h<«t, than the culm, (1.5-2.5 (-10) cm king. >liai|*

Jungles I, thr dp UIIKT hluiii loAotcHMM
 oval, emrgntcd, hemispherical, wfa IH i- in (-40)
 »piktIrl». SptkrWI* *«*ili-. ipiunl •*• libloilf Otokl
 irvctc, d m *rh mar-. flowered, wny lu lirmvii ± b mm
 tang at amtmik. but Uiruhin^ i ± 30 mm lung and
 0 HUB i*Ujr tohi-ii inuiiiii; i.ltimr* hriu. ighly
 •H'i rrsed. DIW «» liuuitly mate Mlrrfrh. dshly
 •nut Hipwii, ^LH-4 mm lung. 2 9 nun wide; ddei mim-
 hrrwd, pair or brov>n with rriMi*li-t>m*it HrtpoC
 irurgmt iunuirh)airv luwrjriii ihf lip: miilith preoifc
 •it HI fp rri. hrieth awn-like ind often. . . .wed JI tiic
 tip Prritmth bfiuln (5) 6, mieqiiit, iHghll) W d
 iin< tlv long* than ili.- inn. rtumely tc^btkl. S
 'i in S. hfotl *^nlr<! or lacuna, strong^ d
 rrially (Liiirnrtil, bruvlif obtMoid, 1.7-1.9 mm long,
 1.3-2 inn, Hide, Mith niniutr nannvr «iinkl» or
 •MMHh, Khinuif! Ma*k

ttu uiul Uirtih found in »h*IWm H^irt in potili
 >od diir in v oi] rwa 'unika, i bo m nunhci and
 «k*4ntp« wht'ir M ii DABS dot....BU <" RMLunkoMti li
 prrrfr* niuhrmtir l> muddy ">lv Frequently found
 Nidi tsrriitt fitMtniia in bHndued rfiif Addi ((I
 Widoppradud polymorphii sfM-itek.

IHyp i. M i Wumci pani o< *« OU World,
 oaturaBied fa \ (in"i. i Hho, Ccjr, («(U, lv Bh,
 Up, Kl, Kt. Mn. Mh. Mn, M*, Pj, R]. Bt I p, Hfb
 600-1700 a

Schomphoea rigida

[hab]

Bocdcerj >^ 186

H<M.1» IIIJILAI I .iilitl rtrlrri tKII MMWliriMM OIII) 4-6
 toptber, teveti tun wih lrmninului.i! ridgi <» na
 >^ [todiidim if'- brwt>, <i 1-0.9 >>>> in diameter,
 transverse septa present but not prominent. Leaves
 reduced to 1-1, N*4rlrw itv rlls, the lower a 'lr-llllc.
 f<l- in reddish-brown, iw itfiv r! id rical, without
 any life since the mid- <l end* brlow ihr apex. Main
 Inuamci net nrut kppriciif a> a comhuMBWi < the
 aim, ititulK ttiikh lunjfr th*n ihc fdIm ff<pr> r
 rary = .HL.»lui dwer, 6-17 cm k «K.(i7-Imni)Mtr,
 •ii^iiH tK nauened whh U>n, indial ridges. Inflores-
 cence < r ftvtvfjilitt J. of 2-10 WMtk. «pfMmih Ui. i d
 spikes in a dense, headlike cluster. Sp
 oval, I '.....1 nun in dwmctrr, integred
 pale «!.. in reddish-brown to yel U>> or golden (see
 • t*t-Kitil (ilnmrt irtjir. '—ff.fi mm Long, mt(tn>>
 broad 4ini l^aefWd, Ulnul un^ rri rri i. krri
 ii rh iiii>iinw rrt; iifWK KKII
 • '< ihr iturijin* In m d Pcttuth «« ^m nu .il>-m
 mni
 HIM w^dr, ifaiMMriwK wivy Offl
 •"« hrromn ftiri brrum (o hL-
 with angles same color as the sides.



FIG. 186. *Schomphoea rigida* (•, habit HO cm). !., >., • of leaf
 sheath (2 mtn>. t. tpikdet ii tarn}, d, ithtmv < l i.
 (03 mmt 5 tnuFUrrmt l. balm (10 cm); g. tip of ^tmth
 (1 wmy, h, ^ikriri ilmml.t, RKW l l mm l. j. nu. (0.5 mm).

Annual. Month III MMVIII.IK flooded places,
 ijr>- ring as tin >. . . . In Common ID marsh-
 L>nd>, | ponds and rice fields. Sometimes cloniganous
 •la*rn develop wihIn the local durbie, the i
 mainly developed nu> are usually somewhat larger
 (Up t<t "1 mm k>flg) lit** 4li,iMii<u, irtintit <»> • !i,
 IUP<tILU) Uir mini (omfflini xtli mi u ., rri rri / ili.
 rpl- let > W• the neck of a peacock golden-yellow to
 ptk brown i green, the na& DSBM)>-(h' means
 ^ac-M k-lil* 1 lki 5 viKyjlfnu* btii ^luiii > *. rri
 (2-3.1); atgU-* trf ibt- iinli lum^nv h ^a*. 41M! (In
 wuitc i oltrtij as the »iilrt
 Hyp/Toul Eadteaul Africa Ind. As. IR, Hp, Pj,
 Rj, Up.

Schomphoea unguis (HoctucUCU f» Mi iiiiLi II
 Falls ex J. R. lial l/tij>ff< tnH)pllniil Mi* tmrl
 Seneb. S. I. NajiMWC Fuchcf]: nj !
 RiHjt* ihalk) Col it iiiiimnum. uiltnti icreti i<<
 Angul<rf HIOI I* longitudinal ridges, 6-60 , m lonjt
 <Uirbr^ d, d 3-4 mm in dia iMtri. baOaw,
 timtuwtw icpu p rri rri. Leaves reduced to 1-3,
 bladeless h rri rri, l**1* to irUiluhb>*,.,., t|K upper

cylindrical, fluting in A n.irn ... LIT lobe with an acute apex. Main oninuaiiofi oJ the culm or leaflike, as lo'ig 4* oi much loftier th ... he vulm jimjui. BtJO < m long, 5-25 ...

twrwrTitT [>vinInIji,I.I! <>t 1-23 Wttfk*. apparnnrjr lateral tpikctei* in a dnnr. hrwMikr cluster ^ (rtirku imik. OVoM i> subplot*)*. 9*J mm 1l>TIR. 2-4 mm in Humrtcf. »»Uutr, gtjKW-H-Unw ...

to bronze-coloured. Glumes delair t<*bri ... 2.5-3.2 rtim Jo<K- often ending in J>h<ti and ... lateral nenm promi- unrl. krriL KWt ...

Perian-h segments ahtcnt. Stignw 9 Nttli tharph ^nglRtl. ohr, ... l.f-1.5 mm long, O.f*-I.S mm widr, rrJiicnrK wan on the akin but not on tJw wtgin. p>k brtfm »hni young becoming 4wk biwwn m hLxk. with uaj ... il>jn tM' vide*.

Anmul In irwMuklh lluoitrd pUt<< or (UiKluig in shallow [rf-ftnancrit *>jii] 1 S ... sometimes cristoga >KMI> ll n*tr»> oVwkijj within the IMUI 4 ... the change- inntislv itcwkiprd nut* tnr utnulK t*rnio*hal bf|pn' (up to "J S mrii ! ... in chjHiHipMnouA unr* It I* mil ... b* iudriiK cluitrn of goidrnr-brown •ITIH ... !<Hirrd -vjiikr-I* i> anl (IM* wrn tOOOWI ... ma likr .V niJU htii rt dkun- gushed in b largrr gtumn 2.5-5.J mm k»»n», u tradwm «rpu ... <m ll i« Mimrtimr* rnt>»>dcfc<l to '» no more than 9 uviii of .V i>»m<iiiiM

11. I -II]. Alma *od Indu: Ind Ap. I -| Kl. R|. I..

Schoenoplectes subulata (Vahl) K I.. [Scopus subulata Vahl: Scopus (Vahl) Ind., non Sch. jnVr. tittmtii'cwih. < ... mi* »*^*ti (Trautv). FK, 17

Rhi/^mM^ with totottk, Motoot up to 11 m. i thick, imulh (rrniiiMimn tit Wben. < ultn< lootety tin ... hut kHT< times obviously Stfckti ... bdoH the nlloir^rTMr. [*UiMf>t>. *V-PJO (-t ... cm tall, 6-12 mm m ducwln hrkw, 2-^ mm thirL hrkn ... on banl, *rtturrd IM • Jc* or Mwk ... the upper •heath bladed ...

crkb-brtmit Hi nMKolmmL muttr nr Urn p ... larir whrn ptnrnt ihuftrt than ll ...

UtiliMm riM r hiM i ... f ... MMh - mIm, M 1-l<t no long, dmfirf m j<*f ... nroU-i 4inIm Ihr inner «dr. thr lip oh ... ifitraclinf, nu*1 ... n motr, unrf)tal, ... unthrd (w ...

1-1 (-*) rm lw| Spikes H imalh walked and *ol*wy. OVOid to (IUot1g-4ni>Hi. trirlr. (lf ... many-flowered ... pale to iH'iJuin* bratm, 6-1AOMI U>>g 2-4.5 mm in ... tiumrtrr. Glume* war tout, apprmd. wn ... broadly ... oblong. ttooghr (nncjir, obttMr ur U%hih W ... 3-4 mm long, t t mat widr; win nrrM-fn*. p* v»»1, darker ttnim tine* or patrhi: mai^bt pwb-i. MtimW^K hairv o r n w «* ib* tip; midrib prominrtu *niltv ...

sent (m. • a 0 V-0 | nun lnnf. whitHh. hj- ... or ... ** macro. Prrunth of fs) 4 o* '». viln, rath •>' ... p ... phimowH frktRrd. with Mofin ... air> r<<<tuluuml. *» km|| a* of ilif(hth lonftrr than the ... Smwm i/l' 1; KlanKim RatlCDcd<nd pn^nnft "» **

Mifhrn 1.5-1 mm long. ... <<V w<h • * W » fanlike, ... *%*v appriHIBfe. Styk totter dun *>ir ... M^m*. 2. Nip «fM^tMihh ... ^n>|th' *>r- abnormally flattened, elliptical ... l ImIW. i - mO l*rtK (including the 0.5 mm ... 4|>rti, 1.5-1.7 nmi<i* < wn-ith, chestnut ... M mhlmk.

Perovial. Found .1 MM pU., often standing ... Wtr r, tolerating depths of up to E tti U kip* ... comvm near ihr COM and 1* found in ... K*^



f K, 1ST. VI • If II Mi subulata: a, base of plant (2 cm); b, inflorescence (2 cm); c, spikelet (2 mm); d, glume (2 mm); e, fruit (1 mm); f, fruit with all five outer perianths removed (1 mm); g, culm; h, culm (10 cm); i, spikelet (2 mm); j, glume (2 mm); k, fruit (1 mm).

Utcd kxafty for milting tuau. h mam A

•iini •jr"imii (...OM [tuiu.ni fiona h hco
KJ which il l irntpcnic ijwie»
<MIU Etnpe and w A*u wiih A-iii{<<1 mini* *od
iH4Ct 4iul hltMfkl p n null - unirill*

;(•., IMI Imlu. st \«i.» ami Miui.iir.u * n, Ind:
Ail. 1)l. Hp, M, Kt, l'}. H| hi

Schmaphicus mallei |>' \i «> I Sojak [Scopus mallei]
N• • l] Vlt. IH7

Ukr & junfvtf hui (mallei fend more lirndti
M ulihs n|i i., lit, ni i.ill, 0 V I nun v.nli i inflnre* race
vriih l ni 2 (3) upki li iv v.}V« 1* K M mm wul. pert
imh IKnili-. 4-',,, ilt dcdru 1 ls lofgct dMB <" ntti. n-K
lr» Uuti 13 mm Uiu't: amben a "MI.H mn long; Hvt
Jlw.iv» J.i.ir |>|, -K (ihr wnti4l Mti tlat).
1 lfc mm Inn, 1 tii widr.

\MIUJI In H<l b}M-M pin. - .1111 ni. IWkb li weim
» niu-<nfiilr with V pixtnuU add ma) ad bl M
at the rank of species.

IG Ux,, Tnd. SE Ind. s| and • \tl» extending
KIndiAa?Wb<

V trp*t in the MI K i tcuw toum) in thr 11«nuU>A»; moM
of the species d in <Mrl H<fjiv j; r |p lir (blind !»

HMwim*lo lhii m*k. l'irn thoulr) rvfet t»
lhc key DQ p^fe 9 1

Scleria 200 »JKH «• i
V tai It V M>*U

BcF(in luili.L Knllimi nt llic IV-itJtiU j.] survey (it
70(1-4): 57-79 (1982).
ted 1990, put*

Excluded: the
fetkaring » 1 ^ nmw in 1

not all but they are not considered to be wetland
plants: Scleria ligula Romburg [S. aculeata Willdenow,
S. aculeata Mi n-JJ. X Mi Rrixiu* [S. Schimper

NrrtJ, S, mmtii Kunth [V UntU Mtion r% Pfrilrr,
A. repens (Nees) Pfeiffer]. V ^ • f a si.

mm Hochstetter ex Boeckl. -1 V/iMilwli hi
VII".i>n: S ptrfrmaikt [vcr*I Kunih: S

H lliimrn IA LitmybM* fhK^lrkt. S. jlund*
li CUTif BOS SiriulrJ. S

S. mmtii E. G. -rt**dtf»Jahi

Scleria pumila [S. repens Pers.] : 1% I
replug- 4-H.I nun fhtfc 4 uliri* 4iuriK

military Jll>«K ibe iiii>'>imc. !V*ii((kil, with coo*
wiles, leafy. M> IS<2>« «m tall. A-10 (-13) mm

thick. Leaf sheaths reddish towards the mouth; blades
linear, usually flat above, up 1 120 m I-MIR. 8-tft

t^M)) mm wiiir. tHJ^h, glahnMM U11 uatMdiu mi dw
mag•n» .md thr thrtrt |»



FIG. 198. Scleria pumila: a, portion of inflorescence (1 cm);
b, glume (1 cm); c, spikelet (1 cm); d, seed (1 mm); e, seed
with the male
•pikelrtrk (5 nun); t, nut virw6d fnuu brknw 42
vk->n1 Intm ibe ttrir (V Ram).

hianrho WJIII>((nun ;ik.rlri». with
brachj fwnrir IO-jOrm kwik, S-Jf im broAtt dB)MI

HI outline. S^tkctr* •oliuu'y, with 1-4 ij.
arranged glumes. bWxu<l or uni«ruiul; hitriu«j

l u mitnJ fraulr fWrr a'id l-«
nulr Acnrrn; frmJr *piiccc* with l (niulr ft<m<<

mounted br 1 or ! mi>iv glum***; mah-
tt, 4-5 mm (c*ng. wWI V1^IAI mjir

Glumes straw-colour j it i«iin,n. glafaroui .it h
fViuuifi tM<ik\ ttaeOL V «WIM 5. Stigruu S

broad iufi(U4x^, 2.5- % mt n long.
2-% mm hroarf. wuKMh. wpabBouM. |Sst*nittf trftiii

with '• rf*-jnc»*M<nt JI il' but and with J ;
rtJv. IM rup^JupMI wrHl nrr r V mm M UM OJ thr luv

Waring 3 *hiKi and (rianjpihr hthn.

Tennul In thiUkr MM0 m ilu pdM 1bl«« JIII
V m w n m and In nmni|» h often

forming large
Xcrordrtl a» a wrrd tn ritt ficWv Kr* i^
by thr brgr ictinnii panuV vniiont RO) |,rral

puii>.
ill-, /Tnd it-1- i,-T11ji | uhca, Aate
AtIMI

Wahleria [Bauhinium] *Blmtkmi* (pro parte, Schumser pro parte) jMTtr, Srttptu pr» j>iinr| 1 *JKHM-V widtrprad in the tr>|i.

Wahleria confertifolia (Poir.) 5 H»,mper [Eimtkarn afit-feroides (Poir.)]. Kuvanu. Srttptu* i>mf*n>etdr\ Pmrrt. *Scyphus submarginatus* C. H. Wright ex! *repoides* Bentham]: F « I

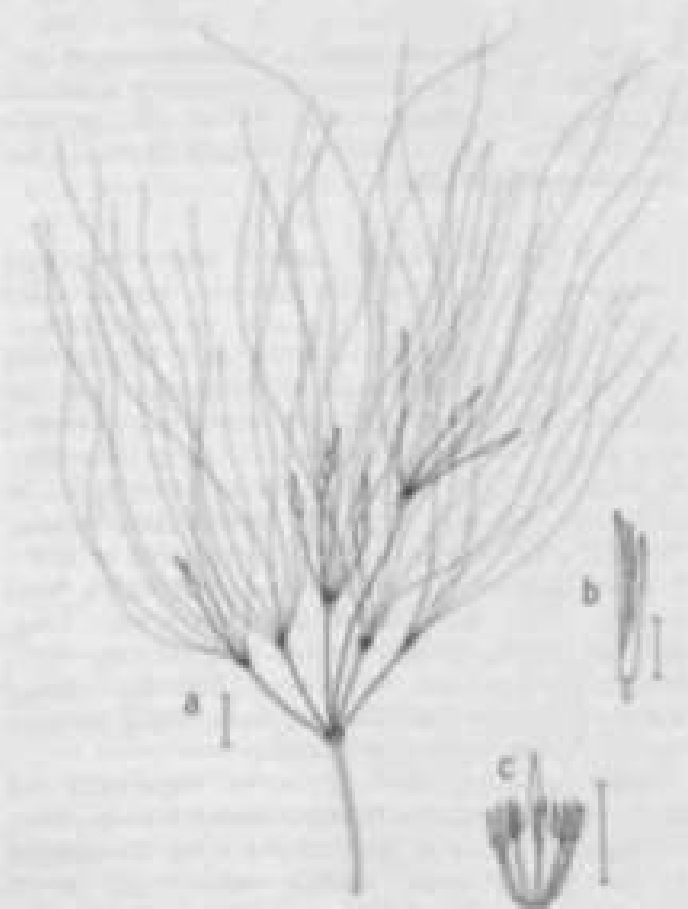
Stem .> IIJ. i.. TH> • in long, with bejuirhc* ariiing in wheel-like clusters r» iit.ti.ills tiihirnded In 1 btM • of «i .le-like leaf the iiln [UiijttnlUp: intriTi«Klr\ lirtwrrit T*h*H]* progrMivr h ahofier rxtrjH ft* the last whorls the terminal ! UJttuhe* lonK' than I)K town ifUerDOdet, !*.*^>rm UJMR. If « than 111 mm thick- *implr. hair Ulr ami «fien vefT numerou*. VB reduced to • aln ur tubular «h«*th». whkh qukMy <lerx\ (ihr hair-likr terminal h i u h n luv alkrn b » be 1r**e* Of are called phyllodes- lankensense of > -4, long, prdtin* (n) (2-5 cm long) spikeless borne in iimbrl* Jt ihr ru«l» ni li JJ>< |M-> but among thr • air-like hrnrhrtr, c*ch nuhtended by 2 scale-like Oir:M>. Spikeless tMfaufbtntvktut, 5-12 mat Ion(t l.i.-nuti Midr, rilimwrrf < iilim<

t-mUwnR ihr aplkctrt. «hr kMOU Herilr. ih< ood biu-Kcul. nuttr or sterile. Perianth bnolli-* ' -14. 2-5.5 mm long, filiform hnt (Uitrnd ai hatr. wh hearing h*i:iwddlv difgeird U*rb*, |H-I^MIHK r» I^{III}, B WMBiS; in th «ii Ufflo long. Style 2-6 mm |dtts: M^iia* It. 1 2 mm kt<tf: «>lr baai persistent. 2-3 mm kwg, fl»llrtird i>duff an. Stam. broad-triged, I,Mi* t" almntfl tMtnd, 2-2 h mm long (< including ... irni wylr ha*- . 1.3- U mm wide, grey to brownish. mini itr.

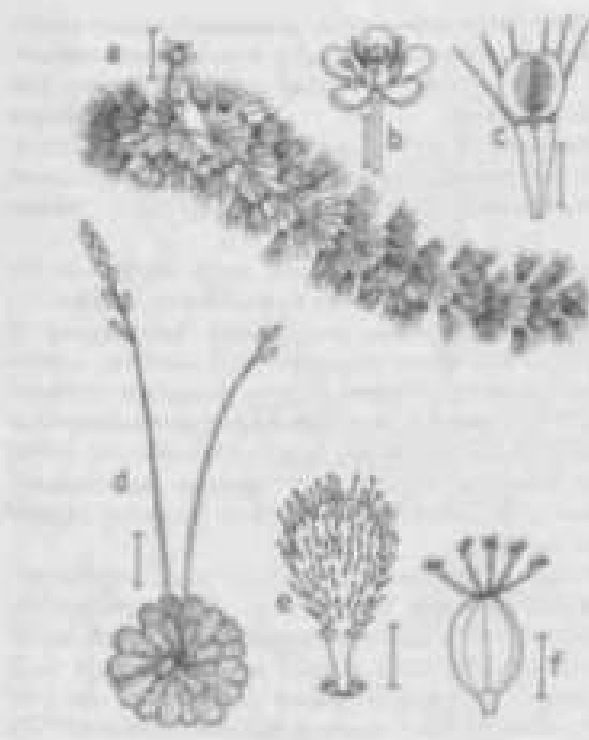
Perennial »* prthap* < exceptionally annual- A ntf> mrrrv d. tree iwimmitin o* llm*tin^ slender, c. aljfalike plant »nh rmrrgrn' m< oi akmh (UIMUIK, iiltgt' h wftm to be rather rare ihroM^ln" haw penkmtt and batfaed prrianih tegment* BIMI a|r ilmi ptnbahK dHpervil fit fl" A h is sometimes placed in tJmkm AIMI tmrlimn in Sepsa but it has alto hern pbtrd in BmnHhrptm, Wnup and Schumser rrrrnt mirk indicates that it is better pJ in a genus of its own. Evers, L. Y. The morphology of tome rrttfcal n**nli«n »(series of Cyperaceae. Annals til the Wkwuti B>u nical Garden 63: 181-199 (1976). (IC) Vc/Hopl. Tropical America, Africa, Malay Pnr indiar, Sri L mkaand perhaps S India: C* Ind

DKOSKMI ^ U 4 genera
Can <iHMmn hrht Leaves alternate or in whorls bbdr« rulJrd m bud. Flowers bur&iuJ. nh ricat usually 5-merous. Sepals united b ... Stam firr Sumrnt as max as or up to 4 times as many as ihr prtak tK«> w)v vtrid. 1-florular; styles 2-5. Fruit a capsule.
1. XHWM f glabrous hrth, leaves in whorls, each terminating in 4-6 'n wlo ami a tunged tirbfc'ular
1. h«««rd hrttw; Iram m IWMI rarttr «M alternate along the v4«n. hUctn rLHirnd hraiuift glandular tr<***j>*

Aldrovanda: 1 species
Aldrovanda vesiculosa t iMMfttl Fig. 190
rtahkliirtr. rootless herb. Sln (stem) free-standing, up to 60 cm h., but usually lem (0.6-0.7 am in diameter, regularly branched wheels of 5-8, each leaf with a concave basal part and terminal >nc HI 4-7 luiMiri *i*t an IN' hmgrtl akmg thr MMth •hwh »*n i low cap dl trap small animals. Flowers solitary, solitary, shortly stalked. Sepals 5, white, 3-4 mm long. Petals 5, obscure, 4-5 mm long, greenish-white. Stamens 5, 2 as long as thr irpdt S lvs 5, each wh branched and fringed nigra. Seeds ellipsoid, 1.5 mm long, black and shiny.



he. IN *Wahleria confertifolia* a, habit (3 mm); c, spikelet (1 mm); b, fr. nt II tmm)



1. flmm (4 nun); c. h-of wHhmp ii mml. *Desman indica* L.
 2. flowering stem (D. mml); a. young leaf with stipules (1 mm);
 f. fruit (3 limit)

Perennial. Terrestrial. **HbnM >X^{rt} "k** Mirr. **umulty ftmnd** among roads. **Gregarious mil ittfmtnft Lux^{sl}** colonies in Wm Bengal whrrr n n «mirtimn ftmiidtTri) to be a pest. Flowers emerge **m and rniiHuuphiluui 01** among stems or submerged and clasping in... I be <li* **staminules are wtedt << lurinnn (i** ... <I tptad (b). It » **ODUWonNM pMm irftfl .it tivv iif>** DegreeC. **d'Am>trur* rtr PUnm c JtiuMmi (Kiiurii >** 1-40 (undated). **collected shortly after 1950.** **ADVA, Asia and Australia, probably introduced in Europe when ii n** ... **IKX ll<<wi: R** **k>*: Mn U>** (ut iui hren reported **tobr rxtlrni *n ?** Lake near

Desman indica L. var. **p**
 I • M.) . ' 11.. |< ,i bbd<>flattened, foc>itt>(**ky,gUod^ppedteniacki IVm** **.\nly**
 * ... **HH likf rnH.** **Capit**
 '»' uli tdaI .-ijK • ir **ing by 2-3 values.**
 'I' U IIMJI ill |n lli4|» • • • **stines a' lllul PdlitUITi**
 by insects • >—''''a—HM Mir ikwmiiuWk JllC *nutl
 seeds.

I. < .inlim V-A-ct jh«rni. all leuvi-> in haul **rosettes; MftaS** *D. burmannii*
 I. 1-T4Vr\ intuit >ICM| Ihe item, IKM Jll in band **rosettes; styles 1**
 1, 1JJ1 bhdei t....ti looga bn) bantK bruaHrr **than**
 tl* pt-tuvt-i. tiilMrir jnrjn lubert iilwrtit; *tylm b **par-**
imr.ilMur **it tmdkMt**
 % UeaS Wade* priuir. imuh I **rosettes** **ihan the V-tt**
 *ikx **MihlrTAnejin lubcr*** **prewnt; tynln luitUnntv**
{much brajulird} **/>. peltata**

Itmtrmh **in -V^il R| |<0**
 I. |W ni b*ul r> **stems, cauline leaves absent;**
 •tipuli **3-partite. •M-arww blades obovate ottMcular.**
 5-M mm long, 3,5-6 mm wide, rrttdhtt lu Kirrn.
 Intlor **scm i up i<> I' <iti long, (2-) If** to 20-
 flowered. Sep.ill . .Ui«m^ IVok • vliUktik-iihLit •• i otau
 + I Jllit kmn. pink to whitith. (H^r*¹ of 5 t-jr(trU; <yrlr>
 3.C •fMiilr V^vilvrl. 1-3 unit IntiK.
 I, n mii.il lit premiTirnilt WCI |)br> M **regularly**
 fUhinVil m il IHI.IIK <II mtd) **tatt in •open marshes**
 -wnwlt %i j' Jixt juiMirwl tank*, **Ficwrwrn oprn <*tlv m**
 thr **IIHHIIMH**
 II. I' w Africa H> W **Assiatic; Co¹. In*ⁱ, Mep: Bh.**
 (^.. KI. ki \I|» Ml I d WJi.

Desman indica Linnæus. 1753: 191
 Stem eiv u up to 8 i BS tall. | **leaf blades linear,**
 longer **Imc lui'IK (n>j<Irr than (lie pdHflrv;** the Umrr
 leaves • ***ptradtog or tUrtrxtl, ufj to IV> an l'»'s** **Hie**
 appi i k<w<<< **root, 1-5 cm long. Inflorences up in**
 1.5 cm long. \- in MMknvraL **Scpab inalr. margin**
nutre i* **oblong-obovate, 2 mm long, pink**
In hi- **Orary of 3 carpels, styles 3, each 2-<left to**
thrKur I **spike 7 • \4hnl, ± 3 mm Jonjj,**
 Prfrnittd or prihap* **witiif (n** ... **in pemat**
 nrrn|lv tvrt it< fr^nUib **flixMtf^l** **places 1-niinl in**
ununp*. (tMllim j **and ditches .,ii, M HI or nnur**
 rize **kh I H |D) M <!*<> auil. Surocumn** **grows**
 with *Desman burmannii*.
 (i) i Mr D **rropkjd Afr** **to A>ir*Jij Bur. Crv,**
 Ind: Bh, Co. **KL kJ. Mti. Mjt. V.3.**

Desman peltata ... **with ex. Willdenow [D. peltata**
 var. (**Hamilton .: A. P. dr Candolle)**
Gbrkcl:Hf. 191
 Stem erect or **sluggng. "P** M 2ⁱ tin long, with
A irfiititti lul*ri. **Basal !** **rosettes, stem**
 leaves **ilrrruotr ot** **obovate; ...** **also peltate,**
 linear, 2.5-4 **HIM** long, | 3-2.5 mm wide, **tristules**
 1.5-2.5 **an long** **Inflorences .:.** **M ! I m Umn>**
f tO-rtnwrrtd. Srpalfn'Jtr, margin iiMrihd UMVMI thr
Up IVuli <ptlhllbKH **horae, 1 2 mii i |QOg> »Inr**



Fig. 1. (1) a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, aa, ab, ac, ad, ae, af, ag, ah, ai, aj, ak, al, am, an, ao, ap, aq, ar, as, at, au, av, aw, ax, ay, az, ba, bb, bc, bd, be, bf, bg, bh, bi, bj, bk, bl, bm, bn, bo, bp, bq, br, bs, bt, bu, bv, bw, bx, by, bz, ca, cb, cc, cd, ce, cf, cg, ch, ci, cj, ck, cl, cm, cn, co, cp, cq, cr, cs, ct, cu, cv, cw, cx, cy, cz, da, db, dc, dd, de, df, dg, dh, di, dj, dk, dl, dm, dn, do, dp, dq, dr, ds, dt, du, dv, dw, dx, dy, dz, ea, eb, ec, ed, ee, ef, eg, eh, ei, ej, ek, el, em, en, eo, ep, eq, er, es, et, eu, ev, ew, ex, ey, ez, fa, fb, fc, fd, fe, ff, fg, fh, fi, fj, fk, fl, fm, fn, fo, fp, fq, fr, fs, ft, fu, fv, fw, fx, fy, fz, ga, gb, gc, gd, ge, gf, gg, gh, gi, gj, gk, gl, gm, gn, go, gp, gq, gr, gs, gt, gu, gv, gw, gx, gy, gz, ha, hb, hc, hd, he, hf, hg, hh, hi, hj, hk, hl, hm, hn, ho, hp, hq, hr, hs, ht, hu, hv, hw, hx, hy, hz, ia, ib, ic, id, ie, if, ig, ih, ii, ij, ik, il, im, in, io, ip, iq, ir, is, it, iu, iv, iw, ix, iy, iz, ja, jb, jc, jd, je, jf, jg, jh, ji, jj, jk, jl, jm, jn, jo, jp, jq, jr, js, jt, ju, jv, jw, jx, jy, jz, ka, kb, kc, kd, ke, kf, kg, kh, ki, kj, kk, kl, km, kn, ko, kp, kq, kr, ks, kt, ku, kv, kw, kx, ky, kz, la, lb, lc, ld, le, lf, lg, lh, li, lj, lk, ll, lm, ln, lo, lp, lq, lr, ls, lt, lu, lv, lw, lx, ly, lz, ma, mb, mc, md, me, mf, mg, mh, mi, mj, mk, ml, mn, mo, mp, mq, mr, ms, mt, mu, mv, mw, mx, my, mz, na, nb, nc, nd, ne, nf, ng, nh, ni, nj, nk, nl, nm, no, np, nq, nr, ns, nt, nu, nv, nw, nx, ny, nz, oa, ob, oc, od, oe, of, og, oh, oi, oj, ok, ol, om, on, oo, op, oq, or, os, ot, ou, ov, ow, ox, oy, oz, pa, pb, pc, pd, pe, pf, pg, ph, pi, pj, pk, pl, pm, pn, po, pp, pq, pr, ps, pt, pu, pv, pw, px, py, pz, qa, qb, qc, qd, qe, qf, qg, qh, qi, qj, qk, ql, qm, qn, qo, qp, qq, qr, qs, qt, qu, qv, qw, qx, qy, qz, ra, rb, rc, rd, re, rf, rg, rh, ri, rj, rk, rl, rm, rn, ro, rp, rq, rr, rs, rt, ru, rv, rw, rx, ry, rz, sa, sb, sc, sd, se, sf, sg, sh, si, sj, sk, sl, sm, sn, so, sp, sq, sr, ss, st, su, sv, sw, sx, sy, sz, ta, tb, tc, td, te, tf, tg, th, ti, tj, tk, tl, tm, tn, to, tp, tq, tr, ts, tt, tu, tv, tw, tx, ty, tz, ua, ub, uc, ud, ue, uf, ug, uh, ui, uj, uk, ul, um, un, uo, up, uq, ur, us, ut, uu, uv, uw, ux, uy, uz, va, vb, vc, vd, ve, vf, vg, vh, vi, vj, vk, vl, vm, vn, vo, vp, vq, vr, vs, vt, vu, vv, vw, vx, vy, vz, wa, wb, wc, wd, we, wf, wg, wh, wi, wj, wk, wl, wm, wn, wo, wp, wq, wr, ws, wt, wu, wv, ww, wx, wy, wz, xa, xb, xc, xd, xe, xf, xg, xh, xi, xj, xk, xl, xm, xn, xo, xp, xq, xr, xs, xt, xu, xv, xw, xx, xy, xz, ya, yb, yc, yd, ye, yf, yg, yh, yi, yj, yk, yl, ym, yn, yo, yp, yq, yr, ys, yt, yu, yv, yw, yx, yy, yz, za, zb, zc, zd, ze, zf, zg, zh, zi, zj, zk, zl, zm, zn, zo, zp, zq, zr, zs, zt, zu, zv, zw, zx, zy, zz.

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Bergia - i apt
 Annual or biennial, tropical and warm regions of the world; centers of diversity in AiminJU an S Africa.
 Usually conspicuous and robust, herbaceous or woody. Stems v krtaxa m wji.
 Leaves decussate, ovate t*luMkd: nuugin fipijunnh tiirtlh*^ MifHilrn jif ivtirnl. Ftowrn irfirm m tJrnw, .tuill.**
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Bergia ammannioides Linnaeus ex Roth: Fig. 192
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Fig. 1. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 1. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 2. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Annual. Found in rice fields. **Fig. 2.** (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 3. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 4. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 5. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 6. (A) stem with leaves (1 mm), (B) bur (leaf 1" 3 mm), (C) seed (0.1 mm), (D) flower (1 mm), (E) capsule (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).



Fig. 1M. *Fig. 1M.* (A) whole plant (1 cm), (B) flower (1 mm), (C) seed (0.25 mm), (D) capsule (1 mm), (E) flower (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

Fig. 2M. (A) whole plant (1 cm), (B) flower (1 mm), (C) seed (0.25 mm), (D) capsule (1 mm), (E) flower (1 mm), (F) whole plant (1 cm), (G) flower (1 mm).

((C)) Tent. Tropical and subtropical Africa and Asia. Introduced in Europe < S America: Ban, Bur, I Cay, Ind: [p. Bh, Hi Go, Ki, Kt. Mb, Mp. Or, To. t p. Up, vi]

Bergia trimera Fitchi Cl < \ \ M< \ i [J HHM] *manis* var. *triseria* (Fitch) r << I \ \ Me

Benthant]: Pfg. l<S
Shoots and M^MI* without red-tippct! glandular hairs. Stems prostrate f when UHIM^ becoming erect later; un : i\\ branched below, up to i^> cm i^>ng, EM inflated, often wwewlui woody, reddkh, witJ simple egtandaubur hatn. Sepales erect, elongate-triangular, 1.2-1.5 mm i -0.9 ram wide at the base, membranous, entire.

or n< arly so; leaf blades narrow-obovate to narrow-rltptiitai, 3;>-M) nnu long, 1.5-8 mm wide, rather leathefy, glabrous, nssrgin serrate, nerves obscure, apex acute. Flowers 4-10, ii) dense willarj cymes, jK-di. • BUB long Sepa 3, 4 or rarely 5, narrow-eitiptka) 0.7-1.5 mm long, ± 0.5 mm wide, acute, glabrous or rarely pubescent, green or pink. margin entire <† fiinhri.it'- Petal 3, 4 or rarely 5, elliptical, ± equalling the sepals, erect at anthesis, whitish-pink. Stamens 3 or 4 (5); 0.5-1 mm long. Filaments swollen at the base. Stigmas 3 or 4 (5), sessile or nearly so. Capsules globose, 1-1.2 mm in diameter, btrigbi opening by 3-5 valves. Sect] ovoid to reniform, 0.5-0.4 nnu luis, ± 0.2 mm in diameter, reticulate rr

L< u sini.ii en annual Marshes, borders of tanks, •eep areas and in rice fields. Often confused with *manis* but differs in lacking glandular hairs, with nerves on leaf blade obscure; usually 3-merous Qqwtm. stigmas se<ul- or nearly so, 3 or rarely 4, seeds ovoid to reniform, 0.3-0.4 mm long, ± 0.2 mm tii tl(>(> even, reticulate. It also tends to be perennial. tal. ji it ; probably more widely distributed in India than shown here, the Rajasthan record is based on my own collections.

((C)) Heli, India, Sri Lanka and ... (Africa, Ce...

Elatine 12 species, all aquatic; cosmopolitan. Usually small and inconspicuous. Leaves opposite (or it f. *thktmtrum* when (red), glabrous, margin not toothed. Flowers not in dense clusters, usually solitary. Sepals 2, 3 or 4, obtuse, united below, without a distinct vein, not glandular. Ovary 2- to 4-loc. Annual or short-lived perennials. Seasonally or totally submerged. Autogamous or perhaps sometimes crossophilous. Disseminules seeds, probably dispersed in mud or by water. Commonly found in fish ponds and rice fields but usually considered beneficial a* ii consolidating mud.

Excluded: *Hit tin** *ffimrtJit* *Mi* ... a N American species, it has been reported at 1287 m in Himachal Pradesh, it is not known b have spread south.

I. ri ... ttebxt!) stalked, the f. ifmtlo mnrnifl < 10 one <kk away from the leaf axils at <latuiit)

I. Flowen wwilr or iir.uK <<; the capcutef remaining in the v.r\\ .tiU

J-Jafinro<i*>^Ma Wujhi; FIR ! 15

Stems creeping and rooting at nodes, densely branched, interflorescing internodes (1.5-) 3-4 (-11) mm tonu ± 0.5 mm in diameter. Sepales minute, membranous, rtotis, i elongate-triangular, irregularly toothed at hntb: base. Leaves in opposite pairs, blades lanceolate to elongate-lanceolate, (3-) 4-6 (-8) mm long, (0.5-) 1-1.5 (-2) mm wide, margins entire, apex rounded. Flowers solitary, usually opening, distinctly pedicellate; pedj with 1-2 mm long, j, with 2 membri axillary bracteoles al th< base, bracteoles minute, irregularly toothed or fimbriate. Sepals 3, ovate, ± 0.5 mm long. Petals 3, ovate, to elongate-ovate, ± 1 mm long, reddish-ovoid spreading at anthesis but lying on the fruit later. Stamens 3, shorter than the lepab. Styles 3, curved. Capsule globose, ± 1.5 mm in diameter, when rip* hit-, to the side of and not in thr Irjf axil. <† opening by 3 valves. Seeds ± 0.5 mm long, ± 0.1 mm in diameter, slightly curved or almost straight, a net-like pattern on the surface, the individual reticulations mostly hexagonal.

Annual. Found in seasonally flooded areas, along rivers, around < (.ink* .Hid m II irrigation ditches. It prefers eutrophic conditions and is mostly found on < on i>^ni mineral soils; it is frequent in rice fields. Under < ,tn it is flaccid with some branches unrooted, on < I it highly branched and forms a tight mat very close to, III ground. The flowers are chasmogamous or with post-anthesis cleistogamy.

((C)) Tent. Warm and uo'' ... Asia, introduced in Europe and North America: Ban, Ind: Ap. lk, Kl, Kl, Mg, Mp,<J. Tn.

Elatine *manis* Schkuhr (f. *E. americana* (Pursh) Arnot)

Like *E. obliqua* but usually somewhat larger: stems (2-) 6-18 mm long; leaf blades (3-) 5-12 (-15) mm long, 1-2 mm wide; flowers sessile or nearly so, usually .S i n M M v. < >, -2 • n \ usually 2 large and I >tt 0.4-0.5 utn Ion, petals hardly exceeding the tepaK. vrth rairh straight MIII > mostly rectangular reticulations.

Ecology like that of *E. obliqua*; both species are sometimes found growing intermingled; *E. manis* is IN !(<<>. circumstances usually larger in all its parts and is the more aquatic of the two. The flowers are usually cleistogamous. It is often misidentified and some of these records are perhaps wrong. It is unlikely to occur in Peninsular India.

r<i>}. w.imit i areaaol ?!K- Northern Hemispl Bat, Lad, Wp |k. 1 MO-MOO ok

ERIOCAULI A<EALU ^ncra

Eriocaulon: ± fHJ vpn kK almost umnnpotJBHI

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l in- geaiu <>...i<: on has (Ji.m) IIM.II endemk species in the lubconi of India. It is also (her <*"I) and taxunoniK point oi view S!t>t hirj.f.it ^jxi t\ niivi ni wet place* nt htlK r.tilnr tt),ili [fl wnda, 1 li>i<:; then M t oo t)»' •flu.un apieciea and ilic- lowland wetland tpecin. fhe i pxnring in Imlta >>» <tlnn.il area h.tw iH-tu Sns.tri. K and lakrohnan, N P The uttnilj H in India. Biahcn Sni^ii Uabendra P*! smgh. Dears Dun 1-195 (1994); this It baa been used at dw *i iiluatradoi h>t (i>- lixisjtii nibcominent there i- itm \vitk ol Pysos, I¹ I. Indian to [oumal • of Indian Beauty, 2: 131-134, 192-207, 209-216, 307-320 (1921); 3: 12-19, 91-115 (1922) - this work is .ui of ind raibeI unrdiabli fot Sn lank.. — Phillipa, Sylvia \l Notes on water Eriocaulon species Imm in. Ki-v* Bulli (1902): 287-303 (1994) I wtml

p.mn ul.uK ljk<- Hi duns)r R. Ans.in (Kathiboda), Hi Svlvia M, Phillips (Kew) and Prof T Stin/cl (COM Itnti] ior tlicii help.

Exi luded specie* oi Eriocautm.

Endemic to die Himalaya*: at bhutanicum \<- •IMiu; E. katmanduerue N.mikc: •Ncp; £, pseudtxjuinquangulare Riilil,in<i *Inii: I |>: /., putmiui). 1). Hooker: •Ind: Up; ii". *tom/<nir S.iiakf: »Nt'p; E. tritec-ttides Niitakr: *Ncp: £. rind*¹ Kut m

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Myrinif to the hi)h <i Ni India and Myanmar: I. barba-eapmr Kvsnii; •!>): M^; E. chtrrapunjanum R Aaaaii et N P. ftalahrTihnan" •Ind; M<: n. colktii | D. Hooker: •Bur. •Ind ; enstatum Martins rx K("Hni(kc [£, cristahtm war. mni-ku |. 1). Hooker]: •Ind: AN, Mg; f. gractle \! grnab M. kutzn >Mm. /.. mfirmtm Steuddl war. fei/Tzfi (Fyaon) MoUknke]: •Bur; ft. gregahm K&micke: •Inl | i- ft mi<T>m Kotin<k(•!!!(! Mj; ft milophyllum | D). Hooka [£ aHmtat vsr. mitophyUum (] D Ho a]: •Ban! •ind; K Mg.

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lemfa to th<' hightantb ol Sri lank;>; E. (Stratum K&micke: •Baa, •!>)(! <<<, Ki. Mh, Vlx i<i> tinii I k. Mp baed on incorreci identHH anon)

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1. Scape clustered, sheaths closely served, the slit 4-8 mm intiR, the lip tttBCatC .uul loothed; heads

0.5-0.5 mm long, smooth h and g)ms\ E. debilis

v v apex solitary, sheath, (h_m with spaced ...)

tnd obvious trans* < ... r slit ©'!*

ma long, the up acute; heads grey or black ...

female sepals oblong-ovate, boat-shaped, green ... eat

0.48-0.6 mm long, faintly reticulate indwriokied

5. Male sepals oblongate, 2 truncate d >>>[»eb<<''

at thr up, Gemale petahwilhoui bl ...

3. Male sepals dimorphic 2 ... lofard; ' ...

k Kbn dt

1. Stems abbreviated with leaves in a rosette, lfeloo-

gate then leaves linear and 1-4 mm wide; ... teavei n

wide; temporary ...

ihaa >> ma K tubta

6. I leaves oblong un 'ant 4 am wide) up u> ih**

row and comp! *u up wim]

6. Leaves linear or triangular, gradually narrow

OWafdl thr tip

7. Atithrts white 01 pale feUo* leaves needle-

like b a near a * dense » u> base

(-3) - HI turty not more than m * tBfl

(a siinil ttiud anniu, prob' t'h

att<; most widespread species in India) E. dinnam

7, ^(^th(^t^ ' black; leaves ... utuall

more lhail l mt ... thr

8. 1 <, nrv %hf, ith» ant! M

5. Ixavr*. thrath* and <.tp> ...

9. FWir^ hrat t> wih> ...

10. Robm prrenniala wtl ...

11-1 <eaws densely wool f& ...

12. Female petals membranous, not clawed ...

13. Involved bracts hairy, men ...

hairy or glabrous, the outer ones obscure

item 18-25 mat in dfaunetci. appearing rough through prominent Bond hr;ir t%

E. robusto-bracchium

IS, Involucral In, '!* leather} in Hit-centre, usiuK with membranous m,n gins, glabrous, the outer onea orbiculi! or Dearly w; bead*6-1Q nun todiaame-i<i. smooth without prominent BonJ b m it

It. Floral in,til leather; it1nk overlapping; beads lunl, sepals broadh, winged; Female jxuK t atikr, lined at thread U

15. Female pct.iU threadlike, wtA a inu-h of i,oi> aeai the dp; the petal hail » sepals . . 0.8-1 nun Im^ (*vi<te>p<<ad)

E. textngiifarr

15. Female petafa narrowly linear, wfen,i it vi noui bain ii the middle and papilloae bata * ihe iij>; the petal h.im. mi! leptafo . . I 6 nun long (Myanmar. Ami.tm.m Islands and Sri t anka) K adNbwaiasMWi

n. Floral bracts membranous, nm over lapping: hv<uK soli: M-[MK not Ming reneate petab unequal, *silanccen tic ()* median narrower, ii.»m

16. Floral bract* cuncate-cpathu wuh terminal < utp; male « pab deeply lobed, the lobe* truiM ate (Sri Lanl

I ptammophitum

16. Floral t>i.ms oolong or obhmceo i. the iobet rounded [SW India)

E. richardianum

o. Slendei annualftwithoul rooatod Otuidrrahh)rs> ih.u) :<' <tu k

17. Floral bracti it>i;iii\ '•- overiapptng; the beadi bard; Bowen coaapkuoud) (lattetx pah broadly winged

in. Fmalf jwi.iis oarrowly ihtear, \u .\ K<- main at lhr tni>l()l(BM) p.ipilto-w- It.nis ,ti the tip; th<- petal bain nm mptate, 0.3-0.6 ram long

E. williamsonium

IH. Femafa i" tab thread-tike, with .t brush oi bain tr the up. the jn-it! bain lept

19. Shraih much lotigci <j>it ih>- k ituli lepali of male ' female flown icp.tU in m.ilr tiimrt hr-r, M .IJM ^ t ribbed

E. eurypeptm

19, Shcaih * long hffK¹ ir*ltr>t rm t |

17. Flora] bracts M lean partly memoraBOtM, looaefy overlapping; iit<- beads usually \ott; Bowen not ur \\\sli^htk tl.itiiiHtl; lepab with or without wings

20. Involucnd bracts longer than die beads, spn u^^, and showing beyond the mar^m o{ ihc bead when viewed from above (head Rower-like)

II, Flora] bracts longei than tl>' invoiacrj bracts, NU'it<K ipreading *E. stellularum*

21. Floral brat ts ihorter ih.in inohju i al l>r.t(* not

2^ . \\\V sepala free, I, It-niaic bm ts 2.5 nun <n more wide *E. fy*

22. Male M-pais united bekw and spaibe-liki or female petali S oi 5; involucre) bracti less than 2.5 mm wide

23. Seeds with longitudinal, white, ribbon-like IKIN; mak lepab 2-iobed; remak ^-p.i!* 2 *E. nmcatum*

2S, Seeds without kmgitndinal bands; mate < j>K :t-i<tl<-i; female sepals 5

24. Male and female sepals glabrous (Madhya Pradesh .tml West !* t rnartianum

24. MiU- m<i female sepals bearing bain M >>\\ towards the tips

25. Involucral bi 6 BUD l<m^, obtuse w Bora! bracts acua? & hrtrrntepis

25. InvolucraJ bracti lets than 4 mm tot iU acuminate or terminating In . i finr.d bracti truncate, yeUovrtsiwgrey

26. Invotttera] bracti obovat ± 2 BUB wide, ^uli • i i^i' < iin up; n <. eptade hairy; male tepai ioi<-s rounded al the ups D.6 mm lf>n^ (Kerala)

E. tvarajanti

26. Involucral bracti lincar-obloog to obtanceolate, o.^t>-| mm v>id>. acute to innn.iif ii ilii tij>, receptacle ^l.>> male atpal lobes truncate ai the dps; ± 0.) mm long i widespn

E. xeranthrum

20. Involucral i bracts oi hns; ;*s oi stutnt-i than die heads, nut thowing beyond tin- the margin oi the h<.id ww n VH wed Grots ab<

27. Male sepals 6 united below, noi >>fl << like; fen

28. Female icpata boat-like, broadly keeled; M ape th< athi kmgei than the teaves *t. eurypeptm*

28. Female sepals flat or fold i but not Vr< hck; scape sheath shorter than lli

29. InvolucnJ bracts, Bond bracts, lepaii and petali glabrous or nearly so; female petali without Mack glads *I. duthii*

sepals 5, subsessile. ... appearing tmOh and faintly reticulate; appenda^!-itbaenl

•rntt.il or |x-ihap< jlv> annual, ll it an aquatic *prrir\ K"i"u HjtMWlfMd in nVwtog watri in Mrrjuitt iUrf fivrn, often ait>ilTrtl in tVt ki Hv<|i" "I Mid MMM

JO? KIM), f.uirnm i>, 8 lmlii -1"cl IU. Up, OI November i'ffahraaiy. Mostly about 1000 m.

Erismodes cernuum R Riiitni I-: subobovatum Siebold

I "AM*M*RUMJIHI. 'riWii'taM'mfti mm..! Fig 195
Floral nut. (1 v;|l<tHi>. Ic w n numrrutw. ... U «i<iii.wr to conic*) of nnM, SM mm t>» rtUn:..

glabrous, ... while pr |wu- Tfrll.n. h. ifi>|r Mowrrv ouch
•Ppafci ,V 2 of al> ...
jlt>r<| in trnical run, tppcaruif, iln

A mult anntuJ, Miartir f(<j><<) in thulUm, ...
bui ran hand ...
t> r<h4atIKHkte. <cp>t< "i nuOr ...

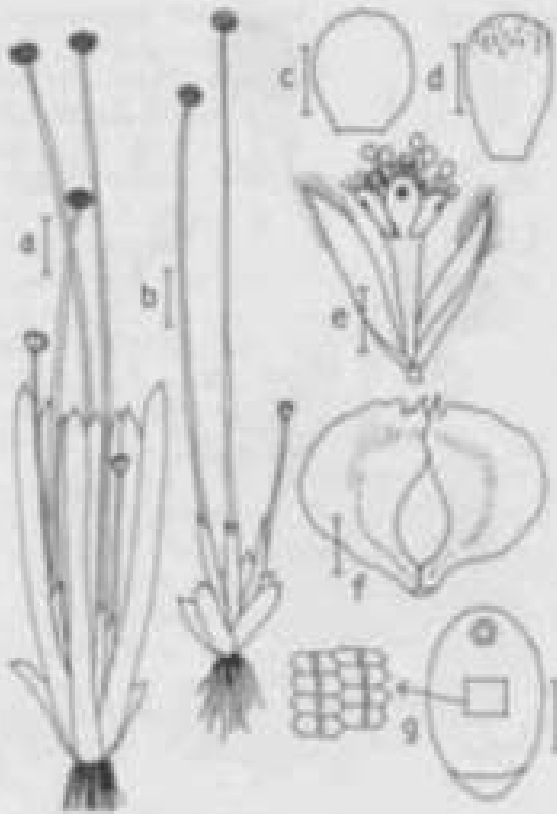


FK>. IIS, /rtar<*l>K ftiwmm: a, llamcrtag j>|,un |l ...
I. IirjdtXmi' ...
floww (0.25 0.15 ... on), ...
(0.5 inm> witl.

flo*<jn rniixrtli to ***an* hrd hdJn BC offHataVscd tn
.AIIVUI .iitl (UIAmhiiin (I9Mi^ to rep ...
n iimn>r ac | N Amm. • Baa, Cey, lad
N. i "i> KJ >>v Mh. .<p. <>, K|. Sk. Tn
0-200 in,

Erismodes rugulatum Dalzell Fig. 196

Tufted, ...
tt-iuinul .ntjt. (5-7 ... 2.5-H t-2") cm
f,ni(, <ti f-H) mn ...
long, K^1.'
Hfrtrruj). M> <> mm lli <ii'
KljtuiM\ Imi4tnul lx^tt brnad
H<n*1 IM<41> bVr ntvilnti.il bradi 'mt tlighiU
Mirji ~>me liakv Jowank fh*
Mai'- .KPUN *rj>k>i 2. nWt >>bo<Mc4aii-
± 1 mm hiug, hvafinr. it^htlv *in\$rti ami puhrm'



Ht- IM. *Jtiii>k m^tfii" • flower* jA<nt hum rtrep
 *airt ll(in): b, Howmt>j(ptjni lnun *K>llim Mb
 •tiMi^l hracl (1 mm); <l. iknl bnn lt mm), r m*k
 lWwr (0.5 mm); C. cap. uk wait prmornt wpal* <Q3 mm):

seed coat pattern (over).

near ifwr tip; prt>J* *, uive<tMU; aniben b U V Female
 IUMriv irp<U 2, oManrrolair, ± 1 mam kng. i<4ii> ii
 and h*MI •h>(wfi. f^l^bruti*, krllrd. acate, prul> ^,
 uihrt|iu1. oMitmh lincmr-lmrriihar^ i 1X5 nun lung,
 up v with w<-IK haiit Jiiti with a <>nap4ctHrU< bUrK
 KIJIH v >tufi)(^kbrn<M4l. O.A-0 7V mm IOUK
 0.55 <H mm in <tMHK-|n. MKJ .out col. • U, UIM> rudy
 ilulHatC. IligIMll in vertical n*m*. Jipprml*^.

all walls and
 occasionally 1 from a vertical wall, appearing as verti-
 <Jll !tnr> on fhr wtrfacr <f lhe •rcd>, htiMk likr. rrun-
 cat. 4i if>r up

An usual. U ulh pank •uhnvh**! <Htrn alpumiant
 and IOTAIW dmwnani m pooh MMl rice fields.

JO ll rp/ Rm/ (Hr). Endemic .. hmUmK nf S Indhr
 • lsk G. l> Dnrmhrr 0-2*1 m

awaratMM...*. MHPHKTLC 'tvmtmrwui yn, rmt
 G Don r% ft*, t delatella var. glabratum
 MoJ < rskel. raff. 197

aarltk rirmgMr, tlrfddr. u> in 55 c m *n imtr long.
 drusly elatell t in • uuMjr of Bur n » u uifrthw i with

leaf rrtuntt, ih* mttftanrai k>><< " close'<.*> swanda
 iht rip and wrminding the toajaaj bundtol ".****.*!
 rrrrxrni vjpn lrtvrt mir-w h<nrri a l> iuj<lrt>ti
 iramliKctii haw. * - » cm kxiff, 0.6-1 mm *fcfc
 Jl ihc bur), 9- c* 7i*m< l. Scapes !*-> "» long
 0.5-1 mm in <iaacetCT, B- W> H Hitihnl. iwi* lth*
 JM inn ifeui thr kwcs. loow, mnUrkwdrct. thr tin +
 mm t>ng, the tip wms 4ir, ufirn tootl<<-<l ll
 glabre to ihoftN roninl. 5-6 mm in donv ter, creamy
 white; m-rpuf> (ohttnu. gtabnttti Invulurral ba
 1 u wide < thr hr*d. obcNirohkwg, ±!S5 >" long
 rounded, gbfarmM, <t>w<oltHurri **>mriimf M
 * h grey, f<l dnwit at maturity, in 3 <> i whch,
 the inner ^ibtnwtng nutr fliwrri FlonJ t*mt>
 rudy oblat. ojUl, t 2T* mm. mrihr*mmv
 w>ite woolly hair* subacute, the (4wk-^HHi<i p<
 v. Mr <monft ibrm. fVmri, %mm>t> M>k
 l 7-2.1 mm ton*, wpafe frnr in l W m << rounded by
 umihMnl braru, otheraitr pallid, iitiiiril J>l <<nr-
 likr, ± l i mm l<<R, Mobed. ih* W- es obru<•
 with woolly hairs ifiuoW th* uftprtr trurgn
 petals oblong
 tad wWi wfchi <ml) l>*n two ± 0.5 *****
 long. the ihn.l | (i l mm Long JIHlH <" Cf<M1 *'llr.



FIG. 1. Drawing of a flowering plant (2 cm);
 b, longitudinal heart (1 mm); c, basal heart (1 mm); d, side
 (kfort (OS watL v. fnaolr IHWI (<> *>). C. seed
 10 B mm> wnh w<4 tt<| aatll MI IMPII



0.42 mm long
seed i-i-l 4)rf>rrtdjKrt .mj>rjrili^ Ln IM- in
Anmijl lLirr in Wrt ^nMnliindik
|O HrM F.ndrnii. K»WIndli find Mli. Mp.

Eriosema rrttdjKrt \[.u uic, (-)•, 1'9)
Tuffed. Leaves linear-subulate, -ll ^-t^ tin long,
± 1 mm widr, ulahnmv ft- in 7-tir i red. aci, ir or .u Ullll-
naif. .Srapnfru IK many, Una, S^lAcn bog, nl.»liniu»,
4rihl*c<l inistid: dmihS obliquely tpaihc*1kr at ilir
spout i. obtuM .ii ifae tip Headi KI^M^1** b« ibn<-ti<<<
at base, app arinf; <ipim, Mi nun in clumcirT. |MI<
vel-
leash-gr v ir<r|it.n) i pjluv Invului i.il l^i,t l* brudh
ou Ci t 5 mm lting. iriuiiii.ttni^ in .i CVtp ttdi MaN
coloiil. slum, gtahtttfc bccommi rrltrard in liuii
floral bncti iitn.niu ONUS, lancet d m th*- Bow
K m k»uu. fi n l "i '<(urwMt, awii4ikr « IUJM;
ru*|Mait IUUK H in rvcding iho bmtt, mui) i \i<-<l-
bog tba Hawera. Mulr ll'mrci srp;ih 2, umrrd mi QQC
udr and *|Mtlu- likr. OOOwMM UtU ii» wtiti-
|M-JUS alwcnl. PmiiuV (hnren: vp,iK.V hrr, laucolar,
gbtitou*. doruVy wiitgrd. fwlloWij [R<UU j

Fig. 1. *Eriosema rrttdjKrt* (1 mm);
b, florit bnct (1 sun] l. male H M T (0
llufc, (0.5 mm); k ^ « ! (l) l mmt with md
<"»• 0. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.

± 0.2 mm long, Female flowers ± 2.5 mm long: irpaJ*
linear, Mate, pattd, with MOM *hta *<>'U* h.mvto
•|>jthttv lirflwl l-5-l.7B mm long, ihc ih<d tfghlly
smaller and flat. prtdw n*ft<Mv ttuaMfMIhuliUr.***
whopical AUnd miul Mime whtr wootty hain *t b>'
two 1.5-1 7 mm loiii, the third *lftlitt>
oblong-ovoid, 0.3-0.5 mm
elongate, Jll({IM-l1 ID wtrtkd l^l«>*. appearing
smooth Jitd gk*if. Mpfm'ndjKn alwrni.
Perennial«» prtkip* <>mfiinir* annual. An aquatic
species growt* briwrn *iu| pa mIMtrrKrii RKftl in
**rr«<<>, 4f^uirtitH nrrr «ern in Mill MM
IOR KIHI EodcMfa IOCCMMal W Jmlu *Im) Ge. Ka.
Mh 5icjit.ini-i -ll...uber.

Eriosema dahliei J. D. Hooker, Fig. 198
tin
**»»(- rrtcpt^iln ((ljl^i>u^ l molixt.il bncti
' JM, . .,1^1, i 2 25 mm UnK. tU -i jl IM • n
Ulc; nulc prt«fe vrithoui W* l |(Uit«iv frouJr arpalt
line •r-rl)||HM ii, t 0.75nm lung. t>n krird. (rttular



Fig. 1ffv. *Eriosema dahliei*: a, flowering
b, medullar bract (0.74 mm), e, i b k (kiwi (D IS mm);
d, Hani »(ih (rituk Ituwrr {0T5 »
r. IOVI4H i«l bmr tI Tna> l. lionl brwt (1 •
j, male (OA M) . II. female flower (OJi

Anmutl. InuntUtrd place*, manhland MU| HI rice tirhti h i* rQm(t) iwtigniMltlc '* *'. ***. g-cusped involucre

f Hcl s..i.,! si

Erioseidon myrsophyllum Kuhnke. It umnkmnm MuU t Argenticus. *E. lobosperum* Ruhland, f. (4MWWI) var. *E. malin* CH Moldifilur. F- i**hr*>cku form. «iAr->> Motdrnk*. f amdhw* R. Atiuu. V j 'Nale et N. C. Nale] F

Red l f i w linror to rtblonit-biK^oUtr. 5-15 cm long, 4-10 mm widr {to 15 mm wide at tmat), mam nerve l. j;labmu%, ubuurb acumuiir to ^ utc J< the tip. Scap ** *rtrul, »lfiiilrt, H-l IO-M cm Urtig, 2-5 mm in riimrUr, gtlbcvti*. • curly - 4- or 5-lobed, »lt((tili> iwmrdr; «hrjih»liM»r. V-lt>cm long. longer id on the r « «, widened in ihc uf>, half, half M kmf[•• the w jfx-t. gUbioit*. fluiouh «ht» three-quarters of its length, p 4on((rd and Umg^umtnAKr above. Heads cylindrical, ii (-S) mm m dUmrtrr. gj> in white, (HiUk* (ivoid to rltiptokL i haiM li »cu iU»*rh' <wibj»pinR. JU semicircular. l Jfi-1.9 mm to*t(. bUclith to dark brown or yellowish-grey, the txu ll' Hith A powder* • pubnrnur. Mxtl brwts Ukr inmhiml bnett but riamnrar «nd «>>^pr. worJtrMittMmte or atH.td, l.J-17 mta widr, lcaih. rlv over UpptAg. tip* * mr or acuminate and arched inward. Mate ll.Ttet-Tt trfMll* 1 (5> fttt, narruw huii-«liap«d. 1.2-1.5 mm lMI)[. ± 0.4 nun widr, bi*V

d powden puhctrtrlt upvWtb; prU t. mi h or wultf Mll • liUk (Luhianibm lin l

J X (ihtKnbtnd. bo»lilu> ••)!(. pcmdrY pub. cent upwatdt: pruk), lioc. spatulate, ± 0.75 .mkmg. hain.*««hor wuhotit - black .pk«l t »l ihr lily Scab obfc»f-e«ipMi*d. ± 0.7 nun It Nig, wrii out rrlU iian«rt*rh rft««(iHc. aU(Tk in vertical ••n»v appciMlifTft l of t from th*- ividdlr *A the itnmriw i*iul *»JU. appearing aa ITHHJl lines on ft* MjrU<r lit ibr M'rtli. b> de-like, *..!)• n at ihr >ip.

Annual. In nuivltr*, t>rl it- fields, at tw rdf(n of drying puoU jnd in iinn' • Imiffn «< rock 1< is wiabk m«ur.

(OHrit VJwm)... M UK »tod Ga,tt.Kt, Mh. July-IV. rtuber 0-t 3

HfMViiw J** pumil (Moldenke) S. U PIMlip* (E. willdenowii «HM var *argens* Moldenke); refer to Fig. 210a H

Like *E. stragulum* (Fig. 219) but ibr frmaW- ptab UV A h,mh'< hairs, like *E. willdenowii* • tttg.MJibMt

it ha* S-mrn>u\ ti.mfi* and *. man i'!'!''!'. li .i. |i|l,r> from ... leaves.

Perenn*! Uanhlanda. II lrl|, e IHUHIM 10 lhr wntctn kmLuuU • f Sri Lanka * T

Eritrmdmm ft u'oihi tux var. Fig. Sid

Stems elongate, slender, up to 10 cm long but UMUJK %hof-rt, clothed in fine roots and a mesh of libt« fton dewing 1 area. Ur k^ is clustered towwdi lbr rip and surrounding the. unftk- ir''''''141 tmetfttil HMpr. Leaves bilobed from an expan''''ri, «wi' mostly base, often ± crescentic, dr nig Mack, up to 5'. cm 100K, 03-13 mi< wide (2.4 m n M tll<1 ba«>. S- or 5^Kn«ft. feapn nail. l i-Wtin tw'K- 0.8-1.8 •u« Jn dumcti, 6- to 8-ribbed, scarffy white; 1; ahMlfai up l. ± 8 cm. i. much *h'MH i d>J" •' * lrawr*. Uwn. *nh «pw/d ncrw* awl itan*Ti»r i''''''^A be, ih« 0>t 10-1& mm Uwq. rhr uj

>414VUWIL .sculpte hemispherical, glab'««»* involucre



FIG. 210. *Erioseidon lobosperum*: a, male flower (0.5 mm); b, involucre (0.5 mm); c, floral bract (0.5 mm); d, male flower (0.5 mm); e, female flower (0.5 mm); f, seed (0.25 mm) with ... of root system (over).

whorl-, the outn AMI UllllllllIF ± 2 nun bag
 glabrous, black or grey to yellowish-grey, ili«- mm i
 more oblong, thickly white-pillose, subtending
 flowers, turned <i*»n u muurity •i» tana nba
 iflg niaic fTmren- Hor*I bracts nirtxwfv tun rate.
 ± 2 mm 1*MIR. p rri ^ brown to bUtkith. vttli *hiir
 wooltv hair-v. IIKPIIK ftOUBiUte. thr tib*k*poi. 1
 pctau visible 4JDI.H.K IJirnv Bo»cn SnuwrtMl' MJl<
 rtowrrtr tepab otxnatr. 1.5-4 mm lon*. United !*cm.
 *J»bed aixivr, giis «- bIKki wWi while mraolh i>*ii/
 two krrVd, l)H- third flat; (*cuJk A. oblong, gUnditLn
 "nd «kfa whirr W.H.IK h*irv iwo ± 0.6 mm long, Uir
 thir It I Kim |..iiy, j.c.nn.ltnjc liont ihc wp*h:*iHbr«*
 whi¹¹ Krnialr HtMn-fv *rj»jU lxui like gic> "« *Urk-
 »AJ. »«(ff) k)n« K.«.llr liaint. f*v i-13 mm hwg, thr
 •bird itmibr but lurTowrt; prUb wkd αfj« on a *A
 t*p w 0,11 mm lonft; |»rijd» narrowly obfcuKcobie. wiii»
 a subapical gland ..ml wuh mttfe woolly hairs at >br
 tips, use slightly lji^ri tliJii iht HIKI i>t' s - r«k
 ub)iiim «.<«<), ft IS-!) it mat hnt^ weed COtt rr|(t tr-wiv
 tersely doogate. aligned in vcrtit J! rtrn», appearing
 faintly rrticttllsie, somewhat Mtekted to almost
 horizontal. |ppf|Wtl|H-lhfTTK

Perennial or perhaps also • iiiiuul J p
 submerged |»J *n)M> /li-Hiujf Hirjriiv rOOTlf DO i
 and m mud, apparently never seen in still MHO. The
 m only emerging ».. for the water surface. <Hiin
 »nc in colonies.
 |O? Ru». KmlrittK to Sri I atiU and Indi4 MMllh "I
 X! N: tOy, «|nd kl Ki Up lh-t«iu»«rr-|>fi! l)- «>
 1000 m.

Ericaceae *Jussiaea* **taarf el N, P.** Balakrishnan
 [K. var. *desvati* *Jussiaea* Fwvn]: Fifi. 301
 111 B n (but involucre) br* li up to *• mill
 long, densely exceeding thr bc*l. l 1-3.5 mm wide;
 male sepals hooked at the back; frs
 appendages of tht- terii* itKitlrii at iKr lips.
 Annual In MII .itn1 mmhy pIMri
 (O Hyp K»» >lirll H. dense to ^ liidu: •!«*(Kl.
 Ki, MI.

Ericaceae *Jussiaea* **fh fj. p. Hooter** (| n+Bmmmmu WL
 var. *Martensii* (Hooker)
 Fw. •, t, *Jussiaea* MUIMIO fell— *Jussiaea*
 Moldenke: Fl. 201
 lull-¹ *Jussiaea* thfttt without a thi imjr. Leave*
 ..Wfd-itwped, u| to 6 cm long, 8-20 cm long, ± 1 cm
 **fc M luur. niimv ncrvrd. gUtirmi*. Aiiirtutr Inwinh
 U'r apnc, ihr tip ob«ti«« <i Mbobow N« »pe* (r*. M«
 '• It i . . . iig, i, Mi«rh habrr, indbtimUy t 7-W»»
 mm. y nearest sheath up to 5 cm long, ribbed,
 sparsely hairy, mouth oblique. l|«'s globose, ± 8 mm,
 densely white villous; receptacle hairy. r,nr,i>

bracts cuculate-*Jussiaea*, tllf Minn tiUliw. the mini
 -UbaCUM Kiuiou, »pir.iriuiy; -M nliiii.iiu li irlifxrii.
 hairy it th« l,w k ID thr upper part. ± 2 mm to
 t lJ iir'n .,nr' nm.il l)ia. kL ili...lxmj, uni.ii. of
 obovate-cuculate, 2.5 mm long, serrulate, acumi-
 nalr. dritvls l lithrd in wlnt'r hain in the iipi
 F1 «rr 3-mrrrotu. Male tlimcr*: vpjU ^, oboi
 oblong. tuntvtc Jü tliir lwr, tumrtl mid *pjiln like
 and Nplti down uiv udr. ± t/i mm tunf(. hv^ltmr, ihc
 tips hatlfi f>»j) »«»* t 12 r»m long, f)r- faba .ill
 • it Met) li.ni ii ilw ape*, vriihuul * bU*k gbud. OCK
 Jt^liriv [ai^rT litait tbc wl»rr 2, tO-8 mm lot);; HUIKTV
 k Feniak IUwrcv. irfwh ^, fippe, -dij^ttlls iifif^ui^l,
 linear-obovate «e. beveded inwards ibe tip; prlaU Hoi
 spatulate. ^-2,5 mm U>»t, wilb IODJ white horn ^mj
 lacking black apual RUIUU Srrdf t>wwt-f;tolMiM,
 1 0.55 mm Jong: *Cf • coat cells >anncrK-l\ c(oog)t*,
 atigOCd HI w < lfa Al rom; Jt^x-inLmr* tottiani from
 centra " "•* t(mravoac radial wall, elongated, curved
 and jointed in iln «lji« • HII«« of the same vertical
 (re ibrming longHudbttl parallel ribs.

Vmiiu) *Eootoj tUlktCHtn* Usually misidentified to
Jussiaea.



nc. MI. f.w<n|« A****1 *• flowering plant (1 var);
 h, fcrnak-tiowrt 11 mnt) A i*, ^*, flmmmg plant (2 var);
 d, «ml (01% ntiti wllh im | nm pMrrc (used); e, female
 flwn (0.5 mm).

[© Hel-] rniiaiii 10 M.tiin.tr and the Andaman Islands: •Bur, •ln! An

hvjKaulon hrterviepis Strode! [A. dtan in *Pyram. I. diana* var. *bngibrart/ntum* FVMHI]: Fi((. 202

rafted Leave* Hneai *» Unear-bnceolati (0.5-5-15 cm long, 4-K mm wide, Bat, glahrm»t with 5-13 nerve*, Bttenuaae unrard* an Obtuse to acuu dp ^ |K" saaj (up i» 40 or more), b-'2'2 t m PHIL.; 6-10 nun m diameter, ± .S-nhbed, glabrous; shcalhl bat, up t long. nn.siK half .i\ long a». thi- leaves, >< "ii< Head* rioboar I = fern ipberi* .il. *»-|0 mm in <li.niieic-i. limn white i" dart gi . . . recepta*«< ovoid oi eyHndrical, with ihofi hairs. unotucral bracts oblong-lanceolate, 4-6 mm long, I I mm wide, tpreadirtg, much longer than the Bora! 1U.UK and Bowers, maw coloured, n\): . . . and glazemy i»ii ii thmrttig beyond thr margin of the head ^li< . . . I ln>iti .ilnm . . . becoming . . . Beaed in imit, nibacute "i obtuse Floral bract H oHanTfohitrninsir I -'»- nun long, mrm-hi.m.us, acne to acutmti.tr. t.i.i. k ihr tips papillate hairy. Flower \ t'liKiDih Male (lower*: trpalt uimed leaf) H nathi . . . an 'l ipHi down oiuride, 1-1 5 an



Fig. 1. *Wt hnotmmhm kttmbpt** a, flower (1 cm); b, head (2 mm); c, tawokKtal bract (t m); d, floral bract (1 nun); e) OMIC nowrt with flonl bract «nd to». . . . lar bain (0.5 mm), f, lrm-cl. flower (0.5 mm). *. seed (0.75 mm) wtih irrd 1 oat paUn 1 (mm).

long, black, 3-lobed, the tips papillate hairy; petals very Mti.ili. with >vhitr p.iptltar .nut .« hl.n.k .»pi*-il gland; anhrn black Female ilitwiiN •epali free, I '-... Itltu hnt | dark, 2 narrow t-n-shaped' and beaded v»tiii whke bafai along rite ka d .n>i at "i>< dp, i'11 > .i|t| . . .)ti lintMi Ap.tiniil.in | I nun l«ni>; ttLu L. IMIII whaM baW 41 thr Up. petak luu MI ^ilil.ttn r <il.iu to \palhul.i"- 1-2 nun l.nit.; h.nr> .il ihr tip. *ilh tti wkhoU) *!»** V. Ulam h. Seal tuhlong 0.4-0.8 SouasHag weed COatC<fli| tranverich rliMif^alr. ahgnrd m vertical fOWS! .ippeuii i . . . 5 or 6 from the transverse radial «.M^S appearing .i* tran«rrv rings "M the •*uit.«< " " the wcd». bristle-like, flaitrnrd it ihr up Annual ifl marsh - and icaionalK inundaietl p illy ahtindani t .>min<>n in in< fields flowering after the harvest Verj variable tan length < (the involu- i .il)>t.« (i . . . shape and colour of the heads and form of III) female sepals. It is perhaps conspecific with the Min an species *E. hance* *tatrum* \ r Brtmn \ r "«" *mngtonit* N \ Hi (mn) II, . . . Probably endemic to W India Sfasd CO, KI Ki ML, KJ Septemb - March. 0-200 m

Enoftiultm tamrolahim MajM] ex. *Stenale* I [A I*****^ turn War. *piltium* Moklenki *E. hance* *tmtngainu** K An*^11p \ t Nair ex N.CNJ]: Fig. 203 hilt. •(I • A< - lanceolate. i,b-6 1-1ftl 1" long. •. IS mn. H hairy, narrow towards the s. apt i '«« dend<' 5-20 (-MI (tn long, t h mm in diameter, glabrous * * * »[>.if*eh hairy, indistinctly 6- or 7-lobed, scarcely IV»IM, . . . thl lip 1 to 2.5 cm long, base, glabrous or hairy, mouth ur, a. ui. X. adi glabrous or t* tphrrMaJ. (V) B 6 mm in diameter, white; r t«taC» covers, hain InvoliHial hi <ntU ..' of quadrate, 2-3 mm long, yellowish-grey, membranous, not reflexed, rounded at the tip, hairy upwards and dnsi' at the up H" bracts cuneate-oblong, 1.2 mm long, Hi membranous, shorter than the female sepals, • Mibartu hairy an b Malr flower; srpab %\ be-like an dtpttttd 1, »S-S mm long, dark. !Mo»in1 glabrous <r spi hairy towards it tip; petals minute, glabrous, itti hit. > gland ithen b k n covers sepals 3, drppK bfi shape i i 7*. I \ unu I'-m;. >< Itowai giev I Mtmrtinmwtngrtt mi the h*tk. I KwncitHWS A glabrous or hairy towards the tip; petals spatulate, hairy, with a black apical gland at the tip. S«««da oblong- oval, 0.6-0.8 mm long; seed coat cells transversely elongated, aligned in vertical rows; n tobtanr from ihr lip An- In marshes, rice held*, on * J11 around dmn« pooli Ih, man hairy pUnu hair



FIG. 11. *tnttmip* bUttmUtnm*. a, flowering plant; b, bract; c, floral bract; d, male flower; e, seed; f, female flower.

been recognized as *E. lanolatum* var. *pilatum* or *E. laurum* etc. India »Ind <i tt Ki.Mh. >iWcbruary. 0-200 m.

Eriocaulon martinianum Wallich ex Griseb. var. *martinianum* (Wallich) R.K. Krause [Synon.] Fig. 200
 This *E. quinqueangulum* but bract is 1.5-2.5 cm. longer than the flower. Male and female plants glabrous.
 Annual Rarr. In m U.
 10 Hrlt- ttiHrmi* to IIIHIA: tlnil: Mji. Wh.

Eriocaulon minimum Lamourk [E. lanolatum Marten, E. arystatum Sims] J. D. Hoakci oonMartlw, E. lanolatum

wide, thickly with 0.1 mm crlk «i-ufiru, cufa*-cote. ^Jf»» «pHWr. 1-*. *-.* f-J<> rut kwg, * 0.1 t»in ID diMM ribbed, th^hih iv»> sheath M |, t', ii, ifaortn ifHq llve (eavrt. i sperry. inflated M 11» BMNUK 'hqtqIK'IY »jtn ohtur ur »

Hea-ts jtM*»<c B0 • ti).^li.ipod, 2.&H mm in diameter, gtingenig ptXt jtittimUltyTfi reciprocal cylindrical, hairy [itnohx '•) biarM a* trklr At the head, [pencil-like, along ip cuncMo, i 1.5 nun Hmg, wuh broadly rounded to truncate .nut loothrif (jpt. Outel floral bracts like iiiMtlinr.il (n.i.u, ± 2 mm UMI inntr Bond in-!"* abonie, grey, deep!) tmwjwi Flowers with stipe: *rpaU 2, <>hlong. 11 mm tong, f{rr\ or lil-n k n am Me, ltghly kit-li'i. iimiiri on iinr *(<k' •) tjr- tui^r; pruu i. < iv <ciil.il] vulh v%dt< jMjiiU.ir 01 -IIIIMH. .tntlt^n ^>L I Fettnk Bo*wi w«li . <?> mm km| tcfpei <j>-ii* 2 (S), WinmriiNnliim'. lo.<v ' i S8 DM low? cinnu; JK-(.llX 5, runiwlx ul),iiii i ol.iti rwo ± 0.7> iimi long. i hi third UtRtiK ItinRrr S.,<J- ovoid-ellipsoid, 0 H-<M nun lf>nj;; Ked i Ml * d transversely elongate, aligned m wmiicri rtwi >|tIM-Mdj^f> In the darn of trau «iir*r #nti iff ma) IMUJ vji)>. appearing reticulate. \tininl A |>i<>f> tnfTwn and perhaps here seen |> Interpmrd species u »rcpmt*d u> K?ot' f-n » not rock fac I ;uili iii.iisl^n 11Urn. 1 iWe £. vnn<ntum hut with a more slender habit, viiwt and flrfaoai scapes, smaller

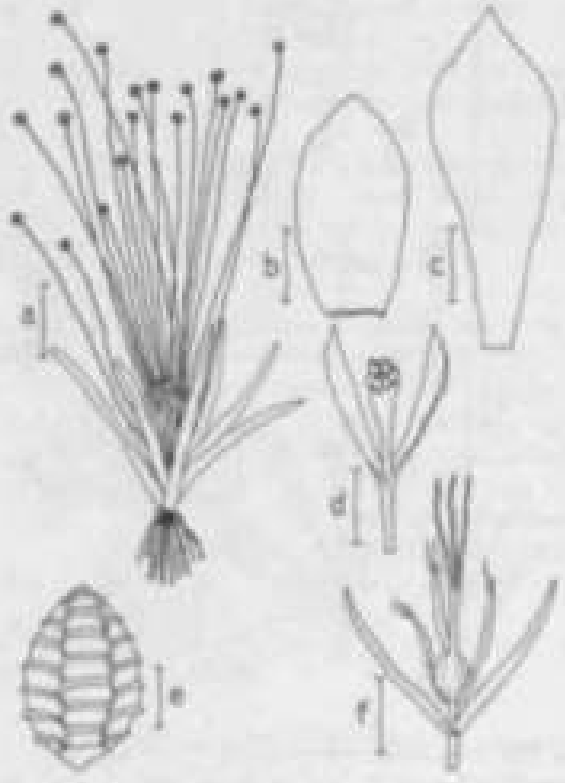


FIG. 12. *Eriocaulon minimum*. A. *Umnrlttf pUm ii* < mii; b, bract; c, floral bract; d, male flower; e, seed; f, female flower.

(ItMvri* wild female JK-UK IIIKMI n d slightly smaller
ihmmg 'li' J vctJinUtc *urf J« <• jtatiriu tin
tf tH uUlloils Wittci I tun l''mg.

11. slv ,\»*. Ban, ftw. t*). Ind. \^ G
Ka, Mg, Mp, Wb.

Eriocaulon aristatum Martius Fig. 205

Fulled |*ea*H lint.i) to kiTtctr-lamruUtr. 4-1:.' (in
long. 5-4 mm wife Him ^bhtWM, «tinnuttr towards
lhr <M -, afCOM -ti Ow I p), with B W MKVM Scapes
1-3, tft-10 en long. 5- « frnbW, g< mly raised,
theaUtt loa»r. otnu»«. W Q i m lun^ . nxxith ubbqix
obtiur, Hc^di *ubflnbow, ST HUB in <lui«irtt.

5-3 nm U*|K, the cm«ri ofatUM-. lhr Innrr brtoniinj
MIU< nir, trlkwHh-crry. *hinm^, nUbrm*. FVnl bncti
cmm

hmg. mrmbrMau^ rurcding ihc fluwmm, yribi
the tecfc* hairy. FUwm Vtnrtmiv Male flwwd.

onr »klc. t * mm long. 5-lobnt. the k>br* MU>-



FIG. 205. *Eriocaulon aristatum*: A, flowering plant (3 cm);
h u.*iihftralbnct U nu |< IU««lhn(t n MI
r | mmi, C bw»w *''•n (I DIP
C, involucral bract (0.5 mm); g, floral bract (0.5 mm);
h, female flower (1.5 mm); i, female flower (1.5 mm) (MP). | << d
tin. »<i). irnl MM 1M**nn iinM-ti

acuminate, greyish-red. Im. hair
equal, the lateral ones minute, the rest lining
up ID 0.5 mm Umn. with<Hii

btr. 1 2 mro long, OK- Uirtjl imn btM-
middle ow Ru ind not krctr<< acute, lat * ** lh*
apex, petals 3. wilwqiwl, litM-jr qrthuku * 2 mm
long, without ^Unili. whitr. »fM»wh hfeiT Seeds
oblong-ovoid or Kkibow, tWS mm h>i^ i^n v'' - seed
coat < rIL InutMtrvrK rl-M^jir. JI^K^I in wTWal (tm**
appearing to me

appe n<dr ttfuiHC from t nMHnr mil* -'''. 0 or
1 from the vertic ,J*»U. hrwi, like, truncate at the tip
Annual Foam} in w

HHI VI tnnnur. NC anH N India. ****
IMI. Nrp: Av Bl, Sk, Up, 7-2 600 m.

Eriocaulon parviflorum fFnnrtl R Anuri n N P
In\Jii*r, |t 4mn*w. pwn*ftmimf**m, |
mfaUnh*,n| ligSft

Tufted. Leaves linear, up to 8 cm long, up to 6 men
*.iic. Rat gUb«.

acute tip. Scapes few or many, up to 20 cm
glossous, sheaths lax, up to 7 cm long. Heads globose
to hemispherical, 2-5 mm in dia. <T.rlr

bracu obloMiHMwmfai
l. tMvWM -fwl gtt«<miit(. MM •hui
of tW HrM vbrn tw

above, spreading or rvflrad i» fnM. <»xi
bracts oblanceolate. l %«*» toMj. mrn
subulate to acuminate. hi*.

Flowers numerous. Male flowers: sepals united
spathe-like and split ko'm nw udr, t 1 '''' ' ' long.
black, 3-lobed, the lobes irt kuir i»f oh-

and a black apical gland; anthers black. Fece
flowers: sepals free. 1-1.5 mm kmg dark, 2
narrowly inlitt >!

black, 3-lobed, the lobes ilurd HaH. ix*-taf -MM<''''
, « M l ««*» ka*r» <> t**r '>'-
petals linear-oblong-ovoid to spatulate, 1-2 mm
long, hairy at the tip, with black glands. Seeds oMMg

aligortl w *ri
from the transverse radial walls, appearing as trans-
verse rings rface of the seeds. bf»«l«

iljlli r«(I at tfa(II)>
Annual. In wet and muddy places, rice fields and in
disturb, also in crevices between wet rocks. Anniat herb

lt«» pcrhap* C<K»*><
RuhUnd
MI | HKIrraM u>r
Mh, Mp, September-February, 0-600 m.

Eriosema fnamitHoptutum S. M Wullip* IE.
 "ilrtmrn. IKUI Marifeto] Kit 198
 m<r< ihjn ^ *. . r. \.nk); Hotjil bracu • W W I M p *
 late,
 mmeue; female irpah t aUkr,«Uwi
 hm<k petal* ofal<nccol<u the modun
 ton* re. densely hairy; seeds tubftobomc. ± 0.55 mm
 lonfl, vHlim, giant?, lonRtivMliti.ill Mi tJrtr.

Ptirnniai. Sandy <rc*m m*ntim in iuwland r.<m
 Gases.

IHrl rilliink 10 kwUftd Sri 1 J H U : •(>> February

Eriosema guineense litinaru* VR,
 F*i.m. S, fwififiMMiwb¹ forma
 molle (Moldenke)]

t afted, vt^ctatW p
 •hfc r<i purpb "> (Mok (M ITMI ah m «i> I 11
 i loa infuk« n Hi 5-9 (-11) cm i
 (1-> 1.5-5 imwWcMM Uh
 with 5-t | wi-tUfta*!***! iirn<r>. rtMnJt It* k
 (up tu 30), 5~40im knm- H-Oli m^m '' diam-



FIG. 226. *Eriosema guineense*: I flowering plant (1 cm); a, longitudinal section of leaf (0.5 mm); b, longitudinal section of stem (0.5 mm); c, female flower (0.3 mm), m. mklr lli*«-i (0.5 mm)

(rt. > or «niblx-d. grnily iwmeri; IHJIII* MK-M- and
 |>.i|K'iv. ohtiur, i^> to 8 cni king, fthonri iJi.m i i.; leaves,
 n purpGah. Head globose or nearly <i. 5-7 mm in
 dUmeter, pair -.
 li*ir» Jttvcihititvl \H'M is linrjtWil.liHin in ntxA'atr. vrn-
 .itni|v. Up In JS Mint imiH. iBOTTo il>.itl Itli- !!
 bra i* JIKI Quwut, l«iitii brawn <r yrikmUk, g*»**nmi
 •nd n^{l>^l} »»»K- becwnlng i jnd <tfr< -
 -d tutttri the lir.ui lit litll >11*I.II bract* rh.>ml-,nl
 in obovaie, i u<.luiu*-. it mniulr, 1.5-2 ttim long,
 membranous. b
 bous or densely hairy. Flowers
 3-merous, pale, L.Vt.ii HUD l«im, fin u tlxtii glabrous
 wip. MJIC (limn > «|>.i|>. v.ni,1,1
 uruted ami
 spikelike and iptii tUmii our tide. 1 1.25 mm Lung,
 white, hairy BI JIT*.; petals very small, with white papil-
 lar and black glands; anthers black. Female flowers
 sepals frrr, linrM-oltbturrilalr, ± 1.5 mm long v > > >
 ca b hairy at die jprx; pnalt n»
 oh long, ttirmirpfitc *(fh (1>jc' "i' " 3
 iad 'i *«iiiiill. i iluir U,|M-I, Seodi oblong i.
 0.3-D l 11*ni l"i>n, • red coat cells transversely elon-
 gated, aligned in vertical rows, appendages 2- • arising
 frotn thr imnrrnc ndul tniU, making tbr *rt*d look
 hact tontaD) * > > >

Annual QnDman Mid •
 in aeafeonjilty itiund>u. i pbi e*. nuinhv guusluut. wrt
 ruc > v MM{ «vi und ^1 H4>. Ir often gp
 but is IMN i mukiercti to f» ftoakwu Iln red coknu
 when ir dr%lop%. a very distinct- foi did ^K < Vt Inn
 not all plants Hu red.

1. i Hyp(IU>| ^....> V) la n U Lhrugh India
 to It.injllj<lc*n .mtt Slvjiutui *K4n. •Km * > > >
 •Iml. »Ncpna recrru record vp. A*. Rh. Hp. Kl. K.
 Mh. Mp. (>r. Ki. In. l>.\vi. O S O

Eriosema richardsonii i KVWHQ K Anioii n N, t*.
 kHahnan IA
 Like *E. latrolopat* l<«i b>gri and rln/.n.r.
 rhannu t1.3 tin |<.-g, 2.3 in m fhirk; Ir<vr< up <<
 2> <u long; »4<prt up to SA an l"ii^; iheaf* Up to
 8.5 tin loaf] iim>l(Mi<l bncU l A mm IOOgi MI
 *>io. long beyond thr IMiyta id (bfl Wctd wlim vtrwr
 from above; fl<ul Ni**fs t 22S mm ItMig- M
 obUmv: ^Iti|*!•!• i 0 +H nun Utn^, |MI> VI I^l

Probably perennial. In wt It.
 ill. I; |(..i..m. to SW tmttl «li<i KJ. KI.
 October-January. 9- H*tt in

Eriosema robustum Ruhlwd (*
 Iittett I m
 n wide it IMMT).
 inJN i. wji.Mhf jpm. Uv tip uitftjutilr <x uhtu*r
 Sespn irverat to many, stout, .WH*» (-S0) cm loaf.



The tip; pruU oblong-ovate-oblong, shortly
 bairv with or without a ... gland. Seeds
 oblong-ellipsoid ± 0.6 mm long. * ft * 5 mm ...
 rrft transversely rloagmIM. *%ned ...
 transverse radial mil. HoftgMed, *rur* << -n-l >> uined <'>
 the adjacent < > « of the t*mc vrrtk > l ... forming ...
 gitutlinaJ ptuitllct ril».

Annual or fierhap* toturtimrt prretmtal. In
 and aW ... po
 (102) Herb. Endemic in India: Ind. Col. KIKi Mh?
 In. November-March, 0-1500 m.

& i i ill . . . —J—MoMeM — Fig. 298
 like /l. pmnnfionm hut UIIITT; hc*d* t 1 <>>' in
 dtarn ... involucre) hr*ii* ± 2 itm l*mj; ni^U'
 wrpa) Uihrv »halt(n< vtilh olnuw lul. ... female petals
 0,75-1 mm to*m., glabruuu, without black gLinlv seeds
 oval-glob. ± 0.45 mm long
 Annual A rvr pbiii luu>><l along nur<n> A l km
 (10) Herb. Endemic tuWIndu #ind Mb

Fig. 299. *Eriocaulum n. kmdt* n\ tm* J. Iktwiui* pUnt l ...
 bv tmvhical b « 1 11 aim J C. flml bfict (1 m: ...
 <OJS mm) with wd eoM p*rtm (kmtth e, nufe ...
 {1 wtm) F. n*mt**» «-««MM l, kfifrjorra) bract (l ma);
 ^ flural hrwt M mmi, h, IMJT ll'jwri il mm» ...
 (0.25 mm) mi wtfh red «NM p*»>>rm (flower).

1 mm or B M « in duiwrr, gfebrou* or ipaiwl>' hiurv,
 6- to 9-rihbrd, ttunul; ibeAlh* U> »* ± 15 cm long,
 base, glabrous or tomrtimr* hairy, mouth very
 obtuse, acuminate. Hnd> gM>o*r of nr*rtv n,
 (-25) on in (iumctcr, K K *) wtthr. appranng rough
 down <h promifctnt lloi JI hmii; mrpbclr lUi to *un-
 rowK roKmuuv. with »Hon h*ir< l ...liter*! btmt%
 abnt it* IO «boviNr«bkmK the «MB <KM-« 2-S-3
 <-S oun km|(. rmndrd «i ittr tip. thr n>itrt ««w-
 scale l pti trlkwrnh-grrv <t JMC tvicnm, gUfartittf or
 with brown ... it* Katn it thr KMT, up l ... 2.5 mm long,
 ... shorter th ... n thr fhrnl bn U xnd lkwrrt Kkiiat
 btaru ... pair or dwfc
 the tip den*-ly ... «1 Mm MWK pwpUkwr twtn.
 Flowers ... Malr lUt<mr< tcp<k «|Mth4ikr *nd
 split down OIK- wlr, 11.75 mm laf^, iLui. l.rfrtr t «TK1
 2 equal, white ... plBatr i airy; -Mil triangular-
 ligulate, with white ... and a black
 glan ... i; uiibcrt bbrk. Female Hcnrvfv *rp<W 3, lf re,
 ... mm kmg, obaitretilate^oMiHi^A. OMMSM
 IMMth AM. often krllrtl nch with itrnw wbil ... hairs at

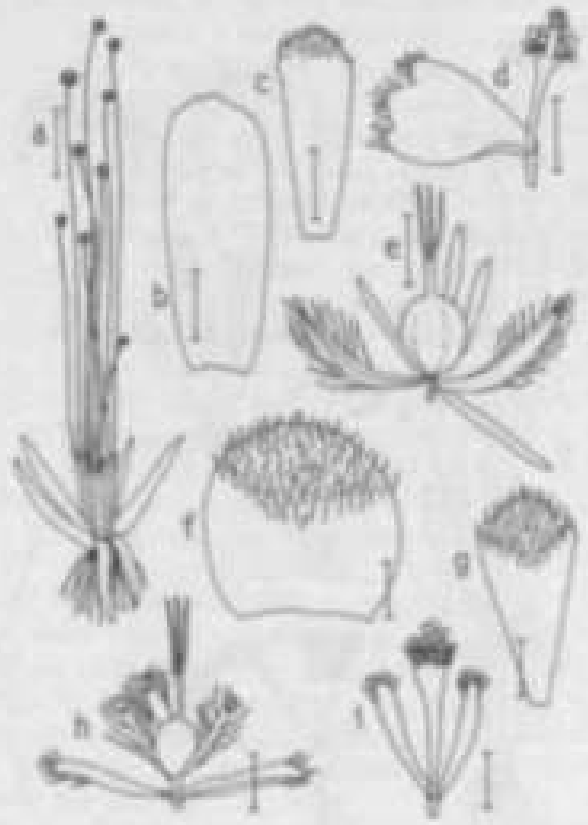


Fig. 298. *Eriocaulum n. kmdt* n\ tm* J. Iktwiui* pUnt l ...
 bract (0.5 mm); c, floral bract (0.5 mm); d,
 male flower (0.5 mm); e, female flower (0.5 mm); f, ...
 MtMvt i tt. * nm | ... g, floral bract (0.5 mm);
 h, female flower (0.5 mm); ... male flower (0.5 mm).



fir., fit. f *Eriocaulon rambianthum* A. Bornerling
 a, whole plant; b, seed; c, male flower (0.3 mm); d, female flower (0.3 mm); e, male flower (0.3 mm).

diameter, 5- to 8-ribbed, ...
 5 cm long, the mouth oblique, acute or acuminate.
 tlr ,K |,, ,|>:-fil' I ' ! IO conical, 6-10 mm i i > *xmr/vt,
 WFFI *A »lllIT'. MHIW' tiimrt pB MpmOUK intr|H->itr
 hjui> ImoliKr*/ bracu at *
 orb<< ill4i. t 2 mm lung. yellow in yellowish-grey or
 reddish-brown, glabrous, *hiuv. Ir^th* tl m
 margins, spreading a» wands in l-nti yUHsl
 bracts broadly concave, ...
 ndjur. i 15 mm tom
 slightly pubescent, ...
 >c"i *tih i * trtAtt^tibr pMch «• pwHiln^
 Flowers S-mrroia, Mfuttgh Ufrnlh; compffed.
 2-2.5 • nun long pajc. Male ttw
 untit l except in the tip, wedge h spid, 2.2 mm Uaof.
 indistinctly lobed, enclosing thr prt^K h
 upwards, a few white p| on (he
 margin; prt^i < t<><ig. glandular and white-papil-
 lowe >n M* I 1-maWr
 flowers Wpall 3. frer, lw>
 trfnb baalahaped. t l mm km«, Mx4Vn him.
 brotdfr «rinfed «* the hrri, narr^Mrd » abmuithm. a
 fo. wh.tr p«pilUr near «br Up. the (hkd vpal lon«iir-
 like >>> And tUi. |ru U ihrr*rt4il<-. 11 mm king, wth
 A bftMh ol trpUlR I srr 0.5-1 mm loo((lomrdt ihr
 glandular flut not >

gtobxHT. 0,5!^' 7 mm UmfL ttcd (Obt • clls transversely
 elongated. «tigned ln wrtkal torn; •pprrwlay
 ta> arising from ihr tr«t*rr«<T.MIUU t"». appear m*
 • vrrtiial lras on »hr ir«i wrfvrc. bmlr-iiLc m«lk
 al thr tip

Perennial m prrhapt wntctintn Jinuuaj S»ini|>
 p«r, Buunbr>, dang •UC*ITI». Her ftrWiv >>>u »
 amh wad. Co« HH«< l- at rarely lras. ,mn b.
 Amer lg the buhm l species of Eriocaulon *»»«< .•' l'»»»1*1
 lral U the rambiavkw of biliform form k prt«b • * * _111
 p k l hrutli UMI Thr prrrnmal habit Mr f
 features: l<chraltrw«¥dHif|6nunaiHi rhr u
 puchr* irf pnwrirn whllr b,«tr* on the tigluh
 ping ll«r>ll l facts are useful field cha nctrt*

HO) IM j l.ArUuvt* M M lJUJU. " * * !
 IVIMIIMJU. lralia, l .Itiniw wd SK AJ«4 HIM « .7> h|J!
 Ncp An. \, Co, k Kl, Mh. September to March
 0- ITS a.

Eriocaulon rambianthum R. Amari et N. P. Balakrishnan
 Kg. lift

membranous but imbricated bracts obtuse-
 canear vW) i utmuul cn»; ± 3 BD long - ± 2 mm
 «*•; rrcrput-lr h*in. mak
 tip; seeds ± 0.6 mm M
 lhaaibr >><d COMtelk

Amtu«L In RMM pUrt MKl wt ltuthr« oti
 ctwul plibnoTKcnliL fare but b*jUb *bunrf*n»
 |G lrrlfctrl lift) frtulrtfIM lnSHmln *li>| hi

Eriocaulon rambianthum Kienker Fig. 211

Tolled. t J-JW* oMong ltiKfotoe. up to IS**1 . " * *
 11 cm wklr, maiiT-nrrwd, giahritut, *tti
 the axes. Scapes few, yrndrt. u> 10 IP .
 ifunrh luivr initJMMii ill ribhrd. scarcely touch
 •hrAlh« up M» t n i m kmf. low. nbbnrw ur
 hairy, mouth oblique, acute. ...
 diameter, appearing spiny, yellowish-grey; receptacle
 uncid-cylindrical. i. h*ir*. IttswUittal bracts «...»"
 . t
 obovate. t 3 mm long, yellowish-grey, reflexed, acuminate.
 Flored ...
 •prraditif. wlKHruh vrry, glabrous
 outside, glabrous at pkptlkw muiUr
 flowers
 Scurous. Male flowers: sepals spathe-like and split
 down «nr tkW ± 1.5 urn long, t»< k, 3.4 ltr<1, with
 •CM «-«-tnmtMr lntm. vpanrh hurt itt
 tip; petals m m *, ghjlrnin, «ta» • W* g ^
 Milhrn Mark fcwlf IWwii Mpah V frrr. «M^ud»
 LMK«.UIT Utdt m i l lnd. ± 1.75 nwi long, yrndrt
 oblique, sparsely ...
 along the back; petals
 linear-spathe-like, ± 1.25 KM long IM«r*. ***** * black
 BBM i gland at the tip. Seeds oblong-ovoid to ...
 ± 0.65 mm long; seed coat cells transversely elongated,
 aligned in vertical rows; appendages h-l from the



FIG. 111. *Eriocaulon trilobum*. a. LU-rt.f.K pl*n< 4* (0.5 mm); b. involucij bnct (0.5 mm); c. fl. (0.5 mm); d. mile ll<r< * mm.

tntvrrr and »-t from the vtnkal radial walls, appearing in 1* in iriimri^ rings .." «' * <<>> rUI r of the i*rd*, brtaie-tike, tniocal* at il> dp Aruni.,1 t>n {be banl* «T ttrram* JIKI *! "n(! 0*r shores of Uir*. olm found in **< »*! y places. Characteristic lt that ihi involuteral bract ar acuminate and longer than the **tarn** the " *! resembles a '10M

[12 ii.] **Epd.....** to SW India I W : Kt, K.L. MI September-April, 6-1000 m.

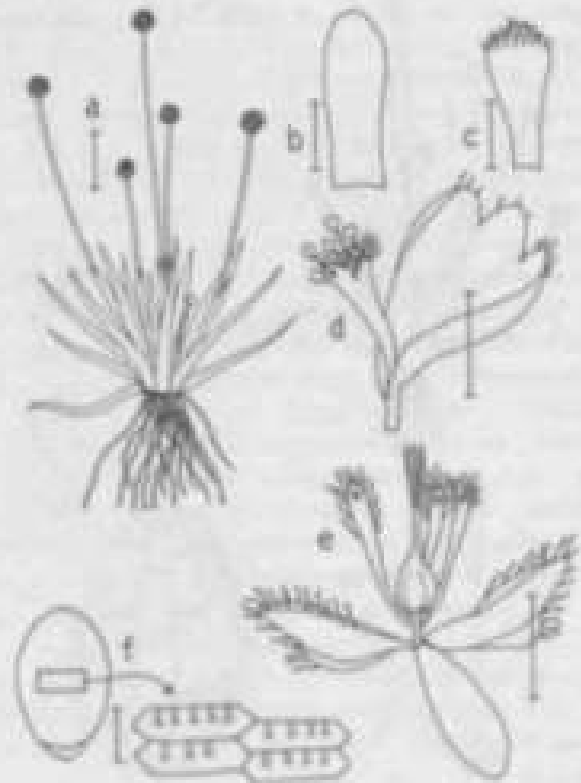
Eriocaulon trilobum F. Hamilton **tat Kfl** (1839) of the Botany of the HJ islands & mountains, 409, L72 (1839) has an illustration in « drtrripoonJh Wi« a i 2

Leaves caespitose. Lt|t|t| to **rkmpu** t, «muhir. towards

(-«>> mm WMir. gWwmi*. * to Iliwncd. IJT n< or **tdbottMC Son** few to many, 7-W im lon| [. glab. M. 5. or ^iMx.l. t>.*tr.l. ihc -H., km*. »• 1.0 cm long, with a Mlqiir mouth. Head* nkil..« IB ^ph< rad. 3-6 mm n iiuifirtri. **bled** to dark grey (receptac), v.,1. thoti hain Inwhitfil N*fi» > **Mk oi ctmc** 1.5-S (-3.3) long, 0.5-1.5 mm

wide. wlvvt-nh s<i-v, **ibe** «|* "liuw, gbbrtuu and thinng. ,ii &<< **ndiidng** beyond the **bctd** becoming reflexed in Iruil. Flora *n J< U I HM **at< r< Will**, 1,25-2 mm long **umtabnnmm**, **htm** kUt« obtwc <i *ulv acur but, nrvr acuintiur. hairy at On- Apex **Fli** 3-merous. **Mik** rinMcrv trjuU unitrii brlttw .nut spathe-lkr, 1-1.5 (-31 mm **Ut>v**, die lobd V obtUHg petals i.....be; !'»>ilii i% I.I^ik Kruulr ftiiwrn: ftrpals S. t rniLil. <il>Uiii i xljir. **bii4l-*Vijj>rtt**, 1-1.*> (-5) mm kong, tafh luiiv ai itn JJH X, (M-IJU 3 free. Tiiirrowty »M< hulaic, 1-1 25 mm k>iif(, **ipkaQf** hair> lobct, rach with ;i 1>H k **tpkal** gland. **Scddi** b l l t i k L tO.4fiii" I00g] **M** d< caa' **Cdh** transversely elongated, ;tlj4iic<l in vritn.il mw>; apprnda^r< S-6 from (he transverse radial wall appearing to IM HI trmnavcTM ring* an ihr »iirfjuc IJI ihr seeds, **brteilc4&i** minutely (Lnvriirdat (hr tip,

AmiUliJ. **W'rK** pbir». jat|<uUrv in rice fields, sptumtng after ihr **hxrna**. **Vik-f** k< /^ pentagonular but not itnmn rrd, **W*fl** (Uik ((irv, unnlrr < 5 5 mm in ill,inn i. i i .tinl irimlik p, bntU l<fiMiiiiij rrllexrd .ii iiMiurits lt diflrn from £ **kHrrvirfm** in lt being from U- **Kptla** 'spal. n dififrnr rron £. orf«om< in having **Bade** prtal*«qu<l and rrcptacic ± g U



FK., XIX. *Amnte tnikmi* t, H.*riW| plan* d (0.5 mm); b. involucij bnct (0.5 mm); c. fl. (0.5 mm); d. e. seed (0.17 mm) with seed coat process (base).

© Tre (Ran. Ptotobi) endemic to the Inriui sub-
confrifirt Baff? tod, Fak; Hp? Ri w, Mn \fh M,,. I Dr,
Kj I p, Wb, Oclober-ffbruarv 0-80G m.

gritMHJM >n<inwtrm ¥ lamilita n r* Martim [E. tmiva-
htm iijr. JIU^4/IM twin, / fru me/wim «tf. **4erfi*u-
J.D II,,.I.i |) | 813

DAMJ | i, n n lint ar to lutirMLifr, 1-6 cm long,
I.V-T8mni wide. gUhrnui, rather IHIMII JI ihr bur,
10- to IIMwprd, «ih* uk* and apkulalr, <hinij I** I at
maturity mri|xMr the <ritual hunch of «apr sheaths.
Scapes few or many <*-* M. MOM. VI 5 (^) cm long.
0.4-0.8 mm in duinrirr. V lo Ruhhrd. nvMed: ihr A
loow. up to 4.3 an long. ihtwicr than ibr leaves,
ublkjucK ifuIn^Ubt «t ()«« mouth, nfirm aplUItg and
hrromtng 2-Wx-rf He*d* ruff^haprd ^ . flatter rH-
mm in diameter xMMening whiir
v. rmpitarir I KMC IO alntOM
Involucral bract* an wwlr w ihr hr«t *I or brfrrr
antheris >>>ivrtim<> %uihr **brn vic«MJ frtim above,
broadly rittot-atr or obtotig, Z-3 mm famf[, truncMr or
with M *rhUMchr triangulw lip. pair yellowishgrey,
shiny. «Ubrou« and glibicninx. jpmrfing up* seeds in
fruit, floral brjcti clmrhr ovriUpping and rin

chr fla*n% r>Uong-oviW to «naihuUir. I W-I 5 mm
long. mtttbranou*. |Uhnim or papitlov M tht
torioin 4uxt «hin> fUmrn 15-1 6 mm lon*, nak
frnok inirtmncfrtt. »ak IUmriv Nipr (1.25-07 mm
king: Irpak 2, 6bkm\$. 1 I.» mm long. Rivv. «bt
irrii.irfl tin tmf «kU- M ihr b»««; prok
3, very small, with
white papilbr. «u h m Mark, Ferrule iUmrtr^
sepal 2
(3), free, linear-ovate, 1.5-2.5 mm kwif. ptuk', nat-
rally oblanceolate, l.»-13 mm long, thinh
to ilmoM gbhmui ! seeds Iomig t
ovoid, 0.35-0.5
(-4)7 mm long «r. I coat cells radiating
it^ular, vertically
elongated, aligned in vertical rows; a
,^rtKta« in the
form <A
ribbon-like bands from the vert. : walls and
solitary inco- ip lew h*IMh frncn UH-
walk, ihr »crlx M « 1 * r appearing
coarsely reticulate
tnth tnghtHlinij MI

Annual. Irrigated places, m*nhUiid. wet rocks,
common in rice fields. It is easily recognizable |
p>U'' shiny ig Knria on rrL
thickly stout scapes; bracts
scarious and co- iptrtrh
enclosing the flowers; seeds
with lotiifiurfinaJ *hrtr n>
ribbon-like bands, with the
Uw>nn rhan
© Tre (Ran.) HH]. S *ml SE Aiu Ran. Rhu,
Cry. Ind. An. Ap. As. Co. KJ. KJ. Mg. MI* Mil, Mi
Tn.v /h. July-January, 0-1250 m.



FIG. 213. Eriosema trichotomum: a, flowering plant (1 cm);
b, involucre bract (0.5 mm); c, floral bract (0.5 mm);
d, male flower (0.5 mm); e, female flower (0.5 mm); f, seed
(0.2 mm).

Eriosema trichotomum I | * HtMtkrr | t ft
1 | 1. (Hooker) Presl [refer to Fig. 209]
Like E. -wiNfMUJru^n but Ltiki Ihr red colour;
lew
thicker and narrower | -£ mm
wide; reciprocal
densely woolly-hairy; petals with woolly hairs; seeds
Mm
Attinul. Locally abundant; on damp sand and in rice
kU.
(O llrl) tixfrm* U> ihr kmfand* ^ St i I..M * Crv.

Eriosema wightianum Martens refer to Fig. 201
Like E. hujeri but larger and rhizomatous; the
rhizome uflrn
thick ft as a slimfa lcavri H-I''
on long, S-J*. mm WMIT. >lmhil» h>>i. V J | H
a few of
iiuii'. Ih
30 cm long; heads ± 1.75 cm in "li-n
.(.)K jrni; ;,i,n< >i ,',, | J | , | ' . i | ntm t'Xlft
floral
bracts ± 4 mm | <T1. *OO* »iMr. »hf
outer ones nearly
gbhr<nM, Irmak
petals elliptic-
obovate; seeds ellip-
soid, ± 0.5 mm. W*. MCKKtch. minuu-h papdtpK
[Her] Endemic to Myanmar MR *nur

Eriosema wightianum Mallesher (E. longipes
Set* rm Kumh tnm fUlinr<|ii; E. elongatum
longipes (Rend.) | | i M..4ri.mMning.'U 214
Rhizome short and lough PT abvttt ! * « « « broadly
htwai io UII. r-lanceolate, 1-Kt *D long, 3.5-7 ("««
wldr (up to ±15) ,m al U*«««. [mjw-fA. subscru-
Scapes 8-15 per raceme, 1%W im a* more long.



Fig. -114. *Eriocaulum siliaceum*: a, flowering plant (2 cm); b, seed (1.5 mm); c, involucre (1 mm); d, floral bract (1 mm); e, magnified involucre (1 mm); f, magnified flower (1 mm); g, seed (0.25 mm) with papillae (1 mm); h, leaf (1.5 mm) with papillae (1 mm).

0.6-1 mm in diamnrr, V .w li-iibl«*l. wrtmjjhf Wi
 »He<h» up lo ± 20 «n Ui*. the iimuth oblique. M
 VKaalaMt HiimuwMpfifrtnl ".....*.. " m m
 •it 'tumeiri, dfM lit alutr. MMitelimo pwurirtivipj-
 i*niy tnrpUt le gUhrntw. bwolturf btaclt »* *W- u
 (hr head, olNnjir to tubicular, ± t mm k«p(. jrrikm IO
 yelkndih-xft twh-bhjwn. giahnmt, thim. !
 rrv
 p
 long, (rtUKfv, t%(ti)y owt% pit«. mil. v.^1 andench»
 "«< tlr (lowrt*. *hi|r <w prr with * * triMffuLiW |.
 mtlrrv whiir h^tn. FVmrr> f m em ui, MJ on>|> UJ-
 rwwd. t2mm Urn*. p*lr. (m>lh frnialr.
 *rpal> rijfxjiw. un>frd miqM »\ ihr lip,
 »«t*irHih*prd. 1 1 75 turn hwig. u,<ir<itH(h lobclr.
 ' firuk, 2, brviHlk wtt^cd upw* <iv m In*
 hitr papillae on »hr tippn MmK m^ixin: petal 2.
 m U«*. Rlwwlulw «nd Kiiitr papilhitr: anthen
 •r brown. Female Acwrn tubtHhkubr: 1
 ?. ftrr; boM-tfi«pn1, t 1.78 mm ktffft. hfi
 lie krel. «Ut .-rtah^rtluw; pruk /I. li>
 H| If^ .in. wnti a bunch of bain abotM
 h w i i a l l p*piU-JJ*:r haK^t tli/ r,, Vrd*

< Itij seed, 0.6-0.7 inni long, Q.4A-4.5 mm wide; KTC!
 roui irNs iit4ti>vri*rI\ *(ni^au<l. ali((ned In witn.ii
 rmn; ^IpeiNtaga vihui-v, .UIMH^ from thr H J H W W
 IA<WA\ WJMV jp{>rurlng M vertical Unef on the «ccd
 Htrfsur.bf-imk^like, rtoillrii JI the lip.

fVrrmii.il QI MÜtaDL in Mrav>oaJh mtimU(«(pfjte*.
 •WBpl .iml IV WHIM Wing w*|fT- I(n fromeimrt *mi-
 huctl will) / vxmnguir, the best dugnuuk IraUnr* are
 thr SNocraW (tffi*.rti .mil frnule |>rtal* Li Ung 'In H |
 minaJ in of hairs; leaf I nomiwr (3.S-7 mtu widr):
 H-jpei more slrader (0.6-1 mm in rfumtrM: hi
 unaltrr (4-6 mm Hidr • !• m Je wyuU Ttmniirtl. vuilnmt
 j <(twrrt bate .mil uili • pronounced recurved rip;
 icm.ilr pralv r<|Lij]]in]; (hr vJMW. wiinrwhai bXMCkl
 (linrar at npj^nrir to RUform) ind iwkkii^ (hr i4riiini.il
 hnwlt HI long h.nrv wedi kwgi • md nsno wrr (• Ilip-
 ioid.0.t>-n 7 miri kng>0.4ft-0J mm wide).

(C) Hyp tfd M^aga-wai. M.uinmu. Si i Lanka,
 Andaman and Nkntui [ilanrtv KIHHA, SI \<LI and
 Indonesia (lacking trcta Peolnwdu butts): Bui. Gey.
 tuft. AJI.

Eriocaulum siliaceum Martini [K. pygmaeum Dalzell
 DonSotattder]:!

Tufiel I' net kffwa or linear-lanceolate, rarely
 miri• dun I im IO«K; ± 5 mm «rulk, liar, glabrous
 attenuate «<Mard» an «m or acuminate lip. Scapes
 nuinv IM feW, (Jlrly n un lluii tt rm l*ini(4-7 mm in
 dbmrlcr. 5- in 7-iiMx-*.l. gl,\IKiii: thmth* *x. up to
 3 «> k>|n. *ulr iir MUXK LfTfMiiMr, llrw U heimt]:*!
 cal to ll.«rtnr<t. t l> mm in ilumriri, vrlli>tti«ki-
 receptacle • iin«. glahroiu. Involik IJII hr^u hm H-
 <44oii>i ta <ti>Untnl»w. S-3/i mm km g, 0.25-0.75 mtu
 wid». Of t(j«e*dijif(, HUM 11 Um^ort than the llural
 bract and lImn-n, ur<i>Ht>l<i>ir •! c .Intent whiir,
 glabrous, iJten th>tfwin|t bot>nd ibe nui^m of tin
 bead wWn virwd from .ittow. aumiiuir M<n.il
 l«*n auCHC, ± 1 l% mm 1*-MK, nMrmbnutMi*, trtin-
 can, bvafine, the lip* papilkMe hair*. Flowers
 Vroettuw. MiJr tUrmrt* w-pwUi uniird brhny. spathe
 like md fplii d<|wn IMM- tidr. i mirMr. ± I mm >•
 htiH'k. Vlobed. the Jib>he« trumjir. the dpi paptilOM
 hain: pciab vrry mull, »«h white }M>ill^r aird a bbrk
 • I gUnd; amhrn blaca. Female ffcicwn «rpab ffw,
 ± 1 nun k*tg tJark, 2 lairra! twe* uhtaiwralair. vrJb>w-
 wK-nrcT i^h<u«r. *»nh white bain JI (he tip, ih. third
 linear, j{!>lwthi* »» tHh -i f«u *shitr h*n% «i th<
 peuU vpitihubte. 0 75-1 mm ITKIR, In-line. hjiry ai
 ihr tip. mtti bbw-k ulandt. Herd* obbrtig-elKp*
 t 0AI mm kng; iecd nut i rll* tim m mtv rU^fxnir.
 aligned In vertical r»m*; appendagr* X-4 hunt the
 radial walk, thortef than ihc >eed roadrelh.

It, brbclr likr, trtimatr at tile up



Pic 111. *tjtmmtdm* w n l h w : *M. fkmrtna*; plant 11 cm); h. hrad <l mi), c, ft**l* brari <l awnl: *c*, involucral bract <0 S B**>*; t, c, m**r* (lower 11 mm). & *MwmMM* *c*, involucral bract (1 •wo); g. ftml brm 0 ami); h. uni: flower (1 mm).

AnmuJ. In tiuff inn, poult on Uwrffc. rke Add**sad* other waaoiulh/ inuntlitrd place* abo fcnuui in it« » wki» be t»ctn wt r<*U: loralh *bund**ni* li is easily fKogniiabk bt it* tinning j**k rrlkw n» Mtiur flower-like he jiU t he head* «rr HifH tit* ulK hltr nw nect uf /: *bracts* has a ha« t *bract* b» tuundrd and noi cuspidate and with rounded c. *bracts* and male w al lobes.

10 *1* •••k... / HdJ TiTjp*r* Africa < Ihnulnwand Indu: B*n Bui, Ind. Nep An. At. 5hr Co, W, Ki. M». Mh. Mn. Mp. 1 n, Hh juK-Dn rmbrt. (>-7W m

EUPHORBIACEAE [BINCHOF IACKA1] excluded see p. 12

FABACEAE || *LEGUMI* SOS.UI 657 genera

Hest•v rinbi «n iirr* Lr«m MipuLur. «Jirn«tr. uHM0y compound. FVmrri uaulh blnual, «ubur» or In mnnn. vpak 5 fne or uatwd fn«k *», usually free and unequal. Stamens 10 or indefinite; filaments free • i imtr«l « K-VY •uprriot. mJkmy, with I or man <*««<. Fruit a | t-«d. ekfcer ^ritekig or separating into l-trrdnl pint**

\ ^rry Uinr And v *desp*td BMI% with relatively Ir* *; *otic* and wrland spec<• ttu»chinK») I !>•• Htnn^ oi newcilm pknⁱ (Oxford University Press) l:Xn-516(IW4);11 *in following work. despite its title, is on own* than a line Sanjappa, M. Legumes of India. B» *lers* Singh Mahesit4 l>| sn^ti. Dehra Dun J-10, 1-338 11<>»] i

F.wiiMkii the ftJViilin .ur weedy pta«i *UUI* for UHI In pwml utiuiMHii h«ii ih n arc not *consider* cu hr wrland aprt kc Af»wm^w *humus* Edgworth. A. ifi—fci (UnnariMj A r •• C *i h !*^o. *Cassia* *l* •HLUHV tkiaw^Hiw /ni t^i«U«* U JMK h C3 Thwl ID. nt/nvmt Wt^ht n \iu<t<|: *D, fcum^M*^{11*} (WBU *nos*) A. P. de *Cas* i i. ^' hi^* — A, F. d* *Candolle* . *D. tn/hrmm* [Uaxm *us*] A. P. de *Mi«b»H«* • *Indigofera* *iiim/iln* II-*gus* ex Roth; *Sesbania* *legumin* *A. arbores*

i. *Le I'm -i* putiMlc. floMn iMlultv wrometrit »» *lower* flowers of *ind* » *science* *fruit* L. Leaves 1-pinnate; flowers bilateral; % «n»metrical, *all* *tertile*

- 1 Leaves with a pain of km!***; bracts the pads *Crotalaria*
- 1. I rAV% with nuni mmr ihati I pain of *bracts* bracts not <• wrlaly the p*U
- 9. Podfl breaking into reguUrh*«haped *1-seeded* portion* *Aeschynomene*
- S, Futtu kmajitudin ally dclur ^ n t n o i *breaking into* pOfthKtft *Sesbania*

Aeschynomene IVPipr *leg* warm regions *St*•uh» or herfaa. Sm»» erect, *crisp* p**t «* *floating* nttciiH*¹t <ijirn *molten* when subm ed or floating *Leaves* •hrtturtr, odit-pmiuu- with *some* unit k»« *Klfmf«** imuJh ptnmu *at*, *inflorescence* racemose, axillary or *terminal*, simple or branched. Flowers *2-5* (u), btUimlh Hinmrtm JI ^» *pale* tubular, *either* 3-lobed ur JMipt *red*. Petals yellow *w. ol* streaks; lateral petal orbicular; lateral petals obliquely *obovate* or oblonf: krri rUhri obww< and slightly cttvrtd of ntfatf nartuw and milch imo-*ved*. *Stamens* 10. u u M brkni, *xmuSh* In t btu*dk» • of 5 or *early* * WiHcd «td *1* free. Onn UHwih Mil *red*, *2* in *mam* mdr*. mlr hltiNm. iwuiwl Pod u *unusually* *separate* between seeds; *joint* 1-seeded, *septa* 10-lobulate.

Free-floating, partly *free* *usually* submerged. The Hrim ur often pulu *and* *molten*. Flowers *enumpblloim*. The ttt**r*«ninulr. aie W» *r* fi« *11* *one-seeded* p«U *J 4 pud. dafirrwrfb b> « « J *and* perhaps aIn by other *means*. *said* for the *publike* MM IN I.VI 11, *decorations*. *W* m

manur and fang* 9*fHtM*i H I Anachromenaceae (Bcmh.) Hutch. (IjrKiiminmiir) in Aauratu. Austro* bail. 177-aWd¹...

I. IOafleg with 2 »K morr necvw, lomcwhai bem. «itb Mn tm.il oblique tip*; JK«1 bofM 00 • * J long W*JIL; d«nvif |»«IK i.(i(ir jntf void JU

1- I r.iil, -ii hrtil 1 rinvc M right with symmetrically obtUK (i)M b o m on * 4-20 luni *»\$C #caJi.«l'H-J ; »» itn jMK) with atmexMli nun Kin

t. Hi.v. IN HUB long; s,-.ii« intpi r. B long; pcid faJlfug ^| J -) 3-i |-7) joini*. each l«M!> mm long u«uaU>; MUXM! (Uppril NtUOT or the |HMI irutriti il H mn. h H DM' .ttuyul. ttMfJl OH RWM«|}O«I

Z. FIQI... usually less than 1 in linn loag; sepals glabrous. t-i, nun lonjj; pod Ulling *P^' "i (S-) 5-10 K-\'\$) itMhiv eadi V6 m»i long; fedudal (uppi 11 Miniu »i tbr [M«d mrigbi, —mirti m papfl UMW i>fi trif !J«C» above iHe »r*r*f*; utoiu tlrnrfer or thick 4fni iMiti.u inii r JI. K *)«.on\ ami ten only at the Uuc

Sepal* bairy, 2-fnbed a/mcul lo the base. ...li 6-B {-1.01 mm long. iVuli psrtl) hairy, yellow; abaxial peuJ (tbovitr, 10-IS mm k«iK- 14—17 mm wiflr. wiih i 1-2 mm U*i% cfaw, ihr itppri itLjj^in Ifincilmni iHirh(.1; tataraj petaU 8-1'J i-lin mm kmg. t \$ mm I; ki-r! 14-^0 mm t«xi^ 1^fj mm br>ttl. SCUBCM in -' bundles of 5, 15-20 mm long. Pods borne of (!»> ^' mm bag stalks, strap-shaped, 4-fi < in Um\, 1-H ttim wiitr. ttir u<Uv,ii (upper) Mdin «> tbc pod indented 4* much a* (Jir 4hx\ul, jo*^f< on (hr i abow ilie »rrtU; falling ipaut in (1-> Vft <-T) about qnodimgvLM i nceded i'iiii%, i-jfh U^IA HUM 7. -t j. . . w«ic. Senli kiilurv->)tAiK««l. ± 7 mm long. 4-5 mm wide. ± 1 ! HUM (hick, bit*k, glow

IViriinial. Lrnwtm; in JIKI itlonff laiiki and lake*. The pilh-likr «ci (.mljii xvl*-m i* rmpluyril fan thr making ol HMh varied iicn»» ** uiihujil (hmrc*, toy*, sutives, liilrlvli* VM! rarhon Tor tfunjMiwdi i h k also cultivated for decoration, grren matiirc and longe>

|IW/Trn/H*p1. Warm and tropiriil A*u. OJHani in Aiviri,ilu: Kui, Him. iur.Cty tod. Hep, Pak: \>, Hli. in |i ki ki.Mii.Mp. tii.st. in. t'ji. wii <i- 1300n)

Anachromenaceae americana Literature: Fig. 2

Like A. indica (MM irjJlru MMnovriit i iirvrd, asymmetrically obliq at the tip, with 2 or more pod borne on .. • L..... long stalk; dorsal part of the pod with a i til margin; |oina (5 5-7, vnu • it bit utar. Eremial. Scum... or none |tl»m; it CU tn*»i temporal) found HI %*!-lands.

(Heli. Panotropia, native in S V America (Cry) .And «An, «Bb, «Cl, «Cn, «M).

Anachromenaceae aspera l.nw Literature: Fig. 16

Stems rivet jorl tifi en 2 m uH or trailing and ling, In«mer «Ww... mtur ul) i»'>< m in diameter. Stipiilr* njtfrowf) omiir, 8-19 mm long* 13-3 mm *»f* cfr, ihfl ntltfh) "'!•*" as ibid* priiriurrd brluw thir point nf Ufrtrtkxi to a •pltr; loner put 1 b RUB klrtg, • - mm wide, uvtulh nun lird or luoihrd. Jj-J*r* fiwriK pctioJaii *»-22 tin long, ending hi * mtnutr nipf. Ur*fJr(t in (10-) VMU>pain,Unrar<itaun«>-I' (-16) «m IIMIK. thokr near the hue and apex ihunei ilun ih«*r In thr centre, 1.5-3 .i.in w*tr. with I nw'ilwn. twiaQy Itlack wtn, ihr Ifuw 4tvnn 'itmiw. the H* Mil>#uir Inn nutuitrly mucranatr. Fkiwtrn 1-4, 12-18 MM long. Pod.... (1.5- | 1-3 1-5) <m lo«g, h»i'': h> d... 2-5 mm 1>ng. 1.5-1.1 mil''. HKII Ol Nfchottl hairs, ihr hjui ^Tlhnrriih. H*««H rk 1-5 mm *»»»). I airy: br4rte«1e* iwtir, 4-5 mm IIMIK, t 2 mm wi<lf. hairy.



Fig. 16. Anachromenaceae americana: * fowl lr«llru (> mm), b,OOi(1 cm), c, one halter (1 mill), it. I^IW: d, <Umr«mK... C. onr Irillrl (2 mm). 1. Hum* (4 mm).

Arachysochloa indica Linnui-in [Swartzia *aperta* Roxburgh. Fl. Ind. *nA^mh* Roxburgh]: Fig. H6

mi CfvCt, "(irn somewhat wnodv JI ihr luw. branched. 30-250 an ull: main atrm eptndrfeal and warn at the b*«\ thr wu beating cadurautgbmiulu hair - rareb; "po^irr *** ^ o o h **thr narrow twatr or cUtpkal, VIK mm long, 1-3.5 nun wide, acm untie, pttiducrd below ihev point.* inarrtiun, loMer part usually notched or toothed. Lcawn ptttoUir; pelbotr*0.S-2 on long-, raclwt 4-14 cm k>ng, ending in a minuir **ipc: leafteia glabrous, in (4-> 8 (0 (-45) pain, ttnrar-ohlofig. 2-10 (-13) mm long, 1-U <-4) mm vkto. Nfek l median vrin, the bate awymmriiAJh obtuse, the tip obtuar but mmutr nun RMMM tl<iwiti 1-4 1-6) (prdumk often bean * leaf wiih another raceme in ihr aaii), 7-9 mm king. i'nitiim Ir* 3-fl cm long,, bearing Biini>«>rv base t«>,r 1.5-4, subulate or •Efraar. arute; pr<i 1.5-6 1bi it k>O|; hrjKirolr* U< nodul-crete to oblong, 2-4 mm long, tub nire or serrate ~p*U glai IMobeti alun-t m ibe haar. r*rh 4-6 mm In g. Petals glabrous, yellow with unmgc Hu<h, nflrn wiih purple streak; 1 » M 1 prul nbonmte,6.V I" inui k>fin- 4-7 mm Wide, »i'l> l l ' MB l'Mj(l l A , ihr uppei nuigin tMtnrln. ur; Ulrr.it prtah *n<l l subequal, 7-9 mm kmg. 2-3 mm mde. Stamrm in 2 bin of b, 6*4 mm king. Pod* htirne on 4-11 mm lon*: stalk, strapsh. [*d, (1.2 -) i.b-S tm king, 3-4 mm wklr, flattened. the artaxial (upper) future ef ihr pod tIntght. tmntxh (ir papillmr cm ibr lmn ahnr ihr lerda. ihr jbxial witiur irrnaie, falling apart in (5-) 6-10 (-13) almoM quadrangular, l-aredrdjotntft. each 3-a mm long. Sred. ublong L«lno «haprd. 5-4 <> hong, f-5 mm wide, dart brown in blar t. κ WJM

Perenn 4l oc * usual. In wi pUcr*. akmg ditches, around pt»k in irrigated ftrbk UKI vaMe pi* . It makes >a good gtem manurr «4>d used as for birr hut it can hri omt A inuklrwmcMrH. . . .tg

IC • Hel i m/Hyp| Pantraf>fck.pрутMfatrfuifecfo MitUhrMirtn N An fV*n. * EUiu. lhn <Gy. <Ind, <N P. ifc <An. <A> <Bh. <Dl. <Gj. <Go. <Jk. <Kl. <Kt. II. <Mh. <Mp. <Pj. <Rj. <Sk. <Tn. <Tp. <Uj. <Wb. 0-1000 m.

Geisophia 2 or 3 species, tropical Asia

Roots woody and spongy when submerged. Stems diffuse, creeping or floating, teretes when pithy and swollen when submerged or floating. Leaves strongly emarginate, with 2 pairs of leafless leaflets obovate, without stipels; stipules membranous, petiole prtldwrd below the insertion. Inflorescences long prrhmrtdf. axillary, simple. Flowers bisexual, bilaterally symmetrical, bracts large, obliquely reniform, •in' ricate. (trrtMrm. more fir lrw CIMUrating the

flowerrr* and Inni- bracieole* abwtit. Srpol tube deeply 24ipprd, the adanal (upf»n i lip entire, ihr *ha**taM*P uhM-wrH 3-UMMhcd. Prvlt TrU«>- W » V f>r »at, hmgrf than die •rpak; adjuUI prul tuvoibx abcM de clurd; lairral petak oblong or obo*n<" or oblong, krd incurved, obtupr, a htllr ihnttri than the abaxial petal. Se •mrm ltJ, uiitrccl. the upper third free; others JI Jiir (K.,v ihonh .iJked; <i«il« 2 style incurved; stigma mirror. Pod of 1 or 2, 1-seeded joint, irv jtHnii wnllrn with * fjl i <<ilrr. ittd< hircm.

An iu»l or perennial FTowei custom tophlkw* or perhaps aetogen wt. Thr disseminales .«• fUitn-parUofa ; ad. pibabJy diaprno* by water. •urface IUILLMI with jutuaak or in mud.

l. M* t m g g bracia many for * , siffc, brown hairs G. cristata
podi thnrtrr (ban lv< bracia
1. ftu. i HHMfilH nun lonalr-detiUir. »HIK»» hairs
pod* WHIKTI I lean the bracia R. lamella

Geisophia cristata Wigh i el Arnott: Fig. 217

Stipules lanrroLatr. kmg^fMMrrd. »»li U>Wg hairs, persistent. Leaflet* RMMK K- 1S mm l>HIH lifw on abax- ular. ihr haan hmg.< agitate, ihr margin* bearing mam long, *iuT brtmn halt*. Ffciiwen t '> 'nT11 long.



FIG. 217. *Geisophia cristata*: A, flowering plant (1 cm); B, leafing shoot (5 mm); C, flowering shoot (5 mm).

very yellow to orange; frd or puipk. fc* WWW than the brno*

Anmul c* Hirciijim prirunwl *n prrmaiwmK
, iJU found in and aroiiitfl tem{MfW} |"
kb it -'<it«i «<"** <" ****11 <IW w*trt
i in deep *»4i< wh^r " |i|rw|»p»
piiby item* CAimmtm wtlI often to

(C) Hel/Ephl, Indochina, Malay Peninsula
Burma and India: Bur. Cr. 1ml. Nep. -AnM-.i^KJ.
Kz, Mh. in Wh. 9-1999 m.

Grasshopper beetle Brnttwfli [G. ***** W. malabarica
Stuart et Babu] Fig. 217

Stiputrt
oblanesolate, shortly spurred, with spiny
hairs, deciduous. Leaflets mostly 5-8 mm long,
ovate, the bases shortly sagittate, the margins
riiHUHHlrnMtr Flowers 3-10 mm long, as long or
longer than the bt**H Jt
anthesis. Petals yellow or
maroon. Pod ItUio^ii Ihw live

Annu*t t* »mTh-imif i
pl»f» t'miful in w
pnrar) jwni% *|vl fkf fields. Common And oflrn
kxaj: abundant. I. I. f. cristata bul smaller and more
driluii'iinl (rrifttt
Indemic. Ind: Kz, Kz.

Oaobrr-famun tl IOOHW

Nephtia II species (mmn MM) unpfcil r

Sic 11 ii pfcMinii, ascending or floating, terete or
occasionally angled when young, simple 01 sparsely
branched, internodes swollen and puber when in water.
Leaves alternate, spinose and usually sensitive; stip-
ules |wtvm tnit
Inflourenca s' eduncular head. Flower: radially
vnrniruf M it. dtr*. sepals, the upper r
ma
nodes.

Sepals campanulate, small, 5-6
Tbm. Pn*U 3L «ML n
-0 or ft; tuwlendr* W. prukwl. |+||*** fn
I increased ourftiMih (khhccim pod. tnluIW ft
several compressed seeds.

Flowering of rmrrgrt". some timn locally dominant.
Pollinated by insects. 1
seeds, dispersal unknown. prrlup br ••n
to animals. Wiedler, D. R. A " »».....' r(l
N. sess. Australian Journal 379-429

(19M

Excluded: Nephtia schoufensis (Sprungr)
Miquel; Bur. N. tripartita (Vahl) Bentham; Ind:
sometimes found in moist places but not wetland
plants.

1. Stems rarely branched, usually floating; k p
IW ln*. ifijudU-i*: koiirtJi H-1M |un»; pod* up to Ljl cm
toii{|. HMili 4- l <> N, fdnuH
l. Sicut* frtrlf twj«v hrd, miuilty ere*t or
tertettria) or emergfrfU] pair of pmnar: Irjit*-l*
9-40 pairs; pods "> tm 0 cm long; seeds & 20 N *

Nephtia alonata Leavins [Alonata sativa (L.) i. liml.
non limij*tui lil. V
ng-il*

Stems horizontal, hardly branched, with
nodes, developing white, spongy
in water,
rooting at nodes. Petals ((andless «ipulc* <
ovate-cordate, thin, [*«-t*
5-8 mm kaoa Finnae
2-6, 1-B cm kOff. l^Jiilrli tr^Hr. S-H t-W> pair*,
narrowly oblong 3-18 mm Utag. l-5"> BCD
dt
mi liifl«. ncmrr tu-Jiii •*) • rtm. 4i to 2.5 i in Lot*
and ofl cm wide tkmttt obmic. mpnaokl t 2 mm
long, 2 * mm ***.' Jw-p* 1 1 TM kji*n IVUN



FIG. 218. Nephtia alonata. a. fenrrM(teal i*4 floating
head (about 12 cm); b. stem with leaves; c. flower
of rachis «4 h« fur* id pmitw >J «*B^* *i«ll gland (width
6, pods (1 cm).

± 12 mm long Skaminodei ♂ the sterile M<wers strap-ittaped, t 10 mm tTMK- P<xi Hat, up t = 2.5 c D Um%.
are • N 4 - 1 0 , • te to elliptic **iliimii** long.

Annual ♂ | perennial. Freely floating on the surface of* water, often forming floating mats with other plants. When [hr « tier recedes it may persist a while as a l and phmt; **die** rtjnted land plants have **MMMWO&d Item** as **I mlci** leaves: **tnd** Rowers. VOIJ shoots are ex. ' ^ N as **i jx>t herb it is UMSd loCfcB** in turtle line to cure ear-**atfce** and s\pht!

(10) >1: Hyp Panirop ex: Ilin, Bur, Cey, Ind: Ak, Bh. •-; Go, Kl, Mb. Mp. 1'l.R), in. lp, lp, WV.

Srptuma plena Bernham [*Alimosa ndmantkra* Kt>x* surh] Fig. 218

like AC **iimMfl** but stems much h» anched, erect or **Mcending**, wn rarch pix<*tralf, up to 2 m tall: **ptni** 4-10. rachts with a sessile glawi bctom tb* low pair of pinnae; leaflets 9-10 pairs, 4-18 mm long, 1.5-3 mil **wide**; (><xi* tip to 6 fin **king**; x*c<i 5-20.

Potential ... a wetlands but tolerates considerable flooding and even develops spongy tissue on the stems **vhrrn in MM**.

(1Plc)/Hcl). Coast of tropical and warm America, naturalized in Asia (Ilin, Cey, Ind: CGo, Ck, CQ, CW).

S M h) 30-55 species; tropical to warm regions

Shrubs in h herbs. Stems erect or floating, the internodes often swollen with water. Leaves alternate, 1-pinnate; stipules caducous. Inflorescence of lax axillary racemes. Flowers bisexual, bilaterally symmetrical. Sepals broadly **mtmlai**, 5-lobed or 5-toothed. Petals yellow, purplish, spotted or white; adaxial petal orbicular to ovate, spreading or reflexed; lateral petals oU long, falcate; keel incurved with : long claw. Stamens 10, 9 united, the adaxial (upper) 1 free. Fruit a straight or slightly curved pod, transversely septate between the seeds but not breaking into joints, marginally dehiscent; seeds numerous, transversely obli-
quadrate.

Annual or perennial. Some grow in wet or regularly flooded places. They often develop swollen and **pit)** stems. Pollinated by insects. The disseminules are seeds, dispersal unknown. Some used as green manure, others locally as medicine or for fibres •nd sometimes reported to be seeds.

This account is unsatisfactory. It is difficult to find adequately collected material — most specimens have either flowers or fruits, alM the Ir^vc* tend to t<— their leaflets. I have more or less accepted the tr^{etfr} ment of Prain, D. Journal of the Asiatic Society of Bengal 36, part 2, no. 2: 366-370 (1897).

Excluded: ... a) *Pennisetum* *S. amoder* Gilbert; *S. arabum* (Lamour.) Merrill [*S. asphylium* **Poirei** sometimes **und in tn** out of (i. imp •* **but tint in wrft.uvil***

1. **aiav.i!** prT.d tmirr ih.tn **1 < ni long**, will: 2 appe •* ags at the lMC wluth m n n k w b **ifiio** I' the claw, stems and k«a tath **ides** smooth, without prickles; pods **iwicd, pc mtiikmi**

1, Adaxial petal not more than 1 cm long, without **apprad^ea** CM **apfw** nodages not running as keels into the claw; stems and leaf r. **ides** usually bearing prickles; pods straight or curved but r. not twisted, erect or ascending

1. 1. 1. • • • branches bearing silky hairs; prickles **minuu** and confined to the base of the leaf rachis and angles of the stem below the leaves **S. urrt(t<**

2. 1. • • • stems and branches without hairs; prickles star-**lri<** d over stems, branches and r. **fikles (M** occan-ails absent

1, IV als ± **Hi** mm long; pod 20-30 cm long; seeds ± 40 **S. bipinnat**

3. Petals ± **6 nun** long; pod 5-10 cm long; seeds -20.

4. Leaflets in 15-20 pairs; flowers solitary or occasionally in pairs **S. maculata**

5. Leaflets in 30-50 pairs; flowers 6-8 **p** racemes **I**

Sesbania isipimm (Jacquin) W. F. Wight [*S. arulata* (Willdenow) **Poirer**]; Fig. 219

Stems erect, branched, up to 3 m tall, bearing short prickles. Stipules linear-lanceolate, 6-10 **mm k)** long. Leaves up to 35 cm long; stipules lanceolate, decidu-**aw m HH w jx m*** M!!, pin .. * i<-tiif in 25-55 pairs, oblong, 1-2 cm N Kms, up to 1.5 " » " *! glabrous. Racemes erect, 5- to 12-flowered, up to 15 long. Sepals glabrous except for margin, tube ± 3 long, teeth triangular ± 1 mm long. Petals brownish- violet flecks; ... usually slightly longer than wide, concave at the base; the appendages wedge-shaped, the claw ± 3 mm long; keel ± 7 mm long, the basal tooth narrow, very acute. Filament sheaths 9-15 mm long, free parts 2-4 mm long. Pods subterrene, 1 erect, up to 30 cm long, ± 2 mm in diameter, not twisted, slightly constricted between the seeds, the margins not grooved. Seeds ± 40, 1.5 mm long.

Annual or biennial. Not confined to wetlands but often found in swamps, marshy wastelands, water-**kiRgrf** pi-ces, banks of ponds and rivers, rice fields and seasonally inundated areas. It is also tolerant saline and alkaline conditions.



ftt 11*. W «*» h*pt*m* I flowering stem < 2 cm>
 b Hurt- ^». (2 cm). A ««*« c. two ***** * 2 cm>
 * b i* i* h* *tih f|w p>fr* <* p><w <* (1 cm). A flower
 c. part of a flowering stem (2 cm).

(1) or here Ofcl II. II li>r
 . . . Nep. Pak. Dh. C., <-. Kl. M U. MI- Mp, Pf.IV.

Sesbania jansoni Miq. (*Anachyris jansoni* Roxburgh, *S. aculeata* var. *jansoni* (Roxburgh) I G Baker, *S. jansoni* (Merrill) Fig. 219

Stems up to 3 m tall, woody at the base (P
 ii (mosses) with white pith-like spongy bark. Stems
 and leaf rachises smooth, without prickles. Stipules
 and leaf rachises smooth, without prickles. Stipules
 1.8 mm long. Leaves 15-30 cm long, with 10-30 pairs of
 1 f l etc. leaflets linear to oblong, 2.4-2.5 (-4) cm long,
 2-7 mm wide, tapering and acuminate at the tip. Flowers
 in racemes of 5-12. 1.5-1.8 mm long. Sepal tube
 nkvc!

TM* nun king, ihr trrih
 1.3-2 mm long. Adaxial petal
 2-3 cm long, 2.4-3 cm wide, yellow inside with dark
 2 or purple lines and streaks outside, bearing 2
 appendages at the base which are

clear; Podl icnully pendttlotS, 25-30 cm long, somewhat twisted, seeds.

Annual h » not confinod va wriaiuu inn ik found ut tny^nT pocrft, mwsh> pl.u rv •wamps mil rite Befck Marti) along the •. macsiaMi CUJIUJU/J .I» ajpren fiunuit -mrl !ot ifaad in plantatio-n*, It U ars a trkabc tupcHu ud umflartt) w ArifAflowMTw atprra. [0 HrlJ. S Mid St AMO: HJII. Bur. Ind: Kl, -Ki, V

Sesbania procumbens Wt Kt c (AJIIOII Pefci to Pig 119

Jike S bnp*tu*a (>ui sri-ins vrr> iniitli MMJIC I -uid morr l>tii< hrtl, UM<JIK pftMOTte; Uipulei up to 3.5 mm IOIK; Irjvn 5-7 an lt>ng. iraJlcis]%-;lt p rath up io 7 mm long; linger* tnlUry M in pain: JK-UU 6-H rum toog, I 9....I loogl > 'li.ui tllr w |aha; poda 5-1(11 m long, 1 5-4 tun white, clear) reofitri ted helwren thr »criU: iccdi 1K-20.

Atttnoi, A **<<< •(ww place*akng the coas, partic- ularh (•iimiiti in i ii • iiHdt,

(0 Hct| l-'iili mi* ti> iVnhiMibi Inriu: *hul A|. G. Ki. Mh. Mp. R|. I ii

Sesbania viridis Link. Fig. 219

likr-V btptntnabut K>: em bearing silky hafa ' 1t'1 ^ Im i l>er a iiii MI niinutr J and confined to the base of ihr leal ui hti and .mulet, oflhc «rm brlow ihr lavrt; NddKiaJ jiruJ \tidrr Ihan |im-. condair n ilm lav; thr bttal III>III nt ihr- Lrrl hiojf .tml Minn podl MifacM •iMI rricous Ijrtwren the «< da.

Annul. U> (*L)-

[t? H*)J, Trtttpkjil A/r« ». nAtuntlizrd in America and Sri Lanka < • v t^Jt.

Sesbania albigosa (Roxburgh) Sweet: refer i>hi; 219

Like *S. procumbens* but leaflets in 30-50 (100) iM rntt-> with Iv-H litiwrrv

[0 Hi t •ivi... *lii.l liti.tHr.Wb.

GE yTIAN ACEAE 74grnrni

titrht Si rim i^n^uUr Of 4^rtitgr<l. Ir<r% ^tti it<aic or IAITI* vi mled: til.ilr* vimjik- rj.^riy 4 in Sincron. HMtafj >" •>>irt. SrpaJ* unttnf beUm. pr- sisting in truii Prial* lutmlu. Ivntrd lit ihr nylvn in S4Jnwt> a* rnuty 4ml ailrrTiHtm^ wiih tlu- [>rul)obr». i)>jn uiprrHw. Uof ^-^wulw. oniirt numcT um. Fruit 4 V-\aSrtl <af><ulr Vrd*numct< us, mii >iir

raj iudod -hr ftUilMny arr «n». mli fow ml i> motor and refer • tdy jil> -> liti irr inn .

•urt pUntt: f-tmrm dtcmmm IOI/ril, C rfnuwftl (Roxburgh) Schultes i i s< hulu i AL; G dfrm IV*hli R Bnnro n Rornvn ri Schultet) *Enicostema aculeare* (Lamourk) A. tral [*Esoson hypophyllum* Willdenow, *Enicostema litorea* Blume]; *Esoson pedunculatum*

Linnaeus; *E. pumilum* Griesbach; *E. tasile* Linnaeus; *E. tetragonum* Roxburgh; *Suxrtia arryboMa* (Oisbach) Wight & C. B. Clarke; *S. minor* (Griesebach) T. Cooke,

Hoppw. enddffc to Indian subcontinent, 2 species

Sinus erect, sparsely to profusely branched. Leaves sessile, 1- or 3-nerved from the base. Flowers in terminal or axillary, lax cymes; bracts leaf-like. Sepals tubular below. 4-angular; sepal lobes 4. unequal, Petals tubular below. ± equally 4-lobed, yellow or greenish-yellow. Stamens inserted on the petal tube, 1-4, 1 fertile. 0-3 staminodes; anther with longitudinal dehiscence. Ovary 1-locular; ovules numerous, on 2 parietal placentas; stigma sessile or nearly so, 2-lobed,

- 1. Petals not exceeding the sepal lobes: capsule globose; branches spreading // *tlichotuma*
- 2. Petals exceeding the sepal lobes; capsule ellipsoid; branches in upright bunches // *H. fastigiata*

Hoppca dichotoma Willd. citow: Fig. 220

Stems 4-angled or slightly 4-winged, up to 12 cm; branches spreading. Leaves dipterocarp-like, 4-10 mm long, 2.5-1 mm wide, base eune. *Cf. OC9* lux: pedicel up to 11 mm long; pedicel up to 5 mm long. Sepal lobes elliptical-hinceliite, ± 1 mm long, shortly acute (iate, marginal nerves lbbk- Peul lobes oblong-ovate, ± 2 mm long, not exceeding the sepal lobes, ridged within. Capsule globose, ± 4 mm in diameter.

Annual, lit moss and exposed plates, along river banks, at the edges of pools and tanks and in rice fields.

(0 Hel). Endemic to India: •Ind: Ap, Bh. Kt. Mh, Mp. Rj, Tn, Vb. 0-900 m.

Hoppta fastigiata (Grisebach) C. ». Clarke: Fig. 220

Stems distinctly 4-winged, up to 1 m; branches clustered and growing upright. **Leaf*** broadly ovate. 4-7 mm long. 3-5 mm wide, base rounded to truncate. (A tins clustered; perkiude up to 10 mm long^ pedicels less than 5 mm long [Mowers sessile or nearly so). Sepal lobes lanceolate. ± 4 mm long, distinctly acuminate, marginal nerves (hin. Pelal lobca oblong, ± 2.3 mm long, exceeding the sepal lobes. smooth within. t in style ellipsoid, ± 3 mm in diameter.

Annual. In seasonally inundated places, such as natural depressions, river flood plains and the edges of pools, unksand rice fields; it usually grows in more or less closed communities often associated with various species of *ErioaiuUm* And *Utriailaria*. Not confined to wetlands

[G Hel]. Kndemic to the Indian subcontinent: •Q-y, • Ind: Ap. Kt. Kt. Mp? Rj, In.

GRAMINKAE see POACI

HALORAGACEA: 8 genera

Herbs or sometimes small shrubs. **Leaf*** alternate-opposite or whorled. entire or pinnately or palmately divided, often heterophyllous; stipule-like appendages rarely present. Inflorescence paniculate, spicate, axillary cluster* of cymes or flowers solitary. Flowers bisexual or unisexual, radially symmetrical, usually inconspicuous. Sepals 2-4, in female flowers sometimes absent. Petals 2-4, boat-shaped, hooded, deciduous or atarm. Stamens as many as or twice as many as the sepals. Ovary inferior, of 1-4 united carpels; each carpel with 1 or rarely 2 perispermous ovules; fruit a 1-4 seeded berry or breaking into 1-seeded mericarp*.

Annual or perennial herbs or sometimes shrubs. Monoecious or dioecious, pollinated by wind. Mostly found in wet places, some aquatic.

Excluded: *Haloragis phitipinensis* Merrill [& Parker]; found in high land in Myanmar and *Laurvembergia* raerajMm'Bluiit') Kautz [Sniff] Wight & Arnott. *S. hinuta* Wight & Arnott, *S. Thwaites*, *S. wanim* Anu. tl ex C. B. Clarke]: found in

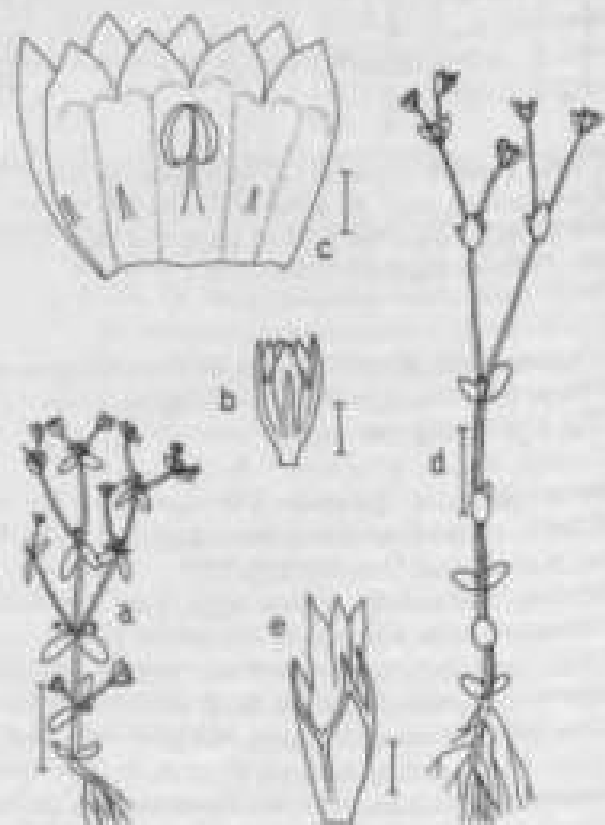


FIG. 220. *H. fastigiata*: a, whole plant (1 cm); b, dissected flower (0.5 mm); c, dissected flower (0.5 mm); d, whole plant (1 cm); e, flower viewed from outside (1 mm).

the mountains of S India and Sri Lanka; although both are **found on** moist soil neither are considered to be wetland plants.

Myriophyllum: ± tO spedes: almost cosmopolitan.....! ill Australia, absent from most of ftrfca, Asia Minor and northeastern S America.

StettO floating or ascending. Leaves usually whored, sometimes opposite or alternate, usually heterophyllous with submerged leaves distinct from emergent ones, pinnately divided, entire or rarely reduced in **Scale***, sometimes flanked by stipule-like outgrowths. **Iafforeacente** mostly terminal, spiU-like. rarely branched or (lowers solitary it. leaf **axils**. Flowers bisexual or **unisexual**, sessile or nearly so. **Sepals 4**, vtry small or **absent** **Petals 2**. 4 or absent (uui* ly **reduced** or absent in female flowers). Stamens (10 4 " r B ; anther* **tinearoblong**; connectives without apical appendages. Ovary of (2) 4 carpets. Fruit dry. breakmg up in to 1-seeded merit:ai-ps.

Annuals or **rhaoflittOtt** perennials Submerged. **emergent** or some seasonally **terrestrial** olten very **abundant** and totally dominant. Monoecious or dioecious, pollinated by wind. The dbw-'niinules are ineiisf disp.r^d in water, in n.ud and perhaps al«. In lals; v-BriaUw fragments af«Q play a role MI tilt ersal. Some s **p e d S** KriOtt weed-, p^ru-ularly **M'spketvm** in N America and M. «q«**ahru** der and •ihers eaten as pot herbs. Mrijden. R. van 244-250 Gaapers, N. Flora MalesSana scr- h 7,11: 972J

Excluded: found in ihr H.n.al^as but ing southwards in India; *MyriophyUum* Uniaaeiu: M. wrtidftrtum I.

1. Plains dioecious; aerial leaves g f e t t, Jg ^ b green, densely covered with minute tn.tyatuii. h e n a p S d gland, all , - n . t e l v ^ ^ ^ ^ ^ ;

1. pSiTmonoeciou« ; aerial leaves n ^ Hf ous, li least the to **dart green**, **bol** obviously glandular, at simple

2. Bractis wately or digitately dissected or lobed
3. Sta anthers linear, 1.5-1.8 mm long; petals 1.5-2 mm long *M. indicum*
3. Stamens 4; anthe oblong, 0.6-0.8 mm long; petals ± 1 (-1.5) mm long *M. tetrandrum*

2. **Bmeteotes** simple, n« dissected or lobt-tl
4. **Flowrt (I- 3T) iogethet** in the g axil: the Middle Howlr bi^al ** ^inct.y *M. oligatum*
carps dorsittly rounded flowers sessile; *M. tuberculatum*
4. FTowers .ollicary in the leaf axi; all mericarps dorsiuely **aCtte** or ridged

...^TM...ttaquatitnm (Velloso) **Verdcoiff** [M. *tmisil' fej*]» Cliimbessieies. **JVl.** [HMrftinaaadvi Gilles ex W. J. **rlooker**]:f%;221

DiSera from all Asian **specie*** by: **plants dioecious** (**females only found**); leaf bases somewhat **swollen**; aerial leaves glaucous, light **bk&b-green**, **dense!** **covered** wiili **minute**, **traafparent**, IK-mi spherical **g&oda**, iitvt-i cntuf. all pinnately divided with **tineas** segments; bracteoles subulate with 1 or 2 lateral lobes.

Perennial, In dilches, usually most of **the** plain emergent

(Vit/HypL Subtropical SE America, introduced in .Asia. Africa and N* **America**: <Ind: <Kk {around Dal **Lake**), might be expected elsewhere in uplands.

MyriophylUtm indicum Willdcnow [Af. intrntuviitim A. P. **deGandolle**]:Rg.221

Stems submerged, **Boating** or ascending, upper part **emergent**. **Leaves** in whorls of (4) 5 or 6; sub-

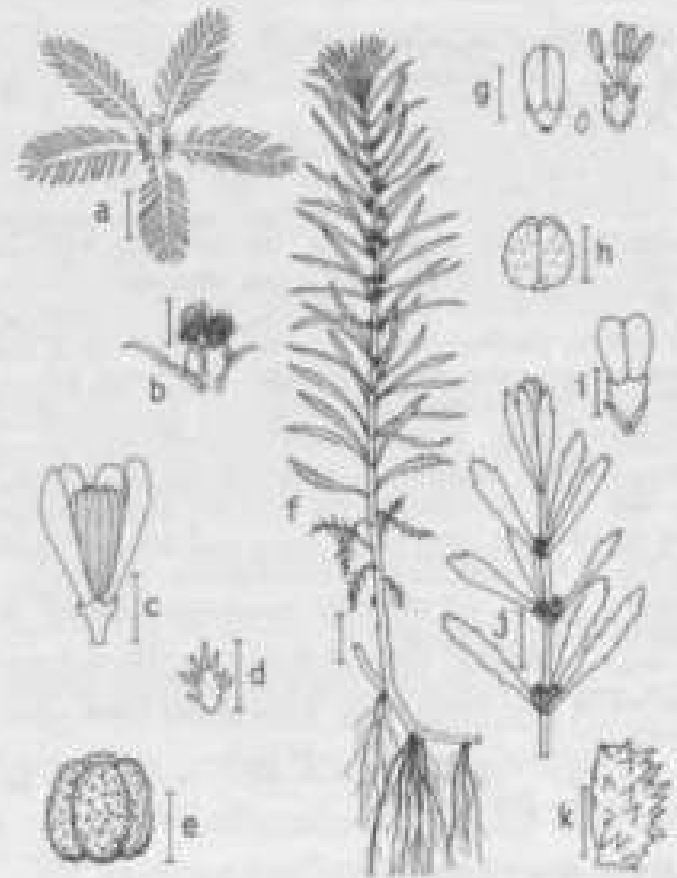


FIG. 221- *Myriophyllum atpintitum*: a, whorl of aerial leaves (5 mm); b, female flower (1 mm). *M. imitatum*: c, male flower (1 mm); d, male flower (1 mm); e, mericarp (1 mm). *M. oligatum*: f, Haueritig plant (1 CRi); g, male flower: led. before anthesis; h, bracteole: right, illustration (1 mm); i, mericarp (1 mm). *M. tmisilum*: i, male flower (1 mm); j, flowering stem (5 mm); k, one mericarp (2 mm).

merged leaves, 1.5-4 cm long, with 12-24 pairs of filiform segments, the segments 1-2 mm long, brown-tipped; aerial leaves pinnate below with stiff segments becoming lanceolate above with a few teeth or entire. Bracts leaf-like, but smaller, rarely more than 1.25 cm long, usually reflexed in fruit; bracteoles pinnately or digitately dissected or lobed, 0.6-1 mm long. Flowers sessile, solitary, usually bisexual below and male above. Sepals deltate, 0.1-0.3 mm long, entire or finely serrate. Petals 1-2 mm long, deciduous. Stamens 8; anthers linear, **1.5-1.8** mm long. Fruit \pm 2 mm long and wide; mericarps ovate, rounded on the back, with \pm flat sides, finely tuberculate or usually smooth.

Perennial or perhaps sometimes annual. In ponds, tanks and lowland marshes. Mostly near the coast. The name *M. indicum* has been used rather indiscriminately in Indian Floras

(Vit/HypJ. Endemic to SE India and Sri Lanka: • Cey, *Ind: Ap, Go, Mh, Or, Tn.

Myriophyllum oliganthum (Wight et Arnott) F. von Mueller [*M. intermedium* auct. Ind., non A. P. de Candolle]: Fig. 221

Stems submerged, floating or ascending, upper part usually emergent, somewhat succulent and red. Leaves usually heterophyllous: submerged leaves sometimes absent, in whorls, pinnately divided, with filiform lobes, 1.5-3 cm long; aerial leaves alternate or opposite, usually linear, 1.5-3 cm long, entire to serrate or pinnately divided but then much smaller than the submerged ones. Bracts leaf-like; bracteoles linear, \pm 1 mm long, margin slightly toothed. Flowers 3-6 in axillary clusters or rarely solitary, sessile or central flower shortly stalked, unisexual or in the centre of the cluster bisexual. Sepals 4, 0.5 mm long. Petals 4, pink or yellowish. Stamens 4; anthers linear-oblong, up to 2 mm long; connectives without apical appendages. Fruit \pm 1 mm long and wide; mericarps rounded on the back, finely tuberculate.

Perennial or perhaps sometimes annual. Usually found in permanent water in tanks and lakes, often gregarious.

{Vit/Hyp/Ten?}. Endemic to India: *Ind, Pak?: Kl, Kt, Mp, Tn. 800-1600 m.

Myriophyllum tetrandrum Roxburgh: refer to Fig. 221

Like *M. indicum* but stamens 4; anthers oblong, 0.6-0.8; petals 1-1.5 mm long.

Perennial. In shallow open water in pools, ditches and canals. In most Indian floristic works it is considered to be a synonym of *M. indicum*.

[Vit/Hyp/Ten]. Northern India and SE Asia: Ban, Ind: As, Bh, Mg, Or, Up, Wb.

Myriophyllum tuberculatum Roxburgh [*M. spathulatum* Blatter et Hallberg]: Fig. 221

Stems submerged, floating or ascending, upper part usually emergent. Leaves usually heterophyllous; submerged leaves in whorls of 4 or 5, 2.5-4 cm long, 1-1.5 cm wide, pinnately divided, with 8-25 pairs of filiform lobes, the lobes 1-2 cm long; emergent leaves in lower part like the submerged ones but smaller, the upper ones ultimately alternate, with less and shorter lobes, the uppermost ones entire, spathulate to linear, 5-20 mm long. Bracts leaf-like; bracteoles \pm rhomboid, serrate, \pm 1.2 mm long, \pm 0.8 mm wide, acute. Flowers solitary, the lowest sometimes female, followed by bisexual ones, with male ones above. Sepals \pm orbicular, 0.1-0.25 mm long and wide, finely serrate or entire. Petals 4, 0.5-1.5 mm long, white. Stamens 4; filaments \pm 1 mm long; anthers elliptical-oblong, 0.5-1 mm long. Fruits quadrangular, 2-3.5 mm long and wide, with sharp longitudinal ribs, both ribs and furrows with pointed tubercles.

Perennial or perhaps sometimes annual. In water in tanks, lakes and marshes.

IVit/Hyp/Ten). S and SE Asia and N Australia: Ban, Bur, Ind: As, Kl, Kt, Mh, Mp, Or, Rj, Wb.

HANGUANACEAE: 1 genus

Hanguana: 1 species

Hanguana malayana (Jacquin) Merrill: Fig. 223

Dioecious robust herb. Stems erect up to 2 m tall, ascending or floating, often with long, creeping or floating stolons. Leaves stiff, erect, mostly in basal rosettes, the lower ones petiolate, the upper sessile, variable, 20-120 cm long and 1.5-15 cm wide, usually lanceolate, longitudinally nerved, with many fine cross-nerves; leaf bases sheathing and somewhat petiole-like. Inflorescence a panicle, 10-120 cm long, 1-3 times branched; branches subtended by large bracts. Flowers unisexual, sessile. Perianth 2-seriate, 3-merous, persistent, green or yellowish, united below; outer segments 2-2.5 mm long, inner segments 2.5-3 mm long, often red-dotted. Male flower with stamens 6, inserted on the perianth. Female flower with staminodes 6 (the 3 outer ones smaller than the inner), dorsally compressed. Ovary 3-locular, with 1 axile ovule in each locule; stigma sessile, 3-lobed. Fruit an oblong, 2 cm long, red, fleshy drupe.

Perennial. It shows a very wide ecological amplitude: from free-floating or emergent to terrestrial. When growing in water it rarely flowers. The pollination mechanism is unknown. The disseminules are red and fleshy drupes, presumably dispersed by animals. The economic importance is unknown. Airy Shaw, H. K-Hanguanaceae. Kew Bulletin 18: 260-261 (1965).

(Ple/Hel]. Sri Lanka, SE Asia and Pacific: Cey.

HIPPITRIDACEAE excluded see p. 11

HYDATELACEAE: 2 genera

Monoecious or dimorphic. Leaves all basal, capillary, without a ligule, base distinct. Inflow terminal bead with opposite bracts and few to many flowers, flowers in beads* minute, unisexual, subtended by 1-3 hyaline bracts or numerous hairs. Sepals and petals absent. Stamen 1; filament capillary. Cervical; Nodulate, crowned by stigmatic hairs. Fruit indehiscent or a 2-lobed opening by 2 or 3 hairs. Annuals or creeping perennials.

Trithuria [Jun, rllii]: 3 species in temperate Australasia, 1 in India

*Trithuria kwtkanensi** S. K. Yadav et M. K. Janarthanam: Fig. *J22

Tufted, green to red, moss-like, up to 1.3 cm high. Stems reduced, leaves erect or spreading, **tufted**, linear, up to 2 cm long, up to 1 mm wide; **inert**; uniseriate hairs present among the leaves, **newer solitary in the center** of each leaf, consisting of a **ring** of filaments up to 6 mm long; **anthers fixed**, up to 1 mm long. Female

Bowen 15-20 in each head, each a solitary carpel. Ovary: Mucous, ovoid, up to 0.1 mm long; stigmatic hairs 2-5 (-6), up to 0.5 mm long, red. Seeds translucent with dark lip.

Annual. Seasonally submerged on sandy and gravelly areas. Presumably pollinated by wind. The division of seeds, dispersal unknown. Described in 1993, known only from Maharashtra, Sindh District,

(?). Endemic to W India: *Ind: M.J.

HYDROCHARITACEAE [excl. NAJADACEAE]:

17 genera of which 3 are marine: almost cosmopolitan

Monoecious, dioecious, (synodioecious or not) dioecious herbs. Stems elongate or contracted, simple or completely bifurcate. Leaves very variable, with or without petioles and stipules, with (!-) 2-10 or more small scales (stipules) in the leaf axils. Inflorescence complex or flowers solitary, subtended by 1 or 2, free or united bracts (collectively called bracts). Flowers bisexual or unisexual, the males sometimes abscise; (rarely) the stamens. Sepals 5 or less, usually absent. Petals 3 or less, minute to huge and showy or absent. Stamen 1 to numerous, often staminate-like. Ovary 2-20 or more carpels; pericarp 2-lobed or without dissepiments: style simple or forked. Fruit a berry or capsule.

Annual or perennial. All are marine squamites. marine or freshwater. Pollination, dispersal is dealt with in the genus.

Egeria densa (Poir.) Nees: IVii]. From subtropical S America has become established in most warm regions of the world but is *potentially* not found in the Indian subcontinent but may be expected on higher ground.

Excluded (keyed out but not described and illustrated)

The following are marine aquatics: *Etthalia* (1 species); *Utricularia* (± 5 species); *Jhalapaia* (1 species).

The following is found in the Indian subcontinent: *Hydricharis dubia* (Blume) Barker [II, *Hydricharis dubia* (Blume) Barker, Ind., non Linnaeus],

1. Leaves clearly differentiated into petiole and blade at maturity

2. Stipules present (median, ± 3 cm long); branched root system usually present: leaf blades thick, not transverse (blade reniform to almost orbicular with a pad of spongy-like aerenchymatous tissue below and a network of veins originating from the point of petiolar attachment, Himalayas) *Hydricharis*

2. Stipules absent: branched roots absent: leaf blades thin, translucent



FIG. 222. *Trithuria kwtkanensi* a. Boiwin plant (2 mm); b. head with bracts (1 mm); c. Stamens (1 mm); d. (female) hairs (0.5 mm).

3. Leaves rarely exceeding 3 cm long; stems elongate regularly branched; perianth uniseriate or absent; the blade lanceolate to ovate and flat; marine *Halophila*
3. Leaves much more than 3 cm long; stems contracted and corm-like; perianth clearly biseriate with sepals and petals; the blade usually cordate with a quilt-like pattern; freshwater *Ottelia*
1. Leaves not differentiated into petiole and blade
4. Plants rhizomatous (horizontal axes wholly buried in the substrate, relatively thick, fleshy and with short internodes); marine
5. Rhizomes dimorphic, with extended, horizontal, scale-bearing long shoots and erect, foliage-bearing short shoots; flowers wholly submerged; leaf veins in a single series *Thalassia*
5. Rhizomes monomorphic, bearing foliage leaves at the apex; flowers rising to the water surface for anthesis; leaf veins in 2 series, the adaxial series inverted *Enhalus*
4. Plants not rhizomatous (horizontal axes if present not wholly buried in the substrate, thin or if thick and fleshy then short, rarely more than 5 cm long); freshwater
6. Leaves confined to basal rosettes, stems truncated, rhizomatous or corm-like, with or without elongated runners or stolons
7. Leaves gradually attenuate to fine point at the apex; stems monomorphic corm-like, without stolons; flowers bisexual *Blyxa*
7. Leaves mostly parallel-sided coming abruptly to a rounded or pointed tip; stems dimorphic corm-like and with elongated runners or stolons *Vallisneria*
6. Leaves arranged along elongated stems; stems not truncated rhizomatous or corm-like but sometimes bearing apical or axillary tubers (turions)
8. Leaves in whorls of 3 or more, arranged in regular and repeating patterns along elongated stems; squamulae intravaginales fringed with finger-like, orange-brown hairs; stigmas linear or club-shaped *Hydrilla*
8. Leaves in two rows even if sometimes spirally wound, arranged somewhat irregularly along the stem (sometimes solitary or sometimes in bunches); squamulae intravaginales smooth, without hairs; stigmas flattened *Nechamandra*

Blyxa: 9 species: tropical Old World, naturalized in N America and Europe

Monoecious or dioecious. Roots unbranched. Stems either elongate or contracted. Leaves spirally arranged, submerged, flat, ribbon-like, not differentiated into stipule, petiole and blade, midrib usually prominent, margin usually dentate. Inflorescence with 1-22 or

more flowers; spathe tubular, of 2 united bracts. Petals band-shaped and scarcely wider than the sepals, capillary or rudimentary. Stamens 3, 6 or 9, all fertile, U* female flowers staminodes minute. Ovary of 3 carpels, distally elongated into a hypanthium in bisexual and female flowers; styles 3, simple, elongate, terete. Fruit an elongated, irregularly dehiscent capsule. Seeds smooth or spiny.

Annual or perhaps sometimes perennial. The vegetative parts are submerged; the flowers are emergent or submerged. Cook, C. D. K. and Liiond, Ruth. A revision of the genus *Blyxa*. Aquatic Botany 15: 1-5/ (1983).

1. Stems elongate, flaccid; leaves cauline; spaces sessile or nearly so *B. japonic*
1. Stems contracted to a simple or forked rootstock or corm; leaves radical; spathes distinctly pedunculate, peduncles up to ± 50 cm long
2. Flowers bisexual; stamens 3
3. Seeds ellipsoidal, 1.25-1.8 mm long, smooth of with up to 12, somewhat irregular, longitudinal non-spiny ridges or ribs, without apical and basal tails *B. aubertii* ^ *aubertii*
3. Seeds with up to 12, irregular but distinctly spiny ridges and with apical and/or basal tails *B. aubertii* ^ *aubertii*
2. Flowers unisexual; stamens 9
4. Leaf tips gradually attenuate to a fine and ^ point with microscopic, regularly spaced, unicellular spines; the lowest 3 anthers + 3 mm long, sessile or nearly so; pollen grains 33.6 ± 4.4 μ m diameter; seeds 1.3-2 mm long, with up to ^ somewhat irregular, longitudinal ridges, each > bearing blunt peg-like spines or almost smooth *B. octandra*
4. Leaf tips distinctly obtuse and hooded > ^ without spines; the lowest 3 anthers ± 2 mm long with ± 1.5 mm long filaments; pollen grains & * > ± 3.3 μ m in diameter; seeds 3-3.5 mm long, *• 2 dorsal and 2 or rarely 3 ventral ridges *B. quadricostaf**

Blyxa aubertii L. C. Richard var. *aubertii*: Fig. 223

Stems conn- or rootstock-like. Leaves ^ f ^ 2.5-60 cm or more long, 0.2-1.2 cm wide, linear gradually attenuate to a fine point at the apex, midrib distinct and prominent with up to 10 secondary veins up to 28 tertiary parallel veins, faint cross-veins present; margin (at least towards the apex) with microscopic, regularly spaced, unicellular spines. Spathe 1- or rarely 2-flowered; distinctly pedunculate; Pedicels up to ± 50 cm long (flowers carried above the leaves). Flowers bisexual, usually emergent but s



fig- 243, *Hatipunn m0fcgnttt*: a, (flowering shoot (3 an I: b- fri»f(lciii);c. detail nflntnervMum (1 an), Hlyxt* water Hi var. outfoii: d. in florescence Cl cm): r. BoweriHg (2 cm); f, IKO feeds (1 mm). & awfcrtf var. R. iwoso«U(1 mm).

times **nibmereal** Petals linear **batt&*ke** often remaining folded and **twisted** wiihin th« calyx. Stamens 3, **anusepalms**. Stigmas /atcrailv papllosr. Capsules (<-) ^-5 (-8) tin long, Stt-ds i-llipsoidal, I £5-1.8 mm long, smooth or wiih up to L2, sonif what irregular, longimdinal ridges or ribs, long ipincs and apicsj and/or basal tiuils absent.

t/sualfy annual hut may [jorsist longer in pcimutuui water. The leaves arc **submerged**- li usually grows in temporary- water :unl ři often round in rirr lit-ls and ""igatn ditches, but is not considered to **be** a serious weed. It flowers and fruits ihroughoui du- year as tong as water is **present** The entergene flowers art- «r«(t^Jy autogamous with pre-authesis tk-isutgamy, the **nibmerged** flowt-rs arr touilly cleisioyatnous. Serd-sel U usually good. The [jis«MTiiuiks art- seeds or **CompleM Capsules, dbpemon** unknown but it is jirobably tmns- perted in mud on die feel of birds or wflfl rice seed-

[(0) Ros], Tropiral anfl subtropical Asia, Australia, Madagascar and E Africa, introduced in ;V America, (lacking in NW India): Ban. Bhu, Bur, Gef, Ind, Nep: An, Ap, Bh.Jk. Kl. Kt. Mp. Or. Rj. Tn. U'b. 0-1200 ro.

Blyxu (lubvrtii L., C). Richard vur. *echinosperra* (C. B. ClarkeJ C. 1). K. *iktntk* et ft. Lfiønd: Fig, 223

ik«* var. *aufit'riu* but the seeds have up lo 12, irregular but disiinctiy spiny ridges and with apical and/or basal uiilf.

Ecologkally indtetu^tdsludjte from v^r. nnbertii.

√(<D) RosJ. Ti'upiciil atK(subtropical Asia and Australia: Ban, Oy. Ind, Nep?: Ap, As. Go, Kl, Kt, Mg, Mp.

Blyxo faponint (Miquel) Maximovjc/ trx Astherson et Guiko \ar.japoriica: Fig. 224

Stems **ftWfcid**, slt-nder. (I-) IO-2*f (-60) cm long, usually branched below and simple **above**. I-eaves cauiine. lanceolate, 15-50 (-701 mm ltuiip, 0.75-3 (-4) mm wide, semi-amplcxicatit at basr. gradualK



JFtc T24. *Blyxn jnfmwai*: t, flowering shoot (2 cni); b. l]»wrr with one («:il itnucri m Uie siclf (2 mm); c, seed (1 mm), 8. *nttaminr*. d,female BoWfr, note ihread-like p^uJs (5 mm): c, male IWTr «* nun); f. two seecU ((mm). *IS- tjUfuiritmtata*: g, leaf tip (0,5 mm); h, st'rd [OJS mm); i, female fibwer with *icp&h* htm bact <4 runij; j, male flowpr at anthesu (•! mm).

normal foliage leaves; sessile or subsessile. of 2 united bract. Male flowers solitary, usually abscising as buds and opening explosively on the water surface; sepals 3, ovate and reflexed; petals 3, linear and reflexed; stamens 3. staminate absent Female flowers solitary, subsessile bulb with a long thread-like hypanthium carrying the flower to the perianth of 3 oblong-ovate sepals and 3 elongate-ovate petals, "pudding and floating; stamens 3, minute. Carpels 3; styles 3. simple, very small (up to 0.75 mm long). Fruit a cylindrical capsule, indehiscent or smooth. Seeds rarely more than 5. smooth and smooth.

Mostly perennial but sometimes annual. Totally submerged! Growing in still or flowing water. Often very abundant and common over large areas. Proliferation autogamous with pollen explosively liberated from free-floating male flowers and caught by floating female flowers. Monoecious or female. Dispersal is by indehiscent capsules or seeds or specialized buds and tubers (turions), presumably dispersed by water. The turions are sometimes tiny and probably dispersed by animals. It is considered to be a very serious weed in N America, in India it can reach pest proportions and is particularly troublesome in tanks used for breeding fish. It is readily eaten by grass carp but mostly chemical control is used. Cook, C. P. K. and Upton, Kulh. A revision of the genus *Hydrilla*. Aquatic Botany ISI -185-504 (1982); Pielerse & H. *Hydrilla utrikulala* - a review. Abstracts on Tropical Agriculture (Koninklijk Instituut voor de Tropen. Amsterdam). 7(6): 0-34 (dated 1981. published 1982).

1(0) VIL. Old World, naturalized in America: Ban. Gey, Ind. Nep, Pak: Aph. Ar. As, Bh. Di, Co, Up. Hi. Jk. Kl, Kt. V. A. Mh. Mn. Mp, Or, Pj, Rj, Tn, Up, Wb. **>-I&UO!!!.**

Nechammdrtt [LagarodphactWUCL ted-]: 1 species
Ntxhamardra alenrifolia (Roxburgh ex Wight) Thwaites,
[Uffsnapktn atmkfi&a <Roxburgh ex Wight) Dtoee]:
 Fig. 226

Dioecious. Roots unbranched. Stems elongate up to 1 m or more long, irregularly branched, in nodes long or somewhat apparently irregular intervals. Leaves ~~canine, sometimes clustered,~~ distichous, flat, band-shaped, 5-6 cm long, veins parallel without a prominent midrib, sheathing and somewhat mucilaginous. At the base, the margin and apex with unicellular spines. Inflorescences axillary, often in dense spathe of 2 united bract. Male flowers solitary, usually abscising as buds and opening explosively on the water surface; sepals 3. becoming fleshy at maturity; petals 3, linear and reflexed; stamens 3. staminate absent; stamens 3. simple, very small (up to 0.75 mm long). Fruit a cylindrical capsule, indehiscent or smooth. Seeds rarely more than 5. smooth and smooth.

lary, sessile, with long thread-like hypanthium. float on the surface at maturity; sepals 3; petals rudimentary or absent; stamens rudimentary or absent Ovary of 3 locules; styles 3, with 3-lobed ovate lobes. Fruit breaking irregularly. Seeds numerous, ovoid. ± 1 mm long, with reticulate seed coat.

Annual or sometimes perennial; longer in permanent water. It is sometimes found in temporary water: it appears to be replaced by *Vallisneria* in permanent water although they do sometimes grow together. It is a common weed in ponds with mobile water (lowered by boating but attached to the bottom). The dispersal mechanism is unknown, but it is probably transported in mud. Ecological importance unknown. *S. <rh(ima,ulru is pittisua) Ky related to Vallisneria and not to the African genus Lagomphium.* Cook, C. D. K.

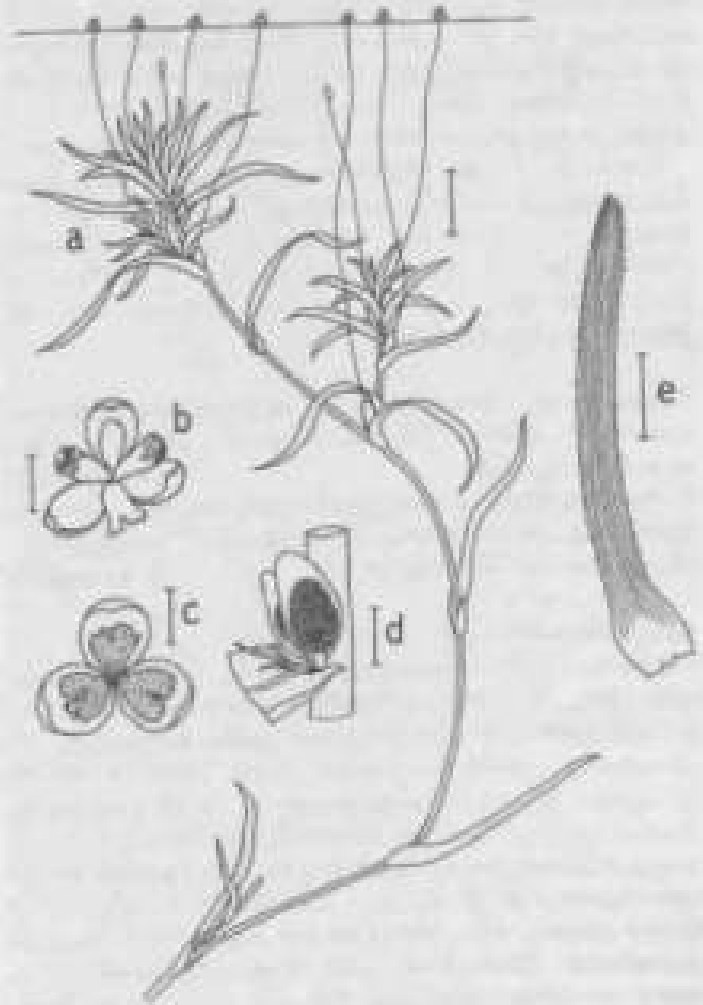


FIG. *26. *Hydrilla verticillata* a, Enlarged branch (1 cm); b, Male flower (1 mm); c, Female flower (1 mm); d, Fruit capsule (1 mm); e, Seed (1 mm); f, Leaf (5 mm).

thick and leathery, never appearing qmk-hktf. Female spathts very hard and thick, usually covered with warn .11 id/or spines: male spatlirs softer and ill inner Flower* unisexual. Malt- Mowers numerous in each spathe. wtUi 3-4 staminodes and (9-) 12 (-15) stamens. Ovary of 9-20 carpels; sivlt* Half to onwhird bifid. Fmii obowwl (o ellipsoid, developing within the spaiht.

IVrrnnial and perhaps also sometimes annual. Usually buna to pennaneni ^ier in lakes, pool! and slowly'flowing rivers. Leaves arc sold in markets ft Myatmar as a pot herb. Female & W « M tuu b crossed with a * & » »itt The hybrid offspring bisexual and self-fertile.

[O? Koi/fcph). Myanmiu and. SE Asia: Bur.

Fallimeria: ± 4 species: tropical to warm regions ↻l the world

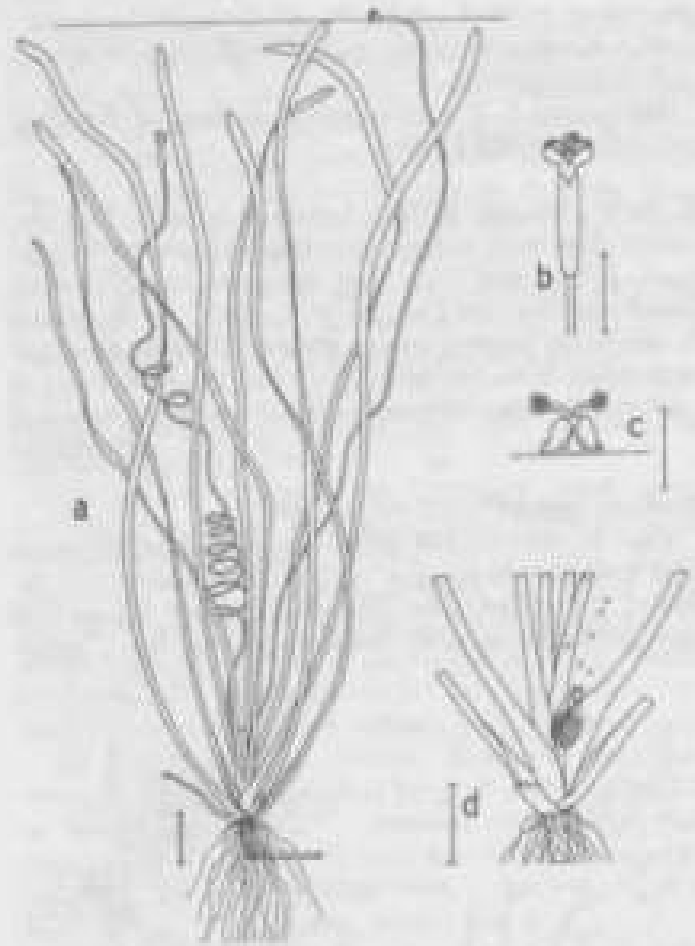
Dioeciom, annual or pognttUL Roots unibrandied. Stems either contracted or elongated, mostly ik-veiop-ing stolon* or runners, the branching system complex. Foliage leaves distichous or jpirodisikhoiw. narrowly <trap*hspcd, up to 2 m or more k>* & ^hc m^TM& " usual lv with unicellular ^ptae* Infiorwcecea axillary: spathe of 2 united braco. Mate ttow<rt f<ajr small, very QUmeroua, abscising^TM buds and opening on the water sut&ce; sepal* Unequal (3 large, 1 *n*lkr>, bewnnns refk-xrd at adthcris; petal Ctt^meotM? or ahse'H: siamhuKle 1 or absent; stamens 2 or 1 (probably demx-rt from 3 united stamens)- Female flowers sohta.y, long pedkdkd, lloaug em *c »" ; 3 or 2, relatively large; petals S or 2. mimiic-; stamnv odes 3 or 2, attempting with ihr pe«b. Own- of» or 2 carpels. styU, 3 or % ««h with 4 flatMd P - F ^ lobes Fruit hrcaktng irregularly. Scc-ris numerous, ellipsoidal, up to 2 mm long.

Uwdcn. i. \r An approach » J] (1982).
Tollin S L Aqoatk Botany IS(3): 269-289

Fallimeria spiralis Linnarus IT. *nitida* (Lourreiro) Hara, i; *granuloides* Roxburgh. V. ^r Royle, V. *denticulata* (Makino) Makino): Rg. 228

Stameru of dw staminusue flowers 2. ^/nd obliquely extended U>mnin« .. V. without any bam the Lse. Female Bowen with an tacfckw (Accepted between &c matching stigniatie lob« (opposite the petal rudimenx), Stigma* B^S*5^ •>«« ^ht S gin.

Perennial or occasionally annual. U*«* •ubmerged. It grow In still ami flowing wajft (P to ± 1 rn/L) and is often very .onu.um d locally dominant The pollination is e p i y p with mobile male- S<««S on d» water surface caught by Homing btl1 ^ched tVmalc llnwrs. The d v semin ulcs are seed- and vegetanve fragments. The leaves are eaten in japan and used * animal fodder in



F[.t. 228. \titiisnfrin jpireft: a, female Qowtdng pbni (2cm); 1., |rm.iU- Iliiwer (1 cm); C,rtf(-floaingmale (lower (1 mm); tt, auk spaihc n*lcasing flower buds (1 <m>.

China, It is often a troublesome plant in irrigation and drainage ditches and channels, ibi: leaves may reach 2 m long. It is eaten by grass carp but they rart-l\ effectively control it. therefore, chemicals ar<- usually used. It fa also a very popular aquarium plant.

[(O) RosJ. Widespread in the Old World, also found in Australia and Oceania: Can. Bur, Cey, End, Nep, Pak: Ap. As, oh, Dl, Go. Hp. Kl, Kt. Mn, Mp. Pj. Rj. Up. Wb.

HYDROPHVIXACEAE: 22 genera

Hytlmlea. 11 spjgdes! pan tropics, niosi hi America

Spiny or unarmed herbs. Stems terete, often swollen and spongy. Leaves alternate, simple, entire, usually narrow; stipules absent, Flowers bisexual, radially sym-n'irkjl. solitary or in ii-mimal or axillary cymes. Sepal* 5, almost free to ihe bale, persistnl. Petals 5. united ai the base, blue. Stamen* 5. inserted at the base of the petals and alternating with their lobes. Ovary superior. "2- or rarely molt--]ocular, with parietal

placentas; styles 2 or rarely more; **Stigmas** capitate; ovules numerous. Fruit a capsule splitting by valves or opening irregularly.

Davenport, L.J. A monograph of *Hydrolea*. *Rhodora* **90(869)**: 160-208 (1WW).

1. Stems bearing axillary spines at some nodes, the entire stem with **patent**, gland-tipped and **very** silky hairs; **petals** 12 mm **Long**; placentas of each lobed, divided into 2 wings (Sri Lanka) *H. spinosa*

1. Stems with **beating** spines, glabrous or with glandular hairs towards the tip; **petals** 4.5-7 mm long; placentas of each lobed, not **(folded into)** 2 wings (-widespread) *H. zeylanica*

Hydrolea spicata Linnaeus: Fig. 229

[like *J. ujfanica* but **shrub-like**, up to 2 m tall: stems and branches bearing 1 or 2 **stipitate** spines at some nodes, the stem with **patent**, gland-tipped and very sticky hairs: spat lobes 6-8 mm long; petals

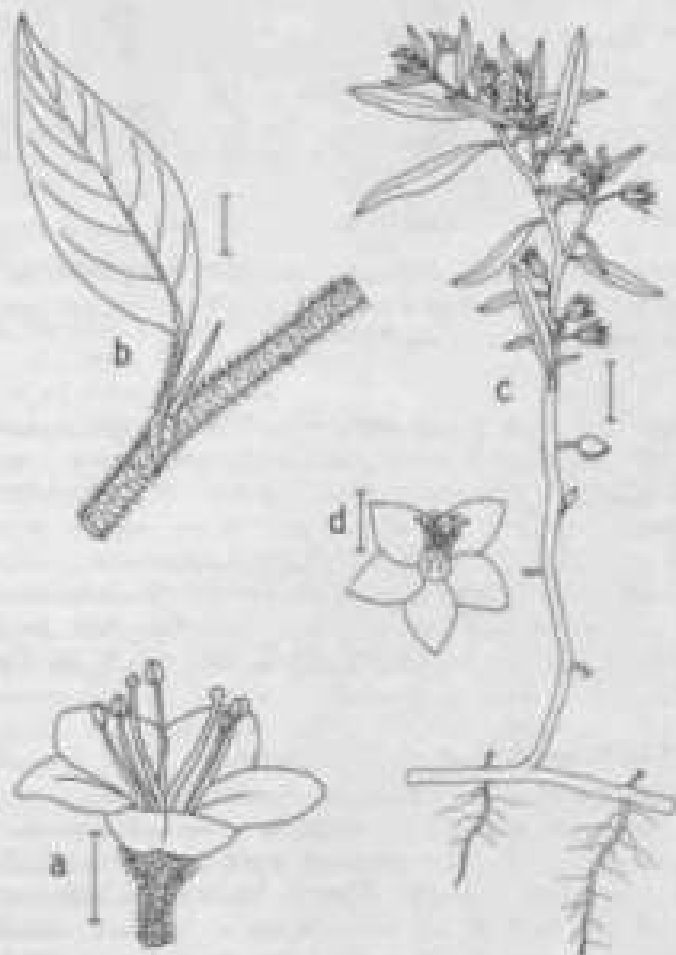


Fig. 229- *Hydrolea spicata*: a, flower (1 mm); b, stem with a spine (1 mm). *H. vylinnuti*: c, **lowering** plant (2 cm); d, flower (1 mm).

8-12 mm long; placentas of each lobed **divided** into 2 wings; scales 0.4-0.7 mm long, 0.2-0.3 mm broad.

Perennial. Usually in wet places.

Hel.J. Native to Aint'ricii, n'ini-;ih/i il in Sn Lanka

Hydrolea aylanica (Linnaeus) Vahl [Stris *aquatica* N. L. Burman]; Fig. 229

Stems prostrate of creep, up to 60 cm tall **IP*60** **light brown** often tinged with purple, **very** hairy, sometimes glandular towards the tip. **Leaf blades** **ovate** **to** **obovate**, **SMfl cm long**; **petals** 1-2 mm wide, **glabrous** or hairy. **Rosette** **to** **terminal** **panicle**. **Scapes** **lanceolate**, **1-2 mm** long, **1-2 mm** wide. **Petal lobes** 4-5 mm long, 1.5-3 mm **wide**, bright blue. Capsules globose to cylindrical 4-5 mm long, **2.5-3 mm** broad; **placenta** **reticulate** **fiducial**, nut winged. Seeds ovoid to **obovate** **0.3-0.5 mm** long, less than 1 mm **pan** broad, with long **diagonal** and **transverse** ridges.

Perennial. Of **two** times annual. Seasonally **merged**, **emergent** or **submerged**, often gregarious at **low** water level. It **forms** a distinct **stand** above **receding** water. It **flowers** in **water** recedes. Pollinated by **insects** autogamous. The **dissident** in **ulcers** are seeds, their **salts** is **«nkiwi»**, **Vo«s»g shoots** **ave** **eatto** **'a** a **vegetable** **are** **reported** to have **antiseptic properties** and used in medicine. **Sometimes** reported to be **washed** in **rice** fields and irrigation ditches **but** **not** **considered** **to** **be** **useful**.

Dist. **India** (Hyp). Old World **tropics**: **Ban**, **R»»**, **Ind**, **Nep**, **Pak**: **An**, **As**, **Dl**, **Go**, **Kl**, **Kt**, **Mb**, **Mp**, **Rj**, **up**. **wb**. **o**-**ia** **o** **in**.

IRIDACF.AE excluded see p. 11

JUNCACEAE: 8 genera

Juncus. 255 species: **submerged** **plant** **mostly** in **temperate** **zones**

Stems erect, floating or **submerged**. **Leaves** **alternate**, **linear**, **capitulate** or flat or reduced to minute **scales** or **absent**, occasionally sheathing at the base; **sheath** **open**. Inflorescence a cluster **of** **terminal** or **axillary** **flowers**. **Perianth** **segments** **reduced** to **1** or **2** **flowers**. **ViMti**, **subtended** by **scale**: **bracts**, **flowers** **8**. **Perianth** **segments** **in** **1** **whorl** **seated** **in** **the** **axils**. **Stamens** **3** or **6**. **Stamens** **superior**, of **3** **united** **carpels** with **parietal** **placentas**; **stigmas** **linear**, **iv**. **linear** **capsule**. Seeds **intertwined** **capsule**. Seeds **intertwined** **capsule**.

Perennial or **annual**. Most species occur in **wet** **places** and **some** **submerged**. **Pollinated** by **wind** or **insects**. **In** **flowers** **are** **seeds** **«»** **specia** **Bt**

bulbils, **diapered** in water and perhaps also by animala.

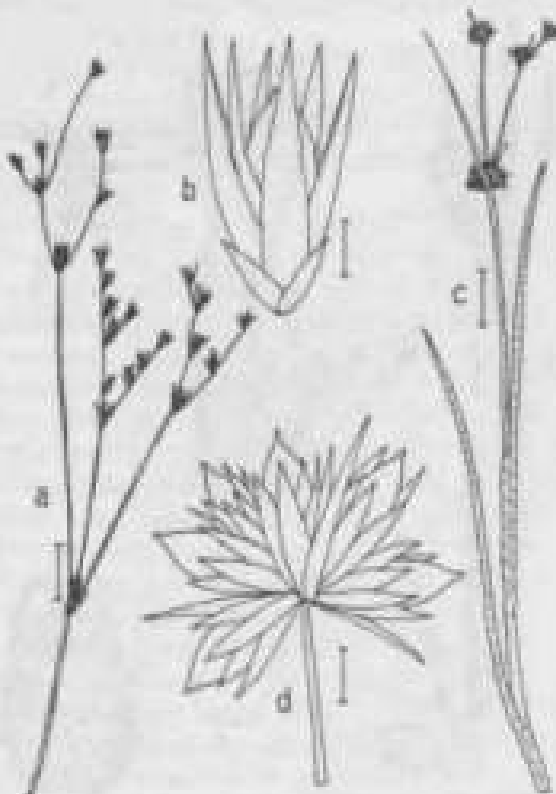
Excluded: about 40% at high altitudes Ed the IVnniihiyas; *Juncus muritimus* L-marck: from brackish conditions in NE Fndia and Pakwtan.

1. Leaves flat, noi hollow, without transtverse septae: Mowers soltLiry or in dusters of up to 5 *J. buifonhto*

1. (raves leretc or Battened, hollow, with transverse septae; flowers 4-10 ill den.se heads *J. prismaiocarpus*

Juncus bufonius [jnmicus: Fig. 23]

Tufted. Stews wwe. (2-) 10-55 (-*0) nn t..ll. 1 eayea basal and on stem, gnislveike, Hat, 1-12 cm long, 0.5-1 (-1.fi)mm wide, not hollow, not riaimersdy septate; sheaths scarious up in MS an long, Fkm< i-solitary »r in dusters of 2-f; Iloral bracts 3 (J bract. 2 b'ac) ol, ovate to lanceolate, shoncr lli;in the fM-i-ani. Pcriunih Begroena *-fi mm long, MLS mm wide, the outer ones louder ihiin the inner, StaSKOi 6 or less in elcisiogaiiioiis llowers, niuch shorter than the perianth. Qapctthu t'tHpsoid to ovoid, 3-5BO0 Jong, 1-2 Inm wide. Seeds ObWold, OS-O:> <mm long, reddish-brown.



Fig* 23Q. *Juncus t/ufoiiuy*. J, SQWCdPg *hout {1 cm); b. tmii- inp hi;irl (1 ii mm)- l. prUmatocarfrM; r. Qcwertffg abouit 1 I cm);d, flullng head {1.6 minj.

Annual nr \L-I\ i:tiily [H-rt-unial. A pioneer plant of wet mud and wind, flowering re tbc wmler recedes, noi conlined to wetlands. Often (otally abmittint and gre- i;u inus in inaesby ground^ op the margins »>l utnks. In young seedlings (he BQedl .in- clevait-d ctmsidci-ably above tlie ground s*t th* plant apparently looks like a moss, having a capStde ui tliir aprx. It iv a highly v-ri- able species, Mostly found on higher land.

1(0) Hel|. Temprnittr ami warm ftglona nf Km^sia and Arnt'rica. probably introducLtl in Sri Lanka: (Mm, <Ccy, End, Ntp. Pak: Dl, Up, Rj, Sk. 200-2-M) in.

Juncus prismatowrpwi v. Brown, not) sensu]. U, Hooker Fig. 230

Tufted. Stems terete or flattened, (B-) 20-60 (-100) nn tall. Leaviea ba\$a) and <n stem, tinear i< Itinceulute or liliform. it-rele or fbiirmd, (S.5-> 10-20 an long, up to 'MUNI wide., the lower ones lurger ihan the upper, hollow .mil inmsvertely s<-putt' within: shcaih scar:<m,s np iri 3.5cm long. Heads hriTtispherical t> sul>globusc. ± 1 cm in diameter, with 4-JO flowers; floral bran solitary (bracteofcs absent), oVatfi to lanceolate, shorter than thv. prrianth. Perianth srgmi'nts ^>-> mm long, all ± alike, greenish or bfdWil. Inflorescence if>nu'tirnes pst'iitloviviparouji. Stamens 19, much shorter th;m the perianth. Capsules up to 5 mm long, 3-sid<rd. fdth proinineni angles. Streds ellipsoid l> oborald, 0.4-0.8 mm long.

Perennial or KMnedmcs annual. In niinshe,s. along sirearas, in muddy places and uaUTlo^rd fields. Mostly on iillv

[(O) Hel|. Subtropical and tropical E and SF. Asia, Australia and New Zealand: Han. Bur. Cey, Ind, Pafc Kl. Kt, Mn, Mp.Tn. 100-2500 in.

JUNCAGINACEAE ticduded see p. II-

1.AM1ACEAE [LAB1ATAE]; 180 genera
Herbs, sometimes woody at base, ofun tXOtOOJC. Siem.s tiMtally square in transverse section. I*aws opposite or whurled. Enflorseeoe vwlort-like, the whorls often crowded at the sieui ,iprx nnd forminj; a spike. Sepab 5 or rarely 4, united helnw. often 2'li[>pcd, wiith \$ acfaxiaf Jobt's ann/ 2 ;ioaviaJ ones. Petals 5 ca -£ tmiied below in io a tube, the 2 adaxial lobes forming a lip, the abaxial 3 forming a 3-lobed kIKVt lip or lobes ± equal. Stamens usually 4, rardy reduced to 2. Ov.xn. if 2 carpels, each with 1 ovules, linally appearing 1-lohtd; style bilid above. Fruit of 4 nutlets.

Mukerjee, S. R. Seconb ttf tlic- B'ttitnttal Sisrvte] Oi India I4(lt:i-vii, 1-228 (1940)

I s< ludt-d: wetland phinU noi extending wnith of the Himalayas: *Lycopus rrvrvpatrus* Li.Jinae.us: *L. exattatus*

Linnaeus lil.; *Mentha aquatica* Linnaeus: A] puUgitim I innaeiis; *Scutellariitt galtrricutata* Linnaeus; *Teucrium scitirrdium* Limi at' us.

Plan Li sometimes found in moist or damp ^iuuiions bul not wetland BpccJ** *Ajugu bracteosa* Wallich ex Henthui; *A. macrosperma* Wallkb ex lkmhani; *Mama palusfris* lil 11 me [On hi ft oru m pa rvijlorum Wai 1 ich ex Bt-mhaitiJ; *Ntpifa hindostana* (Roth) Haines [JV. ttihmiihmdri, Benthain, *N. rudmilUF*. Hamilton ex Bemham); *Sahiapkbvia* R. Brown.

Pogostemon Vj\.\of/hylla. *Eustraiis*]; ± 71 species: Asia and Africa

HCHM. Leaves opposite or wl tor led. Flowers small, in dense, ± continuous^ terminal spik<-s. Sejial tube iwoid or bclWikr, ihe thruai nakvd; M-pul lobes *Th* equal. Petal lobes 4, ± equal. Stamens 4. exerted, straight or sliRlity curved: litanu-ms Ix-ardeit; fltntthen tonflucni. 1-loculai.

Annual or perennial Pollinated by insects. The disseminuies arc nudets, the dispersal is *unknown*. The aquatic and wetland species in ihis group are highly variable and in Rreat need of critical eevimon; pn-^iuns authors have. I believe, recognized too many spede<. Press, J. R. Taxonomi*' siudies in tSie Uiliiiae tril>e Pogosterntmeal*. Bul If tin oA ilu- British MUM¹ urn (Natural Hiscory) Botany scries 10(1): J-S9 (1982).

Excluded: found in the Himalayas, not extending With: *Pogostemon heffai* ã. D. Hookoi) Press [?Dysopk!la knchinaishS. K. Mukcrjee): •Bur, *h)d.

Species found on periodically Hooded BOCSEa sides (rhizophytes): *P. tptadrifolius* (Bt-uthauO Kunt/c; *IVan. •Bur, •Ind: *P. taucifoiuu*.% (Dal/cil eatj. I). Hooker) Kuni/e: *Ind.

Species waitjtbnei found in moist nr damp places but not wetland specie*. *P. auricularius* (Linnaeus) Hasakarl: *P. mtdatus* (Biniluiii) Pre» [DptOpiyUa *Mraphylla* Wight]: *Ban. •hid. *Ncp: /*. *Hnearis* (Bemliam) Kuni/e: •Ban? •Ind; *P. paludosus* HrtulianK •Ban, •Ind; *P. peguantts* (Praiu) Press: •Bur; *P. ttoduii* (J. D. Hooker) Press: •Ind; *P. witfitii* Ben (ham; •Ind.

1. Leaves mostly less than 1 cm long; whorls mostly wild many more than *r** leaves; lloral bractA ai Hie base tf the inflorescence ± as Irmg as the leaves, persisting after the fruit (alls *P. ervrtutn*

1. lvj-vrs ПКОИУ more than 2 cm long; whorls with rarely more than T> leaves (at least, upper node* with 4 or Irssi; iloi.il bfitctt imuli shorter than the leaves. not persisting after the fruit falls

2. SepLiK in fruit siellaicly spreading and diw losing the nutlets (t>j)cn sepal tubes look like holes in die solid spike) *P. stellatm*

t. Sepals in (hut erect or imurved, not disclosing i the tiutleis

3. -Sepal tube obconic, deeply 5-grotJV'tf, glabrous, <hestmu brown, shining btlttw, with 5 elevated tldges; si-pals in fruit ± 2.4 mm IOHR *P. griffi'***>

3- Sepal tube broadly campanulate, nni grooved, usually hairv. greenish, riot shining, withoui ritfit^s- sepals in It nil \h-2 mm lonj; *P. pumitus*

Pogostemon *enctum* (Dalxel!) RtttttW [Mniho strttaia F. Hamilton t-x Rosburgh n<jn Umreiro, *Oymtffhyit'* *imontosa* Dal/eM tion *Pogafittmon tomiKtOSH* Hasskan, *Dysophylla gracius* O.il. II noo *PogMftrwri* *gracili* Hasskart, *Dysuftytte tUUtiawv. grodflifbabeQ*) *Cooker*. *PogosUmatt deatanmsit* {Pani^rahi) Press!: Fig. 231

Sterna creeping <r decuxobeni and nnnh brunt-hen (r), creel pan up to 6-20 (-35) tm tall, flexiblCi uiih shod intennxks, j;Liln(nts or with white haw* Leaves sessile or nearly so, in whorl* of (5-) 8-20, n*^r rowly linear. 4-10 mm long, ± S3 nun wide (when submerged riliform. ±1 nim wide), glabrous of slifj^{litly} hairy, often revoituc. margins entire, tips obtuse c*^r u-. Floi-al bracts linear, o9 long as die UppC It*av<> pR e<-en alter the Trnit fall-f, Sjijikes 2-4 (-*)^{e11} long; 3-4 (-5) HUD in diameu-r in huif. Sepals vrry small, tn'rnispheric or broadly campamilate. ghin(li''*u



Re 431- *Poptiirmtn etwtum'*. a. wlinli' plant (2 cm); b. *floruit* with biaci (0.5 mm); r, nntlrl (OJfi mm); d. Upper ^'f ui *floruit* (0.25 mm); e, wpals in fitiit (0.5 mm).

hairy; tube ± 1 mm long; **kefj** *£&£> f** ±0.25 mm long, erect Of inctttved ta fruit- Petals up 2 mm tang, " ^ * > P « n * - : . t l , b f t * L 5 B a n 1 < m R ; ^ ± equal. rateoblcmg, hairy outside. Sw n » « i « « m s p i a . - O < * filaments, lilatla purple with long ...oliniform **teafe** unv.nl, the up: **aoihew Mocutar. Nüdettd bedd**, ±0.4 mm in dumber, **pak** vdlo^h-brown. smooth and shining.

fcereiuiS in permanently W*1 habiwis or RWiU<L Found along the tawgSna o! ditches and ponds, touaDj Ka«maUy Lb.ncrged, often fuming tog * which an? very conspicuous who, in flower.^ reque found in brackish mwr Bl*r to the coast.. 1 Hi spc- is my variable; alftb there is considerable W n.,1 canfuskm. U is incorrectly called Dy^phylta in mast Indian Floras.

1(0)? Hyp/Ten}. Endemic to S 1"dia: »Ind: W, Mh.

Pogonemon giffardii (J. D> Hooker) Press: Fig. 232
5E R CZ bur iafft longer (up to ± 7 cm long). rareh more that. 4 in a whorl, margins entire; Floral hrarLs **linear, exceeding the Bo** wens; sepal tube obconic ... below, with incurved.

5 pooves and 5 (fettled ridges; ^paJ labes villom with white hairs; sepals in fritU ±2.4 mm long. Annual Wei places
 \O Hyp/Hclj. Endemic io India: #Ind: Ap, Or.

Pogonemon pumilus (Graham) Press [*Mentha verticillata* var. *crassicaulis* Bentham]:
 Fig.

ascending or «*«. simple or with some fleshy
k branchy **IUO** cm tall, rf^ ^ ^ * «
 -J inHaicd **bdow**, glabrous or with **g ^ f f j ^** hai j
Leaves tesdle, opposite or in whorls of (3-) +» j
 Cth_c number **decaufog** towards thr **mM**h** ^W
 to linear-lanceolate, 2-5 cm long. ± |W^{CTM} " J J
 densely gland-dotted below, ± cordate ^ ilu bas...

Kceoialc l« am long» **toy <j*B -M**
 purplish, deciduouv Spikes £**£%£*
 ± S (-8) mm in diameter. S e p a y glandular
 1.5-2 mm long. Rr^nish. ^ndular or iltt 5-4 mm
 hair; bbc, 4. wbequal. d,lutc Petal, up ID
 long, lilac to purpl- lobes 4 ht ^ 9 ^
Stamens cons to^u>! Blarney p
 km« purplish Uirs in the middle- Stfle « tong J*
 stamens, 2-lobed a the- Lip- Nudets ovoid. ± 0.8 mm
 long, ±0.7 mm in dianuMfi. pak- brown

W . 1 . Wet pl*** «tol ftcW* d, uhrs and Jong
 ihc cJITL"* of hikes and pool*.
 luVl. huh.UK 10 -he inchjm
 •Ban, •Bhu. •Bur, •Cfv. »&d, •Ncp: As, Jk. i

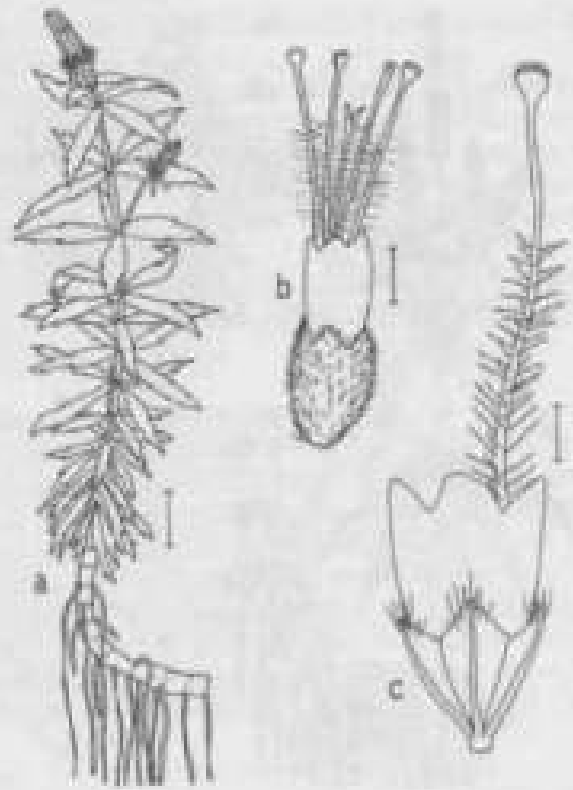


FIG. 232. *Pogonemon giffardii*: a, whole plant (8 mm); b, flower (1 mm); c, detail of flower (1 mm).

/togmtanoi ife//af« (Luureiro) Kmu/e \Dyu>fihyUn verti-
dSata (Roxburgh) Be nth am. D. b/rnthm>anu Mancc]:
 Fig- 388

Sirins glabrous or hairy, visually creeping below **and**
erw i abow, simpk-or branched, 10-60 (-WU) cm tall,
often swollen below. U-aves sirssile. sprtrading, opposite
 or 3-8 (-40) in a whorl, linear to bnceolaie, I.S-7
 (-16) cm long (submerged **leave*** long and m;uiy in
 a wnoil, **aerial** ones shon atid tew n in ;i wlmili,
2-1S mm wide, narrowed ai the base, ipreading or
 deflcsed. glabrous or nearly so, **margins** subcnlire to
 sh;irply serralc towards die tips, tips v<- \ **BCUC**. Floral
bracts 1 in car-lan ct-'cilat. 13-2-3 mm long, **mneh**
 iTi.illei **than** the leaves. Spikes 2-6 (-V2) OB long.
 4-0 mm i» diameter., densely hairy. Sepals broadly
 campanulas, **glandtilar** and densely hairy; tube
 + 1 mm long; Inln-s 5, iubecjual, triangular-ovate,
 ± 0.3 mm **toug**, sir Match¹ spreading and disclosing the
 nutlets (open sepal tubes look like holes in the **feotld**
 spike. Petals up to 2 mm long, palp pink to lilac, hairy
 outside; lobe* 4, ± equal, ovate. + 0.5 mm long, glabrous
 or hair>'. Suuncns 4, exerted, tonspicuous; lilamenls ± 3
 mm long, lilac, **tufted** with long inulinitorni hairs from
 the middle upwards. Nutlets slighih **flattened** globose,
 0.6-JQ.7 mm in **diameter**, smooth, pale brown.

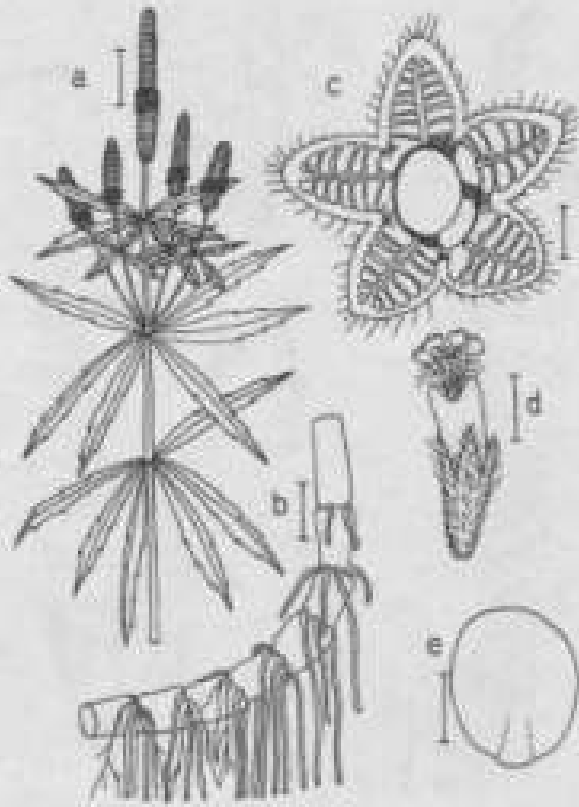


FIG. 233. *Pogostemon steBatus*: a, whole plant (6 mm); b, base of the stem (1 cm); c, fruiting sepals viewed from above (0.25 mm); d, flower (0.5 mm); e, nutlet viewed from the side (0.25 mm).

Annual, perhaps sometimes perennial when growing in water. Mostly found in seasonally inundated places flowering as the water recedes, sometimes in permanent water. It is offered for sale to be cultivated in aquaria for decoration.

{OTen(Hyp/Het)[. Tropical to warm regions of Asia and Australia: Ban, Bur, Cey, Ind, Nep: As, Bh, Go, Kl, Kt, Mp, Sk, Up, Wb.

LEGUMINOSAE see FABACEAE

LEMNACEAE: 4 genera: almost cosmopolitan

Plant body of small thalloid fronds, not or very rarely attached to a solid substrate, mostly free-swimming or free-floating, partly floating or submerged, the fronds solitary or connected in groups. Roots simple, 1-several or absent. Flowers unisexual, naked or enclosed in a sheath (spathe). Perianth absent. Male flower consisting of 1 stamen with a 1- or 2-locular anther. Female flowers consisting of 1, sessile, 1-locular ovary. Fruit a nut or 1- to 4-seeded capsule.

The frond has variously been interpreted as a modified stem, a modified leaf or part stem and part leaf (the latter is the most plausible; I suspect it may be

a modified hypocotyl). Pollinated by insects or, exceptionally, epihydrophilous; the Indian species are probably highly autogamous. The disseminules are seeds <> complete fronds, dispersal by water and perhaps also by surface adhesion to animals (mostly water fowl)-Landolt, E. The family of Lemnaceae — a monographic study. Veröffentlichungen des Geobotanischen Institutes der Eidg. Techn. Hochschule, Stiftung Rübli, in Zürich 71: 1-566 (1986).

1. Fronds bearing roots; budding pouches 2; inflorescences of 1 female and 2 male flowers, enclosed in a membranous sheath; anthers 2-locular, transversely dehiscent

2. Roots solitary on each frond segment; fronds usually 1-3 mm long, without dorsal and ventral scales, the under surface green, reddish or streaked with reddish-brown; nerves 1-5 (-7), often indistinct

Lemna

2. Roots several from each frond segment; fronds usually 4-10 mm long, with 1 dorsal and 1 ventral scale, the under surface usually reddish; nerves (2H 5-15 (-21), usually distinct

Spirodeto

1. Fronds without roots; budding pouch 1; inflorescences of 1 female and 1 male flower, not enclosed in a membranous sheath; anther 1-locular, apical dehiscent

3. Fronds globose, solitary or sometimes mother and daughter connected; budding pouch funnel-shaped with a circular opening

Wolffs

3. Fronds flat, ovate to linear, sometimes connected in groups, often asymmetrically curved; budding pouch deltate

Wolffia

Lemna. 13 species: almost cosmopolitan

Fronds solitary or usually remaining in groups of three or more, lanceolate to ovate or suborbicular in outline flat or inflated, without discrete pigment cells in the epidermis; veins 1-5 (-7); dorsal and ventral scales absent. Roots solitary on each frond. Inflorescences and daughter fronds borne in 2 marginal budding pouches, one on each side at the base of the frond. Inflorescence of 1 female and 2 male flowers enclosed in a membranous sheath. Anthers 2-locular. Carpel with 1-7 ovules. Seeds ovoid, up to 2 mm long, with 8-70 longitudinal ribs, with transverse striations or rarely smooth.

Free-floating or *L. tnera* and *L. trisuka* free-swimming. Usually highly gregarious, large populations may reach pest proportions, some times eaten by humans in SE Asia, a valuable food for wildfowl, also used as fodder and as a source of methane and alcohol.

The following species, although appearing in the account, do not extend into Peninsular India: *L. turionifera* and *L. turionifera* are found in the Himalayas and *L. tnera* found in Myanmar.

h fronds toothed towards the apex* and *namw*d aj* the base ioa persistent green stalk, forming branched chains of 5^B0 fronds, Mitoaaged except wlicn B«*ering

1. Fronds with entire margins and rounded « & < ^{ll(kl)} with a minute and shon-lm-d white «alk, never forming branched chains, rarely more <han . * Irons together, floating on the surface or submerged

2. Fronds 2JM times U long U wide tapering to a long poim a the apex. »box«gea tiutepi when flowering or fruiting

2- Fran* I-J times as long as wide. ± rounded at Ue apex, floating on die surface of the water

3. Root shekth winged at the base: root dp sharply printed (**freat material needed**); «*«» »^{sl} »^{lv} «• ihun 3 cm long; frond* without. a reddbh dflgt o.

3. Root abeaA not winged; root tip mos.lv rtrtrtdfed (frrsh material needed); roous often m««* than 3 en long; tronds, btefl with a redd,sh ungeorwrh reddish sp»Ls j.

4 I -nulls with **dfattect papWae rfoag &e B>dtan tine** of the upper **nwfeee**; the papilla aj the- up «walk» than th<: proximal **papflaei** « ^ 9 ^ « ^ h 30-40 long al rib,; **under** con-

less Lunons dial sttik j

4. Fronds wiflimU distinct papilla aJoag tin modi., line Of OW upper .urface « tf P ^ " thc,» the papilla a. the "P <H«««-l^v longitudinal the proximal papilla ia>dil with lfr4B usually nal ribs; Uirion* Hem d^duped

5. Lowt-r mr&tt of *« t<md red; fronds gibbous, *mat* d»n 1 n*» ^{tlilil lk, la ^ st lac r nae} Sore than O.S m,n in diameter (seen From below); ovarv with 1-7 ovules *• g"

very stikhtlv red4fcb; fronds usually ilaiurn I gibbous, not m or, than 1 mm th,cL, axes less than 0.5 mm in diam L. minor

CUT; ovrvy with 1 ovule

Lemna *L. gibba* nuct. Ind. non Linnac: £ L «*Mr nuct. IwL. non Linnac: *L. perpusilla* nuct. Ind.. non Tortey, /.. *pusillata* nuct. Ind. non Hegelu. *minor* et Hallberg.

L. bfattriMcQaont I- «fcw«»McC»nnl! Fig. **Fronds** floating, **Battened**, **Maw W J*** 1-tir. mm long. 0.8-4.5 mm vide. W (-^ long as **Wide**; the upper smiaee green, beannng be. the one **above** the **BO*** smaller liui. .hr - - a t **tb, dp; vei,» 3. Root, up to SJ>m lonjp ro« sh<..uh** winged, the .ing 1-2.5 **time*** as ***TM B»** " 1 ^ f " **sharpry poinwd** (r«« .n^cna1 **weded**); **Seed- 1JW** fruk. 0 . ^ 8 mm long, **0.3-0-7** mm m d.am.-rr.

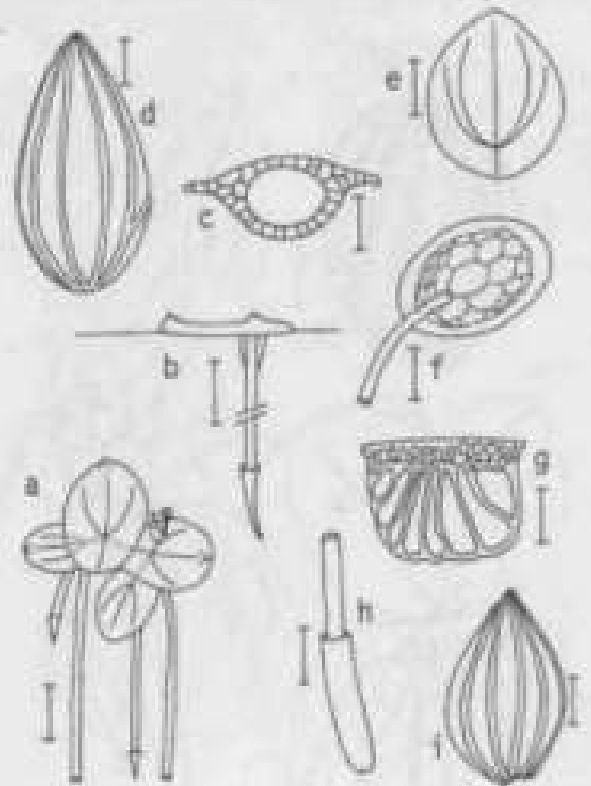
brownish, with 8-16 longitudinal ribs, released from I he fin it when ripe,

IVrennial. perhaps sometimes annual. Usually found in ctttrophic condition-. rOadiide pools, village ponds, hullaloiviillow*. tanks (particularly *tb&K tım'd* for culf- rating *Traf/a*). frequently found in rice fields and in sluggiib canals and ditches. Often growing together with *Spintdrln OS Wttl/fin*.

(0? Pic). Subtropical regions of the world: Han, Bur, Gey, Ind, Nep. Pnk: An. Ap, As, Bh, Dl. Gj, Hp, Jk, Kl. Ki, Mlv Pj, R|. Up, Wb.

Ltmna gibbt 1-inuiieeis: Fig. 234

Brands Boating, gibfcoai, up 10 4 mm thick, L-8 tiim l'»ig. 0.8-6 mm wide. 1-1.5 limes as long as wide: the upper surf me without distiiut papillae ur souiL-umcs papillae visible near the tip ol SMLLI fronds, often with red flecks: veins (3) 4 or ft (7). the lateral vein* orijjinatiig ;tt the node; lower surface gibbous, usually red. largest lacunae mort- ihan 0.3 mm acroiiis. Roois tsualty exceeding 3 cm long; root sheath noi winged; root cap rounded <frrsh



Ftc. 2S4. *irrnna a&pimtriatu*. a, **frond*** viewed Jiom above (2 mm); b. lioiul **viewed** from (hi- side CJ mrrnl; c. root sheaih in tninswntr **wcdon** {UI iun); cl. seed (OJ mm). /, *giWxj*; c, frond viewed lium ibmc *Ci* mm); t, frnd viewed **BIOT** below (2 nim); g, frond in iranmtriv.' (**CCitQ** showing hu uit.ir (2 mini; h, ruoi Lip (0.5 mmj; i, scetl (!)- mm,i

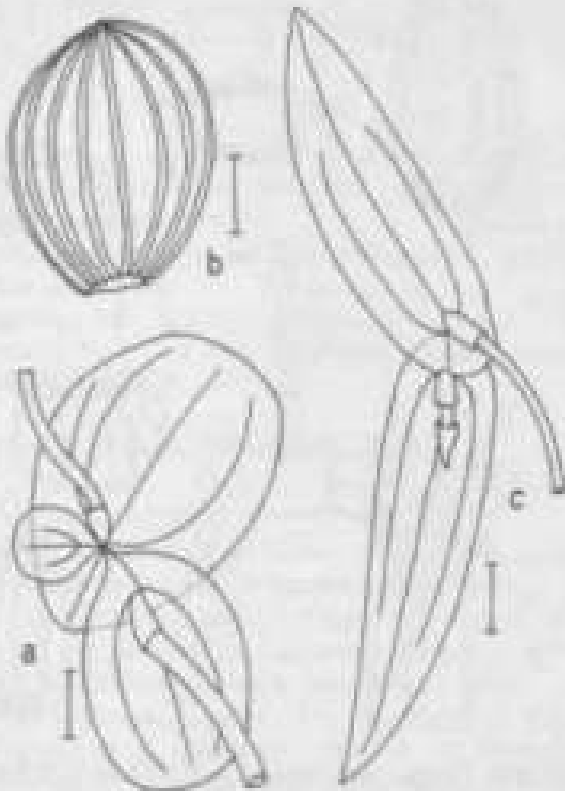
mait-rial needed). Seeds 1-ii per fruit, 0.7-0.9 mtn **IOAg**, 0.4-0.6 mm thick, whitish, with fc-lti longitudinal ribs, released from the i'ruit when ripe.

Perennial or exceptionally annual. Found in a very wide range of aquatic habitats. Usually in mcsotrophk to eutrophic water but not as tolerant a* l., *aequinar-luttis* to extremely etrophic or organically loaded walcr.

[O? Ple]. Almost throughout ihe world in warm and Mediterranean climatic **regions**, naturalized in Japan' **End**, Pat: Cj. Jk. Pj.

Lemna minor L.f. Fig. 236

Fronds **floating, Banased**, nor more than 1 mm thick, 1-8 t-10> ma tOQg, 0.5-5 mm wide. 1.9-2 times as long as wide: the upper surface with indistinct papillae along (he ndvein, the papillae near **the** tip and near the node larger ihan the ones in **between, RPCen** or linked **w&b** rod but without **red Becks**; veins 4 or 5, the lateral veins originating away **from** the node: lower **surface** (lu or round-d hut not gibbous, very slightly reddish, largest lacunae less than 0.3 mm across. ROOM usually exceeding S cm long: **rodH** sheath not **winged**; root cap rounded (fresh maerial needed). Seeds 1 per



Fr>. 255. *Lemna minor*, a, frmiU vu'wi'il horn brims (1 mm). b, >><fd (0.2 mm). / . Men c Ironds viewed **from below** (1 mm).

fruit, 0.7-1 mm long, 0.4-0.6 mm in **diameter**, whitish, **With** KM I) longitudinal ribs, **retained** in the fruit «**> ripe.

Perennial Found in a very wide range of ;iqui'ik, habitats, Usually in **mcsotrophk** lo cililrophir waUT-

ll'Iel. Ckx>lc regions u~ **the** N Hnnisphrre, natural- ised in Australasia: Ind. Nep, Pak: Hp. Jk. Sk. Up,

Lemna tvnerv S, Knrv: **fljgr, gjfi**

Fronds submerged **accept** when **flcrtwang** <^r friJ,1, ing, llaucnd, **elongate,, capering to u long pomteA >>• rOUQded U** the lw.se with a snial \ditte **itipe lhal tOSfi** decays. 3.3-9 mm long, 1.2-3 mm wide, 2.5-4 times ;< long as wide: the upper **nr&ce withoai papUhe< ^rcen**; **veins** S. indistinitL lower green. **Rood Vp W 2^> mn^** long; nK] sheath not winged: rotii cap roundel- Fruit* unknown.

[Ple/Ple]. Humid tropical SEafUL Bur (Pegu).

Lemna titular JInnaeus t *L. frudatn* Roxtmrgli]: Fig. 237

Kronds **mhmerged** except when **Qowedng or ln''j** ing, **remaining** together and **often** forming hn> abet chains. **Battened**, narrowly (jvate, with the **margin** (ooihed **towards the tip. naitawed** at the base w³ P r' sliiirnt **gr<<D** st.Uk. **3-15mm** long (**otcloding *<** **Stalk**), 1-5 mm wide, 2-fl.ft **times** as long ai wide. jW Malk 2-20 mm hniR. **the** upper suilact- without **pap*** lac, green or reddish; veins (1)3. **RoOll up W *rj'''JJ** long; root sheath not winged; **rotit** rap pi tinted (**frew¹** maerial needed). Seeds **I** pei **fruit, 0.6-1J** "" "" lo1^! 0.i>-0.8 mm m diametr. with 12-18 loiiigiuidiii.il rib*, retained in **the** fruit when Hpc,

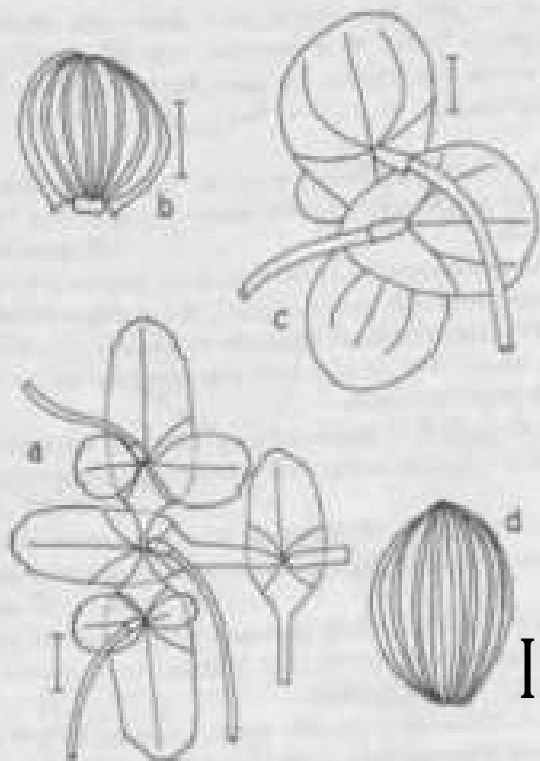
Perennia). Found in still water in **radMC |hrft>e^ & uatJotu, often benveencmetwsal reeds**, li is + f'1,1,11111 to **tnCSOtrophk** water. Sometimes m.iv develop **6urio>J**

IPI/PIJ. Cooler regions of ihe world: Ban, l''d, Pak: As? D? **JkMnR|Uwt**

Lemna twimifera E. Ijindoll: Fig. 238

Fro mls floating. gShboia, **up to 2 mm** thick. 0.8-3.5 nun bng, **0.8-8J on** wide, 1-1.> **t&Bie ** !nn;i** as **Wide**; the upper surfare with disiinct papilla' - lltinK **the** wins, the papilla **near** the tip not larger than *£ **othe**'s. green and **sometfraea With** red flecks **esp. &W** **nes**I the tip; **veini 8**; lower **SUT&ce** gShbou.-. **reddish**. **largest lacunae usually** less dun OS mm **acro>** Ro>J UNUllv **eswe@dinK** :i <m long: root sheath not winged; root cap UM.;,|V **rounded** hut K>mctimeB **poitW"** (>r nirely rootless when **developingolfv<** to brown **curiote**. Seed* I per fruit, U.rMt.8 mm long, ±IKS mm in d **lame** Wr, Whitish, with ftM30, **indiitinct**, longitudinal ribs- retained in the riiiitwhtni tip.-,

Perennial, Turioni sir.k **add** remain ai the k><nrTl during the **cold period**.



upper leaf surface visually with a red fleck above the node; unions may develop
S. ptyrhixia
 2. The lobe which covers the point of attachment of the roots perforated by 2-5 roots; upper leaf surface without any red fleck; unions never develop
S. intermedia

Spirodeta intermedia W. Koch: Fig. 237

Like *S. ptyrhixia* but 2-5 roots perforate the lobe which covers the point of attachment of the roots, red spot on the upper surface of the frond does not develop.

[Pie]. Tropical and subtropical S America, introduced in India: <Ind: <DI (known only in botanical garden in Delhi).

Spirodeta ptyrhixia (Linn.) W. Koch: Fig. 237
 Like *S. ptyrhixia* but 2-5 roots perforate the lobe which covers the point of attachment of the roots, red spot on the upper surface of the frond does not develop.

[Pie]. Tropical and subtropical S America, introduced in India: <Ind: <DI (known only in botanical garden in Delhi).

FIG. 236. *Utricularia* spp. fronds viewed from below (1 mm); b, *U. (K1 -)*; c, fronds viewed from above (1 mm); d, seed (0.1 mm)

[Pie]. Temperate Asia: India, Mp.Jk.

Spirodeta: 3 species: almost cosmopolitan
 Frond, floating on the surface of the water, lanceolate or ovate, with brown punctate cells in the upper surface. Roots 2-21 on each frond. Widespread in the tropics and subtropics. Fronds borne in 2-ranked buds. Inflorescence of 1 female and 2 male flowers. Ovoid seeds longitudinally ribbed. Fronds floating herbs, often forming colonies and growing with Lemnaceae.

1. Fronds 1-4 times as long as wide, the upper surface without papilla: the lobe which covers the point of attachment of the roots rarely perforated by more than
2. The lobe which covers the point of attachment of the roots rarely perforated by more than

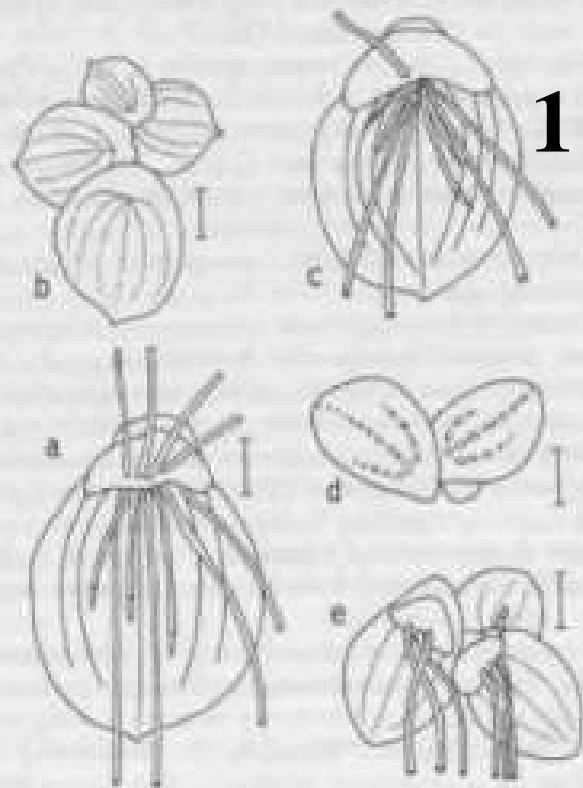


Fig. 237. *Spirodeta ptyrhixia* a, frond viewed from below (1.5 mm); b, frond viewed from above (2 mm); c, frond viewed from above (2 mm); d, frond viewed from above (2 mm); e, frond viewed from below (2 mm).

surface usually with a red fleck above the node; veins 7-16 (-21). Roots 7-21, rarely more than 1 perforates the lobe which covers the point of attachment of the roots. Seeds 0.7-1 mm long, \pm 0.7 mm in diameter, with 12-20 longitudinal ribs. Turions may develop.

Perennial. Usually found in eutrophic conditions, mostly in lakes and large tanks (particularly those used for cultivating *Trapa*) or among reeds, often growing together with *Lemna* or *Wolffia*. Plants very rarely flower and fruit. In unfavourable conditions the fronds sometimes develop turions (small orbicular to reniform, brown to olive green fronds without roots which sink), they may remain viable when buried in mud during the dry period.

{Pie}. Almost cosmopolitan: Ban, Bur, Cey, Ind, Nep, Pak: As, Bh, Dl, Hp.Jk, Kl, Mg, Mh, Mp, Pj, Rj, Sk, Tn, Up, Wb.

Spirodela punctata (G. F. W. Meyer) Thompson [*S. oligorhiza* (S. Kurz) Hegelmaier], Fig. 237

Fronds lanceolate to ovate, 1.5-2 times as long as wide, 1.5-8 mm long, 1-5 mm wide, usually pointed at the tip; veins 3-7. Roots 2-7 (-12), all of which perforate the lobe which covers the point of attachment of the roots. Seeds 0.8-1 mm long, 0.5-0.6 mm in diameter, with 10-15 longitudinal ribs.

Perennial. A poorly known species in India. Flowers and fruits occasionally, fronds do not develop turions.

{Ple}. Probably originally a species from the Southern Hemisphere and E Asia, now almost cosmopolitan in warm regions: Ind: Dl, Mh, Mn, Wb.

Wolffia: 10 species: almost cosmopolitan, absent from colder regions

Fronds floating upon or swimming just below the water surface, solitary or 2 remaining attached, inflated, globose to ovoid or sometimes conical or nut-shell-shaped, with or without pigment cells in the epidermis; dorsal and ventral scales absent. Roots absent. Daughter fronds borne in 1 funnel-shaped basal pouch with a circular opening. Inflorescence of 1 female and 1 male flower, without a membranous sheath. Anthers 1-locular. Carpel with 1 ovule. Seeds globose, smooth with a spongy outer layer.

Very small, rootless, free-floating or free-swimming herbs. Of no known economic importance but frequently cultivated as a curiosity because it is the smallest flowering plant. Landolt, E., Taxonomy and ecology of the section *Wolffia* of the genus *Wolffia* (Lemnaceae). Berichte des Geobotanischen Institutes der Eidg. Techn. Hochschule, Stiftung Riibel, Zürich 60: 137-151 (1994).

The name *Wolffia arrhiza* has been used rather indiscriminantly in India; in the correct sense it is a species

found in the Himalayas and does not extend to Peninsular India. It is possible that *W. angusta* does not occur in India; it has been confused with *W. negUcta*.

\ Fronds subglobose, with an up to 3 mm long tapered projection on the lower surface, the margin toothed *W. microscopica*

1. Fronds ellipsoidal or boat-shaped, without a tapered projection on the lower surface, the margin entire

2. Fronds with their greatest width at the surface of the water, at least 1.5 times as deep as wide; stigma with pigment cells

3. Fronds 2-3 times as deep as wide, whitish-green on the upper surface with bright green margins *W. angusta*

3. Fronds 1.5-2 times as deep as wide, intensely green on the upper surface without green margins *W. negecta*

2. Fronds with their greatest width just below the surface of the water, 1-1.5 times as deep as wide; stigmas not pigmented

4. Fronds shiny on the upper surface, bright green (not transparent), with (10-) 30 (-100) stomata *W. arrhiza*

4. Fronds not shiny on the upper surface, pale and transparent green, with 1-10 (-15) stomata *W. globosa*

Wolffia angusta E, Landolt [*W. arrhiza* auct. Ind., non (Linnaeus) Horkel, nee Wimmer]: Fig. 238

Fronds floating at or below the surface of the water, boat-shaped, with the greatest width at the surface of the water, 0.5-0.8 mm long, 0.2-0.4 mm wide, 1.7-2.5 times as long as wide, 2-3 times as deep as wide, with 8-10 (-25) stomata, whitish-green at the surface with more intensely green margins. Seeds 0.3-0.4 mm long, \pm 0.25 mm in diameter.

Probably perennial but perhaps also annual. Found in tanks and village pools in rather eutrophic water.

{O? Ple/Pla!. Tropical and subtropical Australia-Singapore, Malaysia and perhaps West Bengal: Ind?: Wb?

Wolffia arrhiza (Linnaeus) Horkel: Fig. 238

Fronds floating at or just below the surface of the water, spherical to ellipsoid, with greatest width just below the surface of the water, 0.5-1.5 mm long, 0.4-1.2 mm wide, 1-1.3 times as long as wide, 1.25-1.5 times as deep as wide, with 10-100 stomata, bright green at the surface (not transparent). Seeds 0.4-0.5 mm long, \pm 0.4 mm in diameter.

{Ple/Pla}. Europe, Africa, W Asia and NW Himalayas. perhaps introduced in Brazil: Ind:Jk (Srinagar).

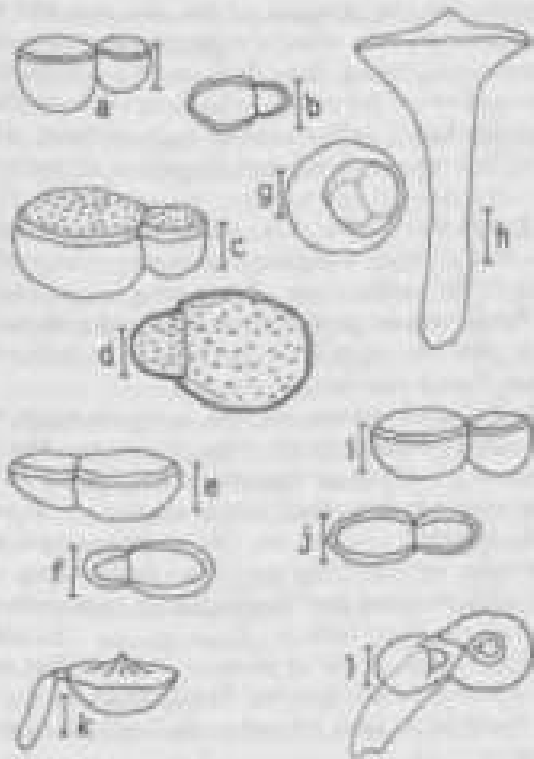


Fig. 238. *Wolffia tinguila*: a, frond viewed from the side (1.4 mm); b, detail of stem node (0.4 mm); c, frond viewed from above (0.4 mm); d, longitudinal section of stem (0.4 mm); e, detail of stem node (0.4 mm); f, detail of stem node (0.4 mm); g, detail of stem node (0.4 mm); h, detail of stem node (0.4 mm); i, detail of stem node (0.4 mm); j, detail of stem node (0.4 mm); k, detail of stem node (0.4 mm).

Wolffia globosa (fotxbiii-gh) dt-n Hartrjg « van der Pbis (W. arctica and. bid., nort FL&UW«») H^k^-, r»« Winum-r. VI, dfHiiw. <(fif''t-~>» S. Km/|: Rg. 238

Probably perennial. Frond* Moating at or just bdovv (>> surfatv OBffite hater, t'Dip.soidal wiib prt^iest wicllh slightly below ihe amftce of Aib waifJ, 0.4-0.8 mm long, 0.5-0.5 DUO wkU\ LA-2 Hmts as long as wide, 1-1.5 JJmcs 35 rfrL-p ^i wide, with 1-10 (-l'>> siomata, rather pale ami iimispirently &&&» h*.' \$^{1}r^a<;. Seeds unknown.

We.-PlitJ. Tropical *n(\ wurm rflgtena of F. AsU and Africa, natural?<d in N America: Ban. Flur. Cry. lad, Nep, Pac- Ap. As l>J GJ, 81. Mp- Pj- Rj- T- U- P- w' -

Wolffia micrvtopica (Griffith) S. Kurz; Fig. 238
Frond* JlfKung «*(the wfiibe »f the vater, 0.4-1 mm long, 0.5-0.5 unit wide. 1-1.5 times M Jong as widr, F^{1e} g''cn. ihe upper surJaci: sMfjorhienlar with 5-10 teeth

along the margin, with 5-10 sunn^ia, ihe lower surface tapering downwards into i 0.4-3 mtn lung and conical 10 cylindrical (someLimits almost cootKke) pjection, not devt'lojiiiiivf < urions. S<t-dj. ± 0.3 mm t<Jig, ± 0.2 mrm in di ametes.

Probaliy :uimial perihaps jjto stjrnftnncs pt-i«-tiiiil; li BowerJ and Brute pi'ofust'ly. prtismnably passing ihe dry xtiLson asteed,

√QYt Me/Kal- V-ndcmic to Bangladesh, tndi;i and Pakistan, >» Liruku iy in warm tegLOM fttff) a dry sex)ton; N [ndi'm plain: •lian, #tnd, *I>ak' Ap, 1), C). Mr.Tri. Up.

Wolffia t/E. Utndolt: Fig. 23S

Fronde luuatinn at or below ihe siuf^ce ni tu-wairr, boat-shaped, with ihe grcawat wirjtJ ai t)«- s«rfl«f of the waler, nearly ntj transhicciit edgt* visible from above, 0.fr-<)9 mm long, 0.'M).6 mm wide, 1.5-1.7 limes M lonjj ss wkle, 1,5-2 times H deep a\ wtde, wii h 8-20 stomata. Stigma with pigmeni celU. Seeds unknown.

A pooily known species. l'robalily pcesonial but perhiaps a3so atmviaL Found in wnlui and villain pool in ratJifj- eu&ropfefe mtter

IG? IV/I^In|, Endemic tu the Indian subcontinent; #Cey, »Ind, •Fuk:R, Wb

WblfirUtt. 9 *pecies

WW/jaJa /twlina (RntTtncau4flilL-) Mon.,d: Rg. 238

Fronde /Joining upou or jwimming JIM! btflotr the water surface or sometimes just ttit base in contatt ivith air. solitary or 2 remaining aitacht-tS, ihm. ovate lo tnptioid, 1-3 mm long, 0.8-2 mm wide, wilh or wilioul 1-celcd mmfriml tet-ih, without pigment rtili in the ^piciennis; ntrivcs a>win; dotsal and vt-mnif scalfs abwnt, Ruuts absent. Daughter Qxmdl Ijonic in a detiate and flat pouch. Inllorescence 1 on each frond, wrthotJt a membranam sh^afh, Anthers l-kM:ular. Carprl with I ovule. Stt-ds globose or ovoid, 0.3-0.4 mm long. 0.25-0.3 mm in diameter, sinotnh with 3 spungy ouitr J^ycr.

Pprciinisl or pt-rh;ips sometimes annual. Not very gregarious, usually Found mixed with other floating plants.

10? Plc/Pla!. Drk-r regions of Africa, introduced in Jurtui; <Iri(i: oVp 196S (HydrMtad),

LENTIBULARIACEAE: 4 gtnera. I with wetland sfwrifs in India

VtriaiUtria: 214 species cosmopolitan

RoOtcSS, iir<-swimiiuig, Gne&Bqo&Dg nr lixed by rhi-/oitls (root-like appendages) a emetgett, mo\$Vy atob^niferons, minecbiies devdoping tubers or bttsooa (modified buds). Leaves ftiiher capillary and usually

much branched or entire then linear to spatulate, reniform or peltate. Traps bladder-like, ovate or globose, usually shortly stalked, develop at stolon nodes, leaves or sometimes at the base of the inflorescence stalk. Inflorescence a bracteate, usually solitary, simple or rarely branched raceme. Flowers bisexual, bilaterally symmetrical, usually showy and brightly coloured but sometimes insignificant and cleistogamous. Sepals 2. Petals 5, united at the base forming 2 lips; abaxial (lower) lip spurred or saccate. Stamens 2, attached to the base of the petals; anthers dorsifixed. Ovary superior. Fruit a capsule, 1 to many seeds; seeds very variable in size and shape, sometimes with glochidia (small hooks).

Perennials or annuals. All bear bladder-like animal catching traps. Submerged, planktonic, free-floating with specialized floats, anchored to the substrate by specialized organs or emergent {tenagophytes or helophytes} with laminate leaves. Pollination entomophilous or autogamous, sometimes cleistogamous. The disseminules are seeds or specialized tubers or buds (turions), some are dispersed by water, others by animals and perhaps also by wind. Many are cultivated for decoration or curiosity, Taylor, P. The genus *Utricularia*. Kew Bulletin, Additional Series 14: 1-724 (1989). This work has been used as the basis for the illustrations.

Excluded: the following species are found in the Himalayas or in Myanmar and do not extend into Peninsular India: *Utricularia brackiata* Oliver; *U. christopheri* P. Taylor: *Ind, *Nep; *U. corynephora* P. Taylor; *U. forestii* P. Taylor; *U. minor* Linnaeus [*U. rogersiana* Lace, *U. nepalensis* Kitamura]; *U. furcellata* Oliver: •Ind; *U. involens* Ridley; *U. kumaonensis* Oliver; *U. multicaulis* Oliver; *U. punctata* Wallich; *U. recta* P. Taylor; *U. salwinensis* Handel-Mazzetti.

1. Leaves divided into narrowly linear or capillary segments; submerged aquatics, usually planktonic; traps borne on leaves floating below the surface; bracteoles absent

2- Leaves sparsely forked with rarely more than 6 ultimate segments; adaxial (upper) lip of the petals as large or larger than the abaxial (lower) one and usually 3-lobed *V. gibba*

2. Leaves many times forked with 10 or many more ultimate segments; adaxial (upper) lip of the petals smaller than the abaxial (lower) one and entire or 2-lobed

3. Bristles on the margins of the ultimate leaf segments and the ultimate rhizoid segments each arising from the apex of a short acute tooth or multicellular swelling; outer surface of the petals glabrous; inflorescence stalk bearing scales below the flowers and without a whorl of inflated organs at or near the base

U. australis

3. Bristles on the margins of the ultimate leaf segments and ultimate rhizoid segments absent {terminal only) or arising directly from the flat margin; outer surface of the petals pubescent with simple or glandular hairs; inflorescence stalk without scales but with a whorl of inflated organs at or near the base

4. Petals white with violet veins; sepals forming a flat disk in fruit, completely enclosing the capsule; style in fruit more than 1.5 mm long *V. trifida**⁰

4. Petals yellow; sepals spreading and reflexed in fruit, not enclosing the capsule; style in fruit rarely more than 1 mm long

5. Inflated organs on the inflorescence stalk stalked, arising from near the base, fusiform bearing leaf-like or rhizoid-like capillary segments at intervals along their entire length *V. aurea*

5. Inflated organs on the inflorescence stalk sessile, arising from the distal half, short, ellipsoidal bearing leaf-like capillary segments only from the distal half *V. stellaris*[^]

1. Leaves entire, linear to obovate or orbicular; emergent aquatics or helophytes, firmly fixed in the soil; traps borne in or near the substrate; bracteoles present or absent

6. Bracts subtending flowers, attached at some point above the base or produced below the point of attachment to the base (basisolute)

7. Leaves peltate; bracts and bracteoles very shortly basisoluate; trap mouth with a short abaxial projection fringed (as in the abaxial lip of the trap) radiating rows of gland-tipped trichomes

V. pubescent

7. Leaves not peltate; bracts at least distinctly basisoluate; trap mouth without a short adaxial projection and without radiating rows of gland-tipped trichomes

8. Bracteoles absent; leaves narrowly linear, not differentiated into petiole and blade *U. subulate*

8. Bracteoles present, resembling bracts; leaves usually petiolate with leaf blade obovate to transversely elliptic

9. Sepals slightly unequal, almost alike; abaxial (lower) petal lip entire; traps with a funnel-shaped rim, the adaxial side produced into a beak; seeds without glochidia *V. caerulea*

9. Sepals very dissimilar, adaxial sepal much larger than the abaxial (lower); abaxial petal lip 5-lobed; traps without a rim, without an adaxial beak; seeds with glochidia

10. Adaxial petal lip longer than the adaxial sepal; plant developing ellipsoid to fusiform tubers along the stolons like a string of beads

U. bifurcata

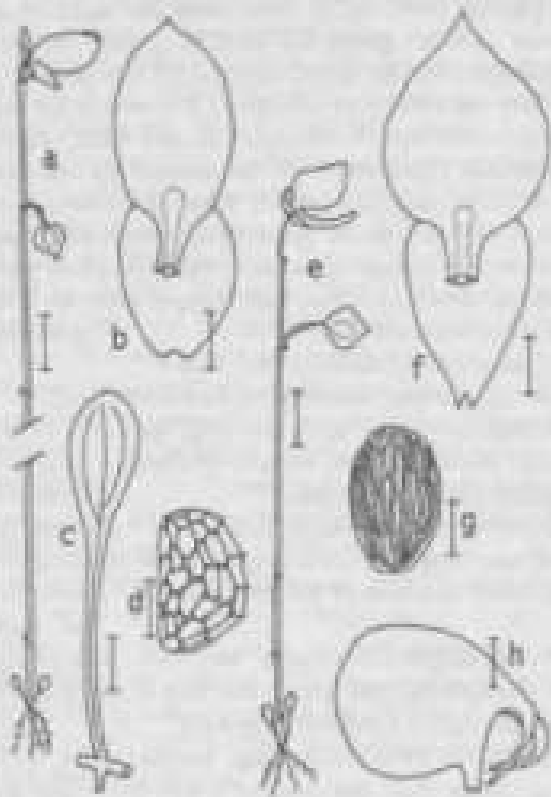


Fig. 239. (*Utricularia armaria* H. & A.): a, flowering plant with stem shortened (stem); b, sepals at anthesis (1 mm); c, leaf (1 mm); d, capsule (0.1 mm). *U. ramosa*: e, flowering plant with long stem; f, capsule (1 mm); g, seed (0.1 mm); h, capsule (0.5 mm).

Seeds **obliquely Ovoid**, 0.3-0.33 mm long, seed cells elongate, with the anticlinal **border** raised, \pm straight, with distinct, triangular intercellular space*, inner peridermal walls concave, **smooth**.

Probably **annual**. On wet rocks and damp soil. Very small in fruit. **Wider** and seeds different.

[O? Hel/Ten], **Endemic** to India: *Ind: Mh. **Low** to medium altitudes.

Utricularia aruata Wight [*U. ogmosperma* Blatti] McCann: Fig. 239

Like *U. graminifolia* but rhizoids few, branching. Leaves **small**, very small, up to 5 mm long, **S-nerved**, petiole **short**, the lamina **narrow**, 0.5-1.5 mm wide, **apex rounded** to **obovate**, inflorescence erect, 6-20 cm long, **pedicels** ascending at anthesis, \pm spreading or declined in fruit, up to 17 mm long, Sepals **oblong**, accreted, 1-6 mm long. Perianths 12-15 mm long, **blue*** violet, with a white patch at the base of the abaxial

(lower) lip; adaxial lip not or not ninth longer than (ho arlaxia! sepal; pilau* with a raised hairy rim and \siili A prominent **tonic** at **HL** side of its distal margin: spur **subulate**, strongly **triverted**, very **slender** (\pm 1 mm wide at tip). about \approx 8 long and \pm parallel with the **abaxial** (lower) lip. apex acute. Capsule \pm 2.5 mm long, **completely** concealed by the **accrescent** **leaves**. Seeds **narrowly** ellipsoid or **noid**, \pm 0.3-0.35 mm long; seed **cells** very **soft*** **in** relatively narrow, the **antidote** **botanics** \pm **atright** raised, smooth, inner peridermal walls **tabular**, smooth of rough, with a few transverse **wrinkles**.

Perennial and perhaps sometimes annual. In seasonally **hooded** **art-jw** and wet grassland,

10? Ten). Endemic to India: *Ind: Go. Kt. Kl. Mh. Or? **Low** in **inclined** **altitudes**.

Utricularia armaria A. P. dt **latidolle**: Fifi. 240

Rhizoids arise from the base of the **inflorescence** stalk, numerous, simple, capillary. **Stolon** **leaves** **sparingly** branched, **tapil**; **leaves** arising from **the** **base** of the **inflorescence** stalk **and** from **stolons**. **leaves** 0.2-0.5 cm long, 1-mm wide, petiole (the **limb** **obovate** **to**



FIG. 240. (*Utricularia aruata* Wight): a, flowering plant with long stem; b, trap (0.1 mm); c, base of plant with stolons, with roots, with **trichomes** and **base** of **inflorescence** stalk (1.13 mm); d, **capsule** (0.13 mm); e, **cross-section** of the **capsule** (0.25 mm) with surface **pitted** (insert).

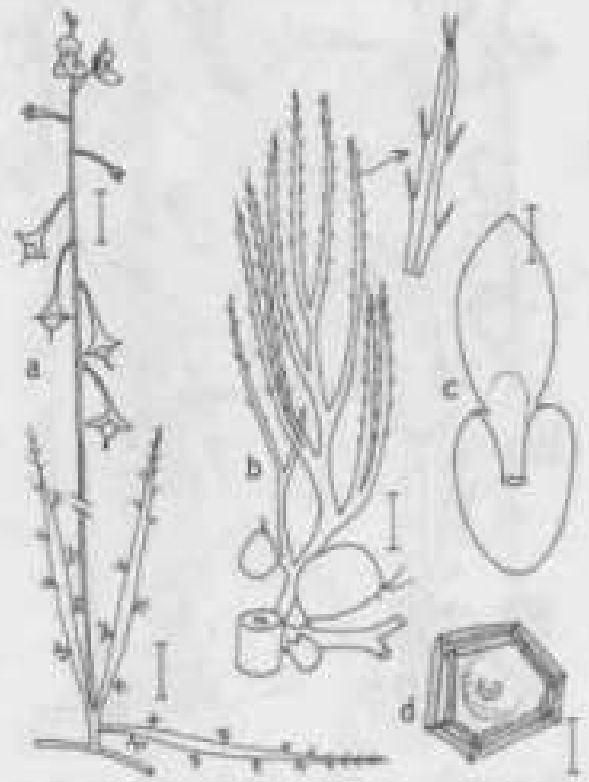
"wlv nhovate, 0.5-2 mm wide. Trapsovmd, **WW** »»" long, me- **mouth** termini, with 9 dorsav **Rattened**, rounded, **adasdal** appendage and a hut much ihortt-r abuttal aptiendage, hoih wiU **tad>fr** in_B c₂, ii. b-lik_c **rows of talked ghm** ^ «»^{ll<} r_{tr} S_u M< r stajk creel, solitary. 2-20 cm long, glabrous above, **usually papillose beta***. Brat is attached by the base, ovate, ± 1 **nun long**, apex **acute**, **K** «W aibwndmg dormant or **aboaed** buds. **BraCieolea** narrowly oblong ± a, long the bract. **Blow*** 1-5 H***; **P** ^ ccb rrtxt. ffljbnii, terete, 0.5-1 mm long. Sepals **MbeqiWl. 1-2 mm long**, glabrous **adaxial MpaJ** broadly **ovate**, **acute apex**: abaxial (lower) sepal sbgnily **narrower**, **apex obtuse or rounded** Petals 3-7 **nun long**, viok-i. **lilac o) white**; **ndaxfau** lip yellowish, **cwutrtaed above the middle**, with the interior **pan deltoid** and the ***»!***-rior part narrower, **oblong**, **ape* crwooue** or «anar-girwtc; abaxial (lown) **lip With *** yeUow hlntch at **UW** base, ± circular, with 2, Jongitudinnl. slighUy **raaed**, **JtdOOlh** or u-ansverscly wrinklrd **crtsW**, ap«! rourul^l «-n...v or **create**; **pfl4i« ma** ^ » **papiHoW** par narrowly **conicaUuhulate**, straight or curved, ± Z mt>:s long as **the abaxial (tower)** "P- ^ **K** » t t «urT ed, ± 1 mm imw; **anther thecae almwt** distmcu **Capsule** **ove**, 1.5-2.3 mm long, dehiscing by aAocul and tiU. [**ongitudfani**, maigimilly thitkcn<l s us »ceds obovoid^onical. **siigbxrv angular**, ± **OSS** mm long.

In seasonally Hooded areas, mostly i" shallow or **peaty** soil bin also in **manhafa** and **Sjw«pj B** (O **Hel/Teu**). Alrii^ **with** 1 record in India: Ind: (I'M: lunar Eii).

Utri **Roxtiurjrh. I" fimftn'ifohn** Jackson ex U. **Don**: Fig. 241

Rhizoirls usually **pTCaCH** at die **base of** the ml Uw -- **cence M.ik**, <i.luT **A on** and **towar** or **Hnn^u-d** and **inflated. M_p** to **1l**) cm **tang**, bearing **leaHike** branrhc^ **Stolons iHinrin**, ir,ru-. **branched**, **papilloie**, up io i m lon_B, **d.i-2 nun thick**, **vmt^xm Inarfng** ^'P¹ ^" rro,, **tiie lias**, into S^ **priman' BBfenP** or so **inflated** aegmcnis. the «*ondaigy segi each **pinrifl** forked from the **b<™ tott num** . ^ further **Kgrneots**, the I'Himate «gmcatt usually with .ont, bristle; «**Ipute**e auticto** present ai the hasc of (fa« **primal? scgn^nts**. 1 dimorphic, mostly **lateral on d<= ^cotid.»r>** * **leaf i^meno**, **obHquely** ovoid. 1-4 mm ong mouth lateral, naked or with **I** **brirtU^fce** appendage «h«» **b>e of prim,,, KpM** wbgj** **J** **bwat**, usually **wttboui oral** **appeadajpa Infioere*»*****

frJabrous. Stales absent. Bi^tis ba^fixed. broadly ovate to circular, apex rounded. 1-2 mm long, ohsoirdy jientrd. Bracieoles absent. Flowers 5-10j ilu- axis initially short, becoming **elongated** in fruit; **pedicels** dorsoventrally compressed, 0.4-1.2 cm long, trect at iimhesis, «u«H> sharply deflexcd and **dlkkcoed**, espe- i iallv distaUy, in Inni. Sepals subequa! (abaxi.tl wpal often slighly broader). ov-alc, **ape* rounded to sub* CUC**, S-3 **DD** long at mahesLs. **bococailg** ± Mrshy and much larger, up to 9 mm Umg juid ^**treading** or reflexcd in fruit. Petals pale yellow with reddislvbrown v«!ns, **L-35 tm long**, **glabrous** to densely pubescent; adaxial lip broadly ovate, apt-* rnrurled: ;ibaxial (lower) lip limb transversely eliipical, the Swse with a **prominent, 2-lobed iwd£ng**, **apex roun4ed** br **emarginate**: palate [itibsceni; spui c^tttdrfe*! from a narrowly conical base, often somewhat constricted nc-ir the middle, apex obtuse or Mibacute, about as **long and parallel** willi the abaxial (lowcr) lip. **fiameaO CUIVed. I-15 mm** l''^1^ iu'liier ihecac ± confltum. (, ipxile globose, up to 5 mm in **diameter**, the wall iehilivdv **thick and Bkaby**, **cuxMnysciMibJ**, the per^Niem style **greats** enlaiged. ± as long or longer **than** the



Rc. 241. (*triniltiria aurra*: a. **plant with Boat**) and inflorescence **tadk<hoftened(1 cm)**: **b, meaofaf W lafftial** with large and imall mips, with **enlarged tip oi :>lad tegmem** (inset) (1 mm); **c. Kpab Bl Linihi>i>** /1 mm h <l, seed viewed rti.Mii above H>A mm).

capsule. Seeds disk-shaped, \pm 5 angled, 1.5-2 mm in diameter, narrowly winged on all angles.

Perennial *perhapt* IQueUilKg annual, Ftarifctonic or anchored by thixoids \leq v sioUms. In tanks, pools, backwaters, rice hckls. ditches and canals. Usually found growing emtnglfd in other aqualic plants. Flowering throughout the year hut reaching a peak after ihe rains. It is considered io lx- A ptrst in pools used tor fish i ttlntpe.

(O? PlaU S and E Asia and Australia: Ban, Bur. (ley. Ind, Nep, Pak: Ap. As. fth. 01, Go, |k. Kl. Kt. Mg, Mb, Mp. Or, Pj, Rj, Tn, Wb.

Utricularia amtralis K. Brown ((/ , tWgHrw atKL Ind_M DOO l.innaem|: Fig. iH2

Rhisoids usually pn-srui. Jew, Ulitonn. bearing nunu'tous short. torko<l branches wiili narrowly o\oid, papillose utiiniatie wrgmentii bearing apital brisiks. Sil>Ions filiform, branched, terete, glabroiou, up to 50 cn^ l<ng, 0.3-1 mm thick. **Leases** wvy numerfiiK, 1.5-4 cm **long**, dhidrd from thr baat' into 2 \pm equal,

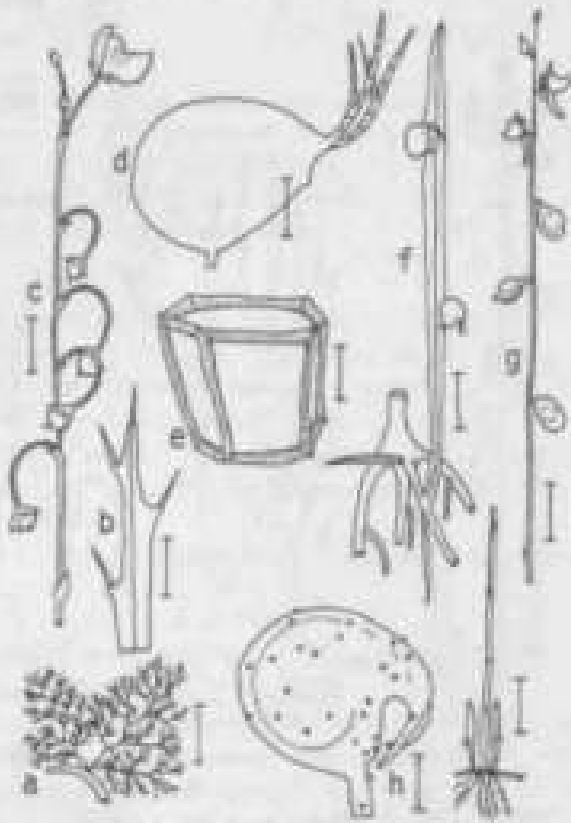


FIG. J «. *Vfinilunn* imWiC a, leaf (1 cm); b, tip of ultimate F.W scimrnt (0.2 mm); c, **Inflorescence** (1 cm); d, trap (<0.1 mm); e, *-ed <X.1 mm). K hfuin. I. **but** CA plitnl with smlnnv rhizoid*. leaf, traps and **InfimfM. rtace** walk hasr (1 mm); g. wlu>tr pl.nn wi(h mflurcscncr walk shoncntrtl (1 cm); b, irjp (0.2 nun).

primary segments, each \pm pinnately divided, the ondan^r segments forked into further segment* iiiiitK- scgmriUs capillary, somewhat MattKnc^{fi} an<l beariu^ niinutc bristles, \ve lateral bristles each HiffH*£ from thr apex of a short **UUtG tOOtb**. Traps dimorphic, arising laterally from secondary to pt'tiuhimaM l&* segments, also at base of **the primary segment*** the lateral **Dn^KOVtd, 0&-&5** mm long, ihf inoinh lawr.ii. wiUi 2 adaxial. simplr or sparsely branched hrisile-likr **Kppea&tgea** and iisnallv with thr basal mips ovoid. Mir mouih basal, naked or with. 2 vrvv short bristMi^^l appendagts. inJlort'scrnce ilalk wrakly *creci*. fiit;t-**gent**, l(>30 (-l(M)) an long, **filiform**, terete, ghbi''is. l-2 mu) thick, at firs! straight litter **becoming** tlexiunis- Scales 1 (-3), always preseni on *the* adaxial **haftd**^{tlif} inflorescence stulk, sitnilar to the bracts. Bracts basifixtd, \pm riirular, **the** h;isc i or obscurely 5-iooihd, 3-5 mm long, many-m Bratteok'sabstin Flowers +-10; the axis i l h **becoming** clongaud in truii: **pe^lStcte** tiU 1.5-3 cm long, treci at iinthesis. drciii^cd in St-pals suhcqual, ovate, V4 mm long: adaxiitl with **rounded** apex; abaxial (lower) sepal Pemls yellow with the **basal** swollen piui of the (lower) lip mutli **darker and** with reddish-brown **and** spots, 1-2.2 cm long; adasial ltp very broadly' *ovate*, apex rt'lLisr; abaxial lip liEiib rt'niionn or **ttattr** vcrst-ly **cllipticHl**, ihr baso with a very prominent **swelling**, ihe distal pan \pm flat, up to 1.8 CW wide, a!** roundrd or rt-iusc; palate glabrous; spur- coniral, apex obtuse, sliiitly cur\cd i shoru-r than the iibaxial (lower) lip. Filaments cu \pm 2 **mm** long; anther ihecac distinct. Caps^{le} exiremely rare (never seen in India), irlolvvsr. lip "l 4 mm in **diameter**, tnatmsdssik. **Seeds** prUinaif- +^> angled. \pm **Oil** mm long, narrowly winged on all ^<itfl<^

Perennial. Planklonic. In **take***, poofs, river bacWaters and ditches- It grows in both still and slotvl. **Bowing water. Apparently remaining HMtOt** in India.

It!...}. **Widelydtributrd** in the Old World Africa, Asia, \ISH;ILIM:I) in ttimperflie and reffion-s: Bur. Cev, Ind, Ntp, Pak: Hp.Jk, Kt. Nfg. R}, Tn, Up.

Vtriivhria bifida Linnaeus [ft *humiti** Vahl, K Vahl pni pane, *U. anlitrh'moidrs* Wallicli. *U. * >>>* L Benjamin, V. BWffirttoM L Benjamin, non ¥flg*« KiB. 242

Rhi/ooids nmnernus, branching, capillary. Stolon* few, branched, capillary. I I iwea arising iiom sioW) node*, np to 2 cm long, l-nerved, petiolate lamina narrowly linear, 0.5-1 mm wide, apex rm or subactite. Traps ovoid, 0.6-1 mm fofljf. *« 0 basal, with ^ simple, subulate, rflexed. ri

in wet grassland and a lung stream sidcrs. Although very variable it is distinguished from all oilier speck:* by the **combination** of distinctly hasisolute (attached **jtfff** above the middle) bracts, the presence of braceioles and unequal sepals.

((0) Hel/Tcn). Madagascar, W India to japan and Australia: Ban. Bur, CeV, Ind, Ncp: Ap, As, Bh, Gj, Go, Kl. Kt. Mg, **Mb**, Mp, On Tn, Wb.

Utricularia crritii P. Taylor: Fig. 244

Like *U. rrtititnttt* but leaves up to 1 cm long, S*iervecd, the lamina narrowly olx>vaie, ± 1 mm wide, apex rounded. Inflorescence stalk erect, 5-17 cm long. Bracts ± 1.5 mm long- **Binttttolo** shorter than the bract. Flowers 1-5; pedicels erect at anthesis, spreading in Lriiii, 2-> mm lung. Sepals **sbghtty** unequal. !>-10 mm long; adaxiit sepal broadly ovate, 5F> mm long, apes acute: ahaxial (lower) sepal slightly shorter. Petals **10— I i> nun long!** palate with a hairy rim; spur \pm as long and held at an obtuse angle to the ab;ixial lip. Capsule ± 3 mm long, umTormally membranous, dehiscing by a single abaxial, longitudinal slit. **Seed** obovoid, $\pm 0,25$ mm long, seed coat tells slightly elon-

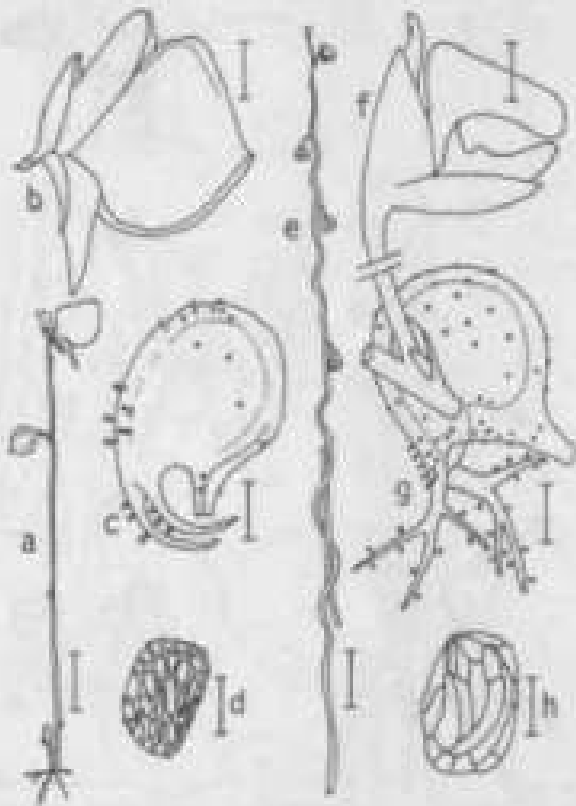


Fig. 244. (>trimititnt rrtitii: **A. Boweffag** gram (1 fm); **b. Bower** (2 mm I: **c. trap** (0.2 mm); **d. sfed** (0.1 mm). *V. foveolata*: **c, Hi/wring plant** (1 cm); **f. RoMtf willi** [wdunL-ir .thonriiciJ (0.8 nun); **JJ. trap** (0.3 mm); **h, siccd** (0.1 mm).

gnte. with th^ anticlinal Ixumdarieit *much* raised, straight, **with** conspicuous intercellular spaces the per- ii. hi ial walls concave, sinuoLh.

Seatoaalh; BoOcd places on Interiie. It is *distin-* **gushed Brotn 1/ u^igiKKa** by larger peuls. entire W *pal* mai^ins and diffei ent seeds.

[O Hel/Tcnf. •**Ind:** Kt (Mangalore).

Utricularia foveolata Yji%c~wor^h: Fig. 244

Rliizoids lew, branching, capillary. Stolons *few,* branched, capillary. Leaves *few,* up to S cm long, l-neiA<ti.)cii(ii,in'. Mu lamina linear, 0.4-1 mm wide, apex acute or rounded, **TrajJt** lew, on stolon *nodes* and leaves, shortly stalked or siibsessile, *globose,* **0.8—1.2** mm long, (he mouth basal, with 2 s *parsely* branched, antler-like, adaxial appendages bearing stalked glands. Inflorescence iwuing, Up *ct* long, glabrous. Scales *few,* like bracts. Bracts *attach** **by the base**, ovate or ovate-oblong, ± 1.2 mm **IOP&** apex shortly acuminate to obtu« or truiiu^'. Bractcol.s linear-subulate, *t* hair as long as the *bract.* Flowers 2-5; pedicels erect or spreading *at anthesis,* sharply deflexed in fruit, Ulifbrm, **flattened** and narrowly winged. 2—1 mm long. Sepals subcfju&l, *2-4 innl* long, ovate, glabrous; adaxial sepal with *obtus* or subacnte apex; **abaxial** (lower) sepal slightly lon^er antl narrower, apex obtuse or subatutf- *7 tal* :<4 mm long, mauve; **adaxia]** lip oblong. a[« *1 rll,* **Cfite**, slightly longer than (he. sepals; abaxial *0^>vit* lip \pm cu*cular, the basal swelling obsntrclv *lobea-* apex entire or obscurely !Vu>oihed; **Jttflatt** *with a* scarcely raised, niinuirb hairy rim; S|ur *narrowly* conical, longer than and held at ± 90 to ihe 3 *axial* **lip.** apex obtuse. Filam<*ms straight, ± 1 mm long; anther thi-cie subciisntl. **Cttnik** broadly *ovoid,* slightly dorsov<iiu.!!lv (allenrd, \pm mn long, *dehisc-* ing by a single, abaxial, longitudinal, *inargina,* **thickened** sfit. Seeds obliquely ovoid or ellipsoid, ± 0.1 **DUD** long; seed coal **cell*elongate**, the antich boundaries straight or sinuate, raised, smooth *the* periclinal walls at (irsl tabular, **almost sm<>ik** or obscurely sniaic, the outer wall is shed to **-1CP(M)*.* concave, very conspicuously and deeply longitudin* y striate suriace beneath.

Prubably nntml, perhaps sometimes pen-nm^1 ^ **shaUove** water, *tm* wet soil, in seasonally *flooded* tats, in rice fields and in wet grassland, *\ distinctive* s)j)< irs recognized bs ib<' following *character* combination: **drilling inflorescences;** petals *v<"0 sm<"j* (3-4 nun long) and mauve; mips with bnmche **(ander-Hke) odudaJ ippendagex;** pedicels sharp? **deflexed** in fruit.

((0)? Ten/Hell. Tropical Old Unrkl: »an *Ind: flh,* Ki, Mp, Or, Tn.

with a conspicuous swelling, apex rounded; palair- with a raised hairy margin, without loolli-like projilions; spur subulate, straight or slightly curved, distinctly widened at the IKLST. tongcr than and widely diverging from the abaxial lip. apex ncmc. Filament* straight, ± 13 mm long; anther thecae distincL Capsule ellipsoid, slightly dursoveniralty flattened. $\pm 2^*$ mm long, dehiscing by a single, abaxial, longitudinal, marginails thick-eiitd slii. Seeds ovuiil. $\pm 0. VQ.6$ mm long; aeclt cam ttits \pm elongate, 2-6 time* a* long as wide, the ;imictinal boundaries \pm straight, raised, smooth, the perktinat walls concave, smooth.

Perennial or perhaps •iomriimes annual. In shallow wetter, in *mushes*, swamps, by springs, along streams and on wel soil among rocks.

(&) M. I I «-n], S and SE .Asia: Bur. C3ey, Ind; Go, Kl, Kt, Mh. Mp, Or, til. 0-1500 m.

Utricularia hirta Klein ex Link \U. *tayhrin* >ut Joseph ct MitniJ: Rg. 211 i

RIU/OKIS arising Mom the base of the inflorescence sialk, numerous. sim>pk*. capillary. Stolons few, sparsely branched, capillary. 1-caves arising from stolons, few, 0-8-1.5 cm long, t-nerved, peiioilate, the lamina narrowly obovate, 0.3-0.5 mm wide. Traps long-stalked. ovoid, tl.2-fl.25 mm long, the moult lateral with l adaxial, subulate, mul tied led appendage and an abaxial and sometime* lateral pair of rows Of \pm united gland-lipped uichtunes. Inflorescence siaik en.'ci. (:^> pi-15 (-30) cm long, densely covered with nHilticelluLu¹ bairs 0.1-1.fj mm l>ng. Brarm dllached by the UJM . narrowly ovate-deltoid, apc-x aiutc, O.n-1 mm long, densely hairy, each bract subtending a (lower with analhtrr Mj>k< mling * dorni.ini or Abutted kmd a \-ari-abfl ctiitiitntv Jtbcnr- it Hracter>tc* «ilmlatr n long or longer dun ihr twan. Flowcn (1) 2-fr, pediceK BWtC, filitonn, trretc, at long or tongcr dun tW lu. u), Scpatf mbequal 1-2 mtn long. deTuelv hairv. adaxial sepal ovate*, obtujc apex; jUwriat (Jowrr) vrpa) slightly largti .J]K % tmiiraie or emarginate F< t.ils 0.2B-1 cm long, violet, maiire or hhte, ad,L\nl lip narrowly oblongs apex rounded or cmarginute; abaxial tip larger. \pm circular, the baw with a rounded. \pm 'Holxd spelling, apex rounded; patate shortly puiM-scent uitliin: spue subulate from a ronical base, \pm .'iiraight. much longer than the ahaxial (lower) lip. apex obtuse or subacacie. Kilamenis < urved. 0.5-0.7 mm long; anihcr iliri ^t- almost dlsliw i Gapsule obliquely ovoid, about as long as the .s^p.ils. dehiscing by a »nglr, longitudinal, jb;i;ial. marginaUv thickened slit. Seeds ovoid. 11.17-0.2 mm long.

Probably perennial. Damp or wet places, marshes, bill also in woodland. Like *tl mhtutissima* but has liairs extending In the sepals.



Fig. 246. *Utricularia hirta*: a. flowering pl.; b. capsule with styles; c. seed (0.1 mm); d. capsule; e. capsule; f. capsule; g. capsule; h. base of plant showing trap and base of stem (1 mm).

[Hel/Ten]. India, and SH Asia: Dan. Ccy, Inrf: Mg. Mp, Tn. IH(K)m.

Utricularia inflata Forsskal, FIJT, '17

Very like *U. littoralis* but petals white, with liems. Floats on inflorescence stalk LOUR anH o-llii^ cal. Uaetfaurkks, ifpratent, mrginfDy toothed. somewhat Meshy, up 10 I cm lon^ in (nut. r o m ^ enclosing and contt-aling ih<-capsi 1]* Sacle Mollowl, than long. Siple long (more than I & mm, nj> <> \$ innl Prolmbiv perenntatl pcrhap* tofnetiroes ^11111111, l'lauktonic with emergcal flowers. In .shallow 10 deep-still and slowly flowing water in lakes, pools, back* it rs. diichps. fwamps and rice fields.

India and .Vssam: liid: AJS. Dt. Up.

Utricularia iazulina P. Taylor: Fig. 24H

Like *U. albamilfa* but petals clear blue, M (8-10mm long): adaxial pcial lip nhlng. ihan the adaxial sepal. S<-ed> nhmoid. 0.2-0.* m

lung, seed coat cells elongate, with the anticlinal boundaries much raised and thickened like a .suing or bead*, almost itraight to slightly sinuate, williout intrrcdiular spates, the pericttnal walls djaWCX, at *Ural* ajiprarhiK rough but shedding lib* outer skin to expose a warty surface, LHK warn numerous, sui»aphertcal,

Small annual. Seasonally Hooded place*, wei noil over laicriic and in wet ginssl.md.

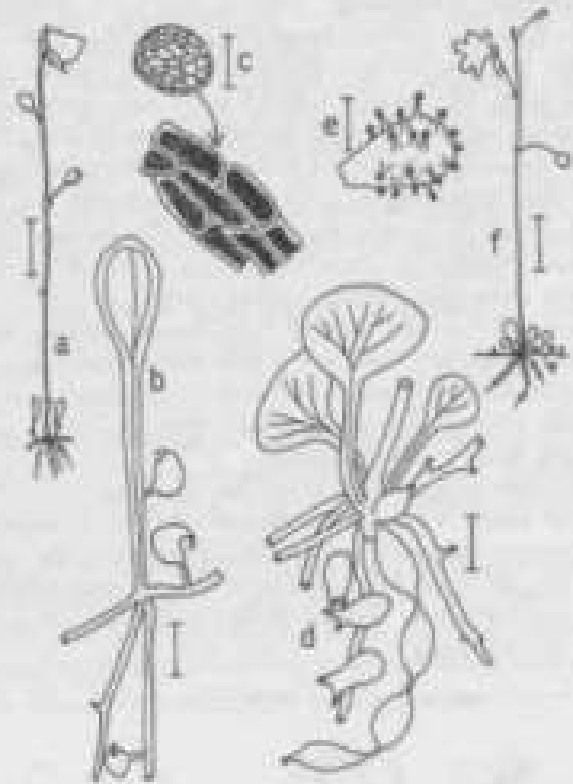
10 Hd/TVnJ. Eendeniii i" India; •Ind: Kl. Um alti- tudes

Vtricularia minutissima Vahl: Tig. 246

Like *V. hirta* but leaves up to 3 cm long, 1-ncrvcd, petiolate, tlu- lamina lint-Lir LO vrrv narrowly obov.nc. 0.-MJ.8 mtti wide. Trap long-sialbt-d. ovntd. 02-0^ »"" Song. r^p«aecncc «aft fc-15 (-25!) cm long, glabrous lo distiiHitlv hairy. Bowers 1-5 (-J0), frequently (Icis- "famous. Srpais g-Sfc3 mm long, gtabrowa; abaxi.il (lower) sepal dUptkal, wiib imncatf or roundi-d. Pemls 0.6-1 cm long, the apical margin distinctly 3-lobed; palat<- shortly pubtstem within; sptir siraight



Fig 247, r^trirtito.O(? ngt«C«: a. flowering plant, with floata U cm); b, leaf*arid« (1-S nun): t, wed viewed firom ihesidc (0.3 mm); d. st-condan- \VA(aegmeai with traps fl mm): c. M-JJU at an thesis (1 mm); e, (lower {1.3 mm),.



Re. 248. VtnmUtria laLiiirui: :u ttotoa with 1<MJ. tra|K ;mtl rhi- /iiirfs (1 mm); b, [lowering |il:m] (1 cm); c,ieed f0.2 mm I with wine seed coal «!Ls {imwLf. K tiitJimfrmii: d, IWM; <l pl.mt with lubers. sLoluns, leases, trjps anrf base oi inflorescence sulk (1 mm); e, «cd (0.1 ma); i, Etowering plani (X cm).

or curved, slightly longer than or up to 1 times as bag as ti*e abasia! (tower) tip. apt:x acntc, FOamenta ± 0.8 mm long. Seeds globose or broadly cHipsoiH. ± 0.25 nun long^

Small tts vcicy ".mail annual or perhaps some tin, is perennial. Wet sandy soil or mini in open, grassy plait's, Lik- V. Airtwhut st*pnl's glahroiii

((O)f Mdl/IVn]. India to Japan ajid Australia: Bur, Gey, IIKUKI.KH.TM.

Utrictilaria moliniformis V. Taylor: Fig. 2-H

[ike *K striatula* bin plant developing dlipsoid to lusirorm tubers along like stolons, axxanged Itti strings of beads; a<laxial petal lip very broadly obovaie. longer iluni rhi- adaadal sepal, apex incgidarly 6-lobtd; iqrar club-shaped, much shortrr lhan tht* abaxiai (lower) lip.

Perennial. Wet rock*. Ll ha* frequently been misidenlilicd as *K striaiula*.

[Hfl-lJth()phyie]. Kndcmk to Sri Lanka: *Cey. 75(1-2300 m.

Utricularia paigaioides Edgeworth [U. stricta U.] (J. König t. Oliver) Stapf ex Gamble: Fig. 249

Like *U. reticulata* but rhizoids capillary. Leaves up to 2 cm long, the lamina 0.2-0.3 mm wide, apex acute, inflorescence erect, rarely branched, nut twining, 20 (-30) cm long. Bracts 1-1.5 mm long. Pedicels erect in Utricularia, spreading in fruit, broadly winged. 3-6 mm long. Petals 7-10 mm long, deep violet; palate with a distinct triangular. **rawed, hairy** rim: spur only a little longer than the abaxial (lower) sepal and is very obtuse. **UK** angle to the abaxial leaf. **1** **Bifid** VI mm long. Seeds numerous **ovoid**, 0.3 up to 1 mm, **pedicel COM** **ceffi** **elongate** with the antecurvature. **Min*tu*** is a raised, longitudinal striate. **uui>** in the pruinose ***alU** tabular, langifudm.dk timir.

Probably annual. Open ***rt** **luhiuiv** **rke** **BrkU** and **CO&S** **U** **pOofa** **ll** **tali** **be** **disun^uilhd** **IM-KI** **'** **u/i^lmaq** **h** **i** **IK** **cuncaic** **liawtand** **>iuuth** **iiungiuol** **H** **v-pal*** and the different kind **<** **crap**; from **(. gnaon^bJu** by its **L-nerved** **tcw^*j** **sborto** **pcoQcels**. **tht-** **more** **cunaeiie** **base** **of** **th'** **sepals**.



Fig. 249. *Utricularia paigaioides*; a. **Bowrafaig** **plani** **(** **uni**: **b**, **•** **lill.n** **with** **leaf** **and** **H.II*** **(** **BUD**.) **!** **•** **BOWR** **(** **2** **mtn** **>**: **H**. **seed** **[0.1** **nun** **i** **f** **irticnittn*** **r**. **fUwet^lllg** **plant** **will**) **laSoroence** **^ults** **^huncned** **il** **emi**: **f**. **HmHt** **(** **2** **nun** **>**: **^**. **ti.ip** **(** **0.4** **mm** **1.1i**, **wfd** **MM** **mull** **With** **<** **whe** ***f** **<** **COW** **Ccill** **(** **mtn** **>**.)

tO? Ten/?H>p). Endemic to India and Sri Lanka. • Ccy. **Ind**; Ap. **Bh**, **Kt**, **Mh**, **Mp**, **Or**, **Tn**. **Wb**- 0-IM>i>-

Utricularia practerita V. Taylor: Fig. 860

like **K** **Bfiglittwn** but **UMVCS** **0-2-1.S** **long**. **S^arred**, **[H-tiolv>n**, **tat** **lamina** **6bov<te**, 1-2 mm **wide**. **apex** **roimrkd** **inflorescence** **erect**. **%-&** **<** **ml** **long**. **Bracts** **±** 1 mm long, **l-iifrvt-d**, **api-x** **wbacute** **Flowers** **l-ti**: **pedicels** **erect** **ii** **iiinlu^is**, spreading in **l-i** mm **loii|**. **Sepal** **margins** **ininuulv** **ptt^H** **I** **idled** **eOogidfii** **ba** **led**) **F**. **M**> **r^s** **mm** **long**; **udaxul** **petal** **lip** **oblong**, **narrowci** **than** **adnul** **vpol**. **Cqwk** **detincmtt** **b>** **I** **rfrngk**. **nal**, **abaxiil** **At** **Srcds** **a<tHd**, **2** **0** **>** **RUM** **l^m** **(** **seed** **oval** **rrll*** **Honpatr**. **with** **ajitK-Jnui** **buwmhri** **fl** **raised** **imwi** **crfnturch** **ihwUncd** **like** **a** **Mlfagal** **be** **^** **smooth**. **Kith** **dkinct** **triwigul**. **tt** **inirn**. **rllii!**; **shallow** **thr** **pentluial** **V*4HM** **inn** **iu**. **MinHitU**

Small **amtoal** **bi** **teucaully** **flooded** **pfece*** **wel** **siil** **ovtT** **laierile** **and** **Mrt-mi** **banks**. **[O** **Het/Ten**). Endemic to S India: • **Ind**: **Kl**, **Kt**, **Mp**, **Tn**.

Utricularia pubttamj, E. Smith: Fig. 850

Like **l'** **annana** but **vegeiaivt'** **part** **very** **ciistui*** **div**. **Leaf*** **with** **filiform** **petiole*** 2-10 mm **long** **tn**. **lamina** **peltate**, **±** **circular**, **someixhftt** **fUshy**. **diameter**, **the** **margin** **eciirc**, **tie** **terveca** **forked** **bin** **not** **or** **sirarceiv** **iii:i*tonn>!** **finj**; **MirlatL'** **noucflaginous<** **glandular**, **Bracu** **attached** **just** **above** **due** **base**, **±** 1 mm long. **superior** **part** **ovate**, **apev** **m** **me**; **(kt** **inferior** **quadrate** **or** **win** **it** **icular**, **Scpais** **haiy**, **pak** **III.K** **with** **a** **vellnw** **blotch** **nu]** **darker** **viol** **on** **the**: **Libiivi.il** **(lower)** **lip** **w** **i-min-K** **viol**. **Capule** **defcifdng** **I** **abaxl^** **louyiuidin.il**. **margin***) **1** **thick** **ened** **th**.

Probably annual. Damp **peaty** **st>il** **in** **stream** **land**, by **stream** **fides**, **found** **in** **bo<h** **open** **stream** **land**. **[O?** **Hel/Terij**. **C** **and** **S** **America**, **India** **and** **Africa**: **Ind**: **Mg**, **Mp**. **Up**. **ft-iyOO** **m**.

Utricularia rrtuidata] E. Smith Fig- 249

Rlii/uiili **numerous**, **branching**, **tapering-** **^to** **^** **fev**. **bnuubcd**, **capillary**. **Leaves** **iiiiivms** 1 **Brof** **siolon** **node**, **up** **BO** **'**) **cm** **lcnR^** **1-nervct**. **pelf** **lamina** **narrowly** **linear**, **up** **to** **OS** **nun** **wide**. **ruiniltd**. **Tfapi** **KloHt/str**. **O3-IJZ** **mm** **lung**, **the** **lxts.il**. **unh** 2 **simple**, **subulate**, **glandular**. **branched**, **10-100** **cm** **long**, **ffaSstw*** **SJJ^** **numerous**, **like** **lirattv** **liuit?i** **attached** **b>** **the** **broadh** **owce-delUhd**, **S-3** **BUM** **long**, **ft-nerved**,

long, the **mouth** basil, with 2 simple, subulate, adaxial appendages bearing sessile* glands and n single, uncatc or apically **2-fobed**, glandular abaxial appendage. Inflorescence erect or twining, \$-W rm long, **glabrous**. Si -airs Few to many, like **bracts**. Bracts **attached by the bate**, ovate-deltoid, M.5 mm long, apex acute- or acuminate Bran cotes **linear** or subulate, as long or somewhat **shorter (ban** the bract. Flowers 1-8: bracts **subtending aborted or dormant buds alternating with those which subtend flowers; pedicels erect atsnthcsls and** in fruit, filiform, broadly winged, up to 15 mm long. 1-5 **tiroes** ;is long as the flowering sepals. Sepals Mibecjual. 2-4 mm lung at anthesis, up to f> mm long in **fruit**, ovate, **glabrous**; adnxial sepal with ;in **acute or acuminate** apex; abaxial (**lower**) .sepal slightly Miialler. minutely H-toothed. **Petals 5-15** mm long, yellow; ad axial lip **constricted** Ewlow the middle, (he **superior part** oblong to transversely **elliptical**, apex rounded or ein.irginatc. [be inferior **pill qitadraie**; abaxial (lower) lip i circular. Lhc base disiincily swollen, with 2 tr A Hiimded. longittuUnaL **ridges**, **apex rounded** or olwcurrly 2- or ^toothed: palatt' [MLpillow; spin¹ subulate, straight or curved, longer than and wirk-lv **diverging from** (he abaxiat (lower) lip, appx acute. Filamt IIK straight, ± 1 mm long; antlttT thecac distinct. **Gapsuk** ovoid, dorsoveiiuilly Maligned, y-^ .5 mm long, dehiscing a single, abaxial. tmigiuidinali **marginally** thick-eued slii- -Seeds obiiit.>K o\unl, ± 0.2 mm long; M&d coal cells trlongiile, iht* antitlnal boLindrtrits straight, or sinuate, raistd. microscopically **tabesfulatd** I he pn-K lin.il walls concave, microscopically tuberculim**.

Prptwbb annual. Bogs and wet gra.vsl.iiid. mosily on sandy or clayey **soil**

[O? **Hel/Ten**). **Tropical** Old World: Ban. Bur. **Gejr**, Ind. Nep: Ap, Bh, Kl, Ki, Mh, Mp. Or, Tn. Up. **Wh**. 0-2300 m.

Utricularia smithiana Wight [*V. camtleavar. smithiana* (Wight) C B. Clarke: Fig. 2:A

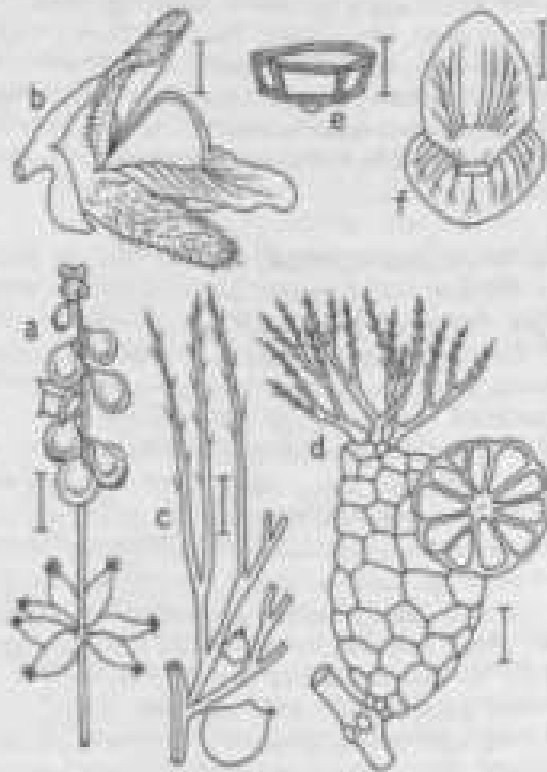
Like *U. utiginow* hut leaves up to 10 cm long, 3-ju.Tved., petiolatc. the lamina linear, up to 1.5 mm wide, apex rounded. [MIHITM ence twining or sometimes creel, (,10-) 2l-f0 cm long, Floivers 2-8; [jedicels ascending at amnesia and in **Graft**, broadly wingrd. 0.5-1.5 mm long- SepaJs snbetjual, 4-5 mm long (in fruit), **ovate**, **marginna entire**: adaxial sepal with an ;K uif apex. Petais 15~^0 mm long, various shades of mauve or violet; adaxial lip slightly **OODttfcted** near (he bast:, longer than **the** adaxial scpah (^ipsule broadly ellipsoid, 3-4 mm long, **dehiscing** by A single abatttaJ. longitudinal sin

Probably **peretmiaL** Shallow water or in very wet ground-

[Tcn/Hcl?K Endemic to S India: • 1ml: Kl. Kt, Tn.

Utricularia stellaris Linnaeus fil. [*V. maewcarpa* Wallich]: **Fig. 252**

Rhizoids abserit. Stolons filiform, terete, spai'sely branched, gtabroiw, up to I m long. **0.5-4Jb** ntm thfck> **BOtmetime** bearing **capillary** air shoots, with apical, minute, elliptical **membranous scales**, leaves very **numerous**, semicircular in **outline**, 1-6 cm long, **divided** from the base into <MJ. seTni-verticillato- primary, filiform **segments**, »i<- **secondary** •segments **pinnate**, **alternate**, each pinna forked from the base into numerous further **segments**, the **ultimate** segments capillary, somewhat flattened, usually with <i>f hiisiles; stipule-like **snriclea** usually present at ihc ha<< d ih<- jiritt,,!^ scj-tm in, I ,.ips numerous, lateral on ifi.- **secondary** segments, obliquely ovoid, 1-3 "" long, the month lateral, **naked** or with 2 sini[>lo **OT** **sparsely** branched **fariAtle-like** apprndages. Infloc*- **cence** stalk erect, emergent, 5-30 cm long, ± 1 b i " 03-1.5 **tam** thick, with a whorl nf S-8 spongy floats consider- ably above- ihr- middle; the floats oaT **ovoid**, 0.5-2 cm long, sessile, with a **few** short, capil- lary, **teal** segments at or near the apex only- Scales absent. Bracts basirixed, broadly ovate to cirt **ulac**, aprx obtuse or **rounded**, membranous, ± 2 mm long.



Flo. 25?. *Utricularia stellaris* (a, inflorescence fl cm); (b, Root with leaf (1.3 mm); (c, leaf with long petiole (1.3 mm); (d, float with transverse section (inset) (1.3 mm); (e, sepal at anthesis (0.5 mm); (f, sepal at anthesis.

sciireiy majw-nefvcd. Bracteoles absent- Flown > ^-12; the axis short, noi greatly elongating in fruit; pedicels filiform, dorsoventrally compressed Btt d winged. 1-5 mm long, erect at anthesis, usually sharply deflexed and thickened, especially distaily. in fruit Sepals subequSl, broadly O*we to circular, ± 3 mm long ;u imthesis, reliexL-d and accrescent in fruit but scarcely as long as the capsule with atigmaj adaxtai sepal with a rounded apex; abaxial (lower) <p:<1 with ii ,cliisc apex. Ratais-ydlow, 0.7-1 cm long, ± densely cowed wlih fine tmiltkelluhir, glaiHi- »Ppcd hairs: adaxiaJ Up broad|v OVfK wiili a retttsc or <Bttrglna|c i*px; abaxial (lower) lip limb transversely '•llifitiial. the base with a prominent. 2-IOIXHI SwdJing, apt'x rounded or emarginale; p*tott pubescent; spur TlindricaJ Etom JI broad, ironical base, apex rcUise or jMue, shorter thaua the abaxiaJ Up. Klamentt slightly curved; anlhti threat- ± confku-nt. Capsule gtobaae, up to X-A nun m diiriHM'i. tin- wall mMe>ftil 'lcschy. circuniscissik-, lht- persistrni style Up tP 1- " 1" 1" <^iik. .Srt-ds disk-shaped, -Mi angled, *> K-L-^ mm m ffianwtcr, usually ?> or more flms» ;is mdc as ¹⁰ⁿe- ^{tt9}*s rowK Winged on all angl<^*.

Probably perennial pttfcaps someiimes annual. Planktonic with emergeM Mowers. In lhaUoW to deep. "Tll or slowly ELowng witter in kikes, pools, backwaters, ditrhes, swamps and rict; fields, h c;m IK> a strious *eed in newly planted lire fii'lds.

tO? Pla|. Almost throughout Africa, tropical Asia from hulu to Vkljuun hm absent Truin Malaysia and N -VisLralia: H;m. Bur. Ccy, Ind. Ncp: AJ¹. As. Uli, 01, Go. Hr. Kl. Kt. Mh. Mp, Pj" Rj. Tti. Pp, Wb.

Vtriciilaria atrxatula j. K. Smith [01 ^Wito J- Graham »nn Vahl. *U. »>i>v ul,:U, Walltch, U gtoctddiota* Wight J:

Rhizoids few, siniplf, capillary. Stolons simple, t'apii- 'ary. Uavcs l<!... ig a rossiite at t.hc bast* of the inflorescence stalk, alsu on snolons, up i< *i mm loog, *"th **numerous forked netves, tobfeatfle or pettolate**, the lamina <ihovaf tb iransvcrstly elliptical, 1-f> mm Wide. Traps boroc on rhizouis antl sloloiw bin never on Icavts, moid. 0,(i-| mm long, the mouth lateral, with an adaxial deeply 2-lobcd app<-ndagt, the distal "largin <f which fiingtd wtili long-sralke.d glands. toflsceaee stalk erect, 1-20 cm long, glabnim. Bractis bamsolute. attached near or very near the infe- rior exuciiiiity and slightly constricted at that point. 1-1) nun lung, narrowly ovate or oblong, the superior ³I>fx subacut* or rounded, tin- inferior apes truncate, •rrtregularlv toothed. Bracteol™ like the In acts but Slightly smaller. Flowers 1-10; pt-iJtrcls spreading at a nth b, pendulous and wttbered in fruit, capillvin-, slightly flattened. 5Mi inm long. Sepals unequal, mem-

branouR, gihrons; adaviiiiil sepal ciniiln to broadly obcordate, Jr>—2"J mm lonjj, apex rounded to emsir- ^in;itc; abaxial (lower) sepal very much smaller, Obiongelliptical, apex rounded u> ("marinate. Petals 4-10 mm long for much smaller wlwn iloistuf^amous), whut linged with violet wiih a yc-How patch at the base of the abaxtal (l*nvri,i lip: aci axial lip ovate, apex shortly SMobed, vei> much shorter than the sepsis; ahaxial lip transversely elliptical to almost circular, apex ± regularfy Wobed; palate fringed with hairs: spur subulate, aboui as ioog aa *ike* abaxial lip. Filain.-iis Miariht, i 0.6 mm long; anther ihetae dis- Lint- Capsule Rlabosc, obliquely dorsovenually flattened, keeled on the abaxial Biface, ±2.5 mm lung, dehiscing by a single ahaxiil slit. SeefLs narnwlv to broadly obovoid, ± 0.25 mm long, thr surface covfrvd with glochidJa (hooked proces-ses).

Annual etr pcreisnial. Permanently wci ptaet^s, under u.mrl.tlK. dripping rocks and tree trunks. It is often abundant ami lonm muffl nuns; when in flower it is **very attractive.**



FKJ. 253. *Vinmlaria itriatuta*. a, **Rowfiog** plant 0 cm); h. base tif plant with stolons, tlii/OTd*. !<<<<, **tnqM** iuid ba« nf inllorefcifnce stalk (1.3 mm); C, scpaJs at .UMH-M-, {0.8 **MM**); i. n.,u<-. (1 mm); e, w*-<1 <(t.l mmj with an enlarged glochldiuw (ituct). *U. rutmlatu*: t. Powering plant (1 cm); K. l*ricl 11 mm); h, IUwor (1 mm).

[O) Ten/Hcl-lithopyte, epiphyte!. Africa to New Guinea: Bhu. Bur, Ind: An, Ap, Go, Kl, Kt, Mg, Mh, Mp, Sk, Tn, Up, Wb. 0-3300 m.

Utricularia subulata Linnaeus: Fig. 253

Rhizoids \pm 6, tapering from thickened base, usually less than 1 cm long, branched. Stolons numerous, capillary, branched. Leaves often numerous, narrowly linear, up to 2 cm long and 1 mm wide, 1-nerved, gradually narrowed to the base. Traps ovoid, 0.2-0.7 mm long, the mouth lateral with 2, adaxial subulate, sparsely branched appendages. Inflorescence stalk erect, (2-) 10-50 cm long, glabrous above, usually papillose to shortly hairy below. Bracts basisolate, peltate, circular to transversally elliptical, with both extremities rounded, 1-2 mm long. Bracteoles always absent. Flowers 1-25; pedicels ascending, capillary, terete, 2-10 mm long. Sepals subequal, 1-1.5 mm long, glabrous, broadly ovate to circular, apex rounded or subtruncate. Petals 5-10 mm long (or much shorter in cleistogamous flowers), yellow (or in cleistogamous flowers white to reddish); adaxial lip broadly ovate, apex rounded; abaxial (lower) lip rhombic to broadly cuneate in outline, the base with a very prominent rounded and 2-lobed swelling, apex deeply 3-lobed; palate pubescent; spur subulate or cylindrical, slightly shorter than the abaxial lip. Filaments almost straight, \pm 1 mm long; anther thecae confluent. Capsule globose, 1-15 mm in diameter, the wall thin, dehiscing by 1 abaxial, ovate pore. Seeds obovoid, \pm 0.23 mm long, \pm 0.16 mm wide.

Annual. Damp situations, seasonally flooded places, ditches, stream and pool sides. It is the most widespread of all *Utricularia* species but is known only from one collection in India; it is often very inconspicuous and might well be more common,

(0 Hel/Ten/Hyp). Almost pantropical: Ind: Mg.

Utricularia uliginosa Vahl [*U. affinis* Wight, *U. brachypoda* Wight, *U. liliadna* Griffith, *U. dedpiens* Dalzell, *U. elachis* Ue Goebel, *U. nayamjanarthani* et Henry]: Fig. 254

Rhizoids numerous, branching, capillary. Stolons branched, capillary. Leaves arising 1 from each stolon node, up to 5 cm long, 3- to many-nerved, petiolate, the lamina linear, 1.5-6 mm wide, apex rounded to acute. Traps globose, 1-15 mm long, the mouth basal, with 2 simple, subulate, adaxial appendages bearing stalked glands, the stalk sometimes distally swollen and bearing stalked glands. Inflorescence erect, 3-30 cm long, glabrous. Scales few, like bracts. Bracts attached by the base, broadly ovate-deltoid, \pm 2 mm long, 5-nerved, apex acute. Bracteoles narrowly linear or subulate, slightly shorter than the bract. Flowers 2-10; pedicels suberect at anthesis and in fruit, filiform, narrowly winged, 1.5-6 mm long, not or not much longer

than the sepals. Sepals subequal, 3-5 mm long (in fruit), very broadly ovate to almost circular, distal margins minutely toothed (\times 20 magnification needed); adaxial sepal with an obtuse to subacute apex; abaxial (lower) sepal slightly smaller, apex obtuse and minutely 2-toothed. Petals 5-8 mm long, usually lilac or violet, with the swollen basal part of the abaxial (lower) lip usually paler, sometimes streaked with darker purple and often with a blue margin or sometimes petals wholly white; adaxial lip slightly constricted at about the middle, not or scarcely longer than the adaxial sepal, the superior part broadly oblong, apex truncate or emarginate, the inferior part broadly ovate; abaxial lip \pm circular, the base much swollen, apex rounded or emarginate; palate with a hairy margin; spur subulate, slightly curved, \pm as long as and widely diverging from the abaxial lip, apex acute. Filaments straight, \pm 1 mm long; anther thecae distinct. Capsule ovoid, dorsoventrally flattened, 2.5-3.5 mm long, the wall uniformly membranous, dehiscing by adaxial and abaxial, longitudinal slits. Seeds globose, \pm 0.3 mm in diameter, seed coat cells isodiametric, with anticlinal boundaries much raised,



FIG. 254. *Utricularia uliginosa*: a, flowering plant with inflorescence stalk shortened (1 cm); b, (lower) (1 mm); c, sepals at anthesis (1 mm) with enlarged marginal teeth (inset); d, seed (0.1 mm). *U. wrightiana*: e, flowering plant (1 cm); f, trap (0.4 mm); g, scale (1 mm).

ir;u_kht, smooth, with distinct triangular i
1 x<< the peridinal walls concave, smooth.

Small annual »r perhaps aomtifmo
Seasona% flooded ground and along banks vml lwrU
"I stream" It is often confused with *U. gnimtnifalia*
which bag ovoid seeds with elongate **<<" *r>w <<"lls_;"
much longer pedicel top 10 lit mm long), cgpaule with
thklwncd edges to the dehU-rnce slits and smnt.ih
«pal margins. It is verv difficult u> distinguish it from
U pratUHia without seed* *Viriad^ n vli&nom* may U-
dwringtrfahed from *U terutow** and *K thatMnikn* as
«iey have bright true blue petal) with B much more
ample abxninl (lower) ftp with a distinctive 2-tobed
swelling ar its biist" M mflftaiM has a twining mllores-
«>>cr stalk and larger petals (15-20 mm 1on_R);
f. «ri/ii has a more ample ahaxial (lower) pe(al Up and
vrry differt-tu seeds a'd leaves; *U. wff^•uuuu* has
numerous and ton.spitLioLis scales on UM *
^Ay. and largerpeaU(10r-15 mm long).

WO) r«n/Hel?K India to Australia: Bun Cey, Ind:
•^p. <-. EL Ki, Up, Or, I>. Uwalutnilos.

ItnatUtriti unghtiana P. Taylor [*V, ujuavaaa* auclL Ind-
*>> I- Benjamin]: Rg. a:VI

like (f «%nfl.ifi but trap appendages withi^
glands. Inilurescncet stalk up to 40 i^m ^H- uaring
very numerous and cqnipScetOas .stales, si
town^ads the base and hract-like above. Sepab S-5
—s, ovate, adaxiat srp:il at nte or acuminate. P*
'arger (10-15 cm long).

hr.buhly pei en Dial. A poorly known species; proba-
bly In marshes and wai grassland.

tHel?/Ten?J, Endemic to the Western Ghats: find:
Kl.Kl.Tn. 100-2200 m-

LEGYFHIDAGEAE see BARRINGTONIACEAE
excluded see p. 12.

UMNOGHAWTAGJB AE: 3 generu

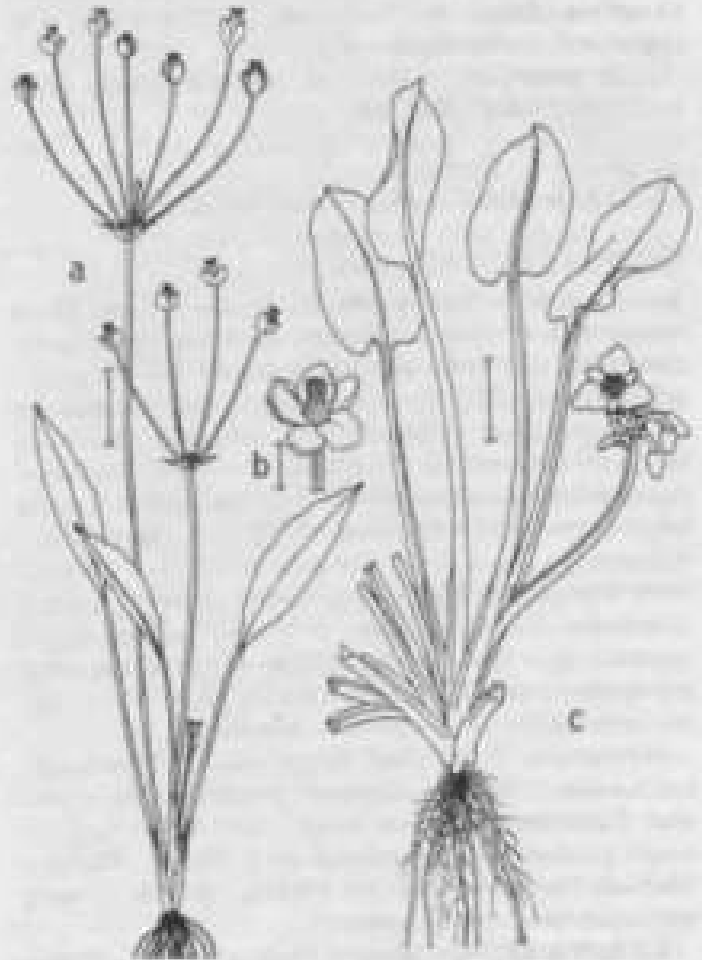
Atnuial or perennial with lalrx to socialized tubes,
Juwtiilr leases Linear; adult teaww differeo^aied into
petiole and blade, the bladts itnffttTate to ovate or
cordate with parallel nerves. Inflorescence umh*t-liket\
Hillary dusters or flowers solitary- Flowers bist-xiuil.
'*imoniorphu'. Sepafa S, gireeiii peratatent, with latex
Uibcs. (Vials 3. while or yellow, delicate, not perHSttHL
Slamens 6-fl ot numetewc Carpels wpextor, 3 to
Numerous, free, in 1 or rari-iv 2 wdrfs. Prtfti a head of
Ua or thin-mUcd nutlets. SrtrN nunK-raua, scat-
tered over the inner surface of the carpel wall or soli-
tary: embryos curved or folded.

Juveniles submerged, adults emergent Pollinated by
toiects or autogamous. The disseminules arc seed* or
thm~walted nutlets.

1. I*af blades lanceolate to oblanceolate, the apex
tipped by a hard, omnt inucrn; petals whin-. IjametU
i-boui 9, wamm^efcabsetiji *Butomopsu*
I. Leaf blades ovate to suhorbiculatc. the apes
rounded or emar(finale; petals vellow; *OsmetU* more
than 9, surrounded by staminodeis *IJmnodiam*

Butomofnii | {cn(^w\ q
ButomopsistaHfoiia ill. l)ori) KJHUI [Tautgpehaiis *Uttifa&a*
(D. Dun) Buclwnau, *liulomopsis fanrtioatft* {Roxburgh)
Kiinih: Fig. 255

U-avrs radii.il. n «i; peiioK-s up to 20 cm or mort-
long; leaf blades lanceolate to oblancncniatc. 3-12
(-nif) cm long, 13-W (-5) cm wide cuaeate at sase,
acute or obtuse at apex, tipped by a hard hhmI nMKXQ.
Inllofrs) enoe borne abo\ of the leaw», ot 1 or a whorls.
Petals while, dL-li^ucwrrnt. Stamen* ± 9, all fertile.
Carpels -t-9. united ai the base. Frun 9-12 mm long,
exceeding the sepals. Seeds htirM-shoc^h^prd, Uss
than 0.5 mm long, minutely waited?



FIG, 255. *Buttomp& taiifalui*: a. fl*kwrrin*4 plant (2 cm):
h, Flowa- {A mm). *IJnHMhari*. %fiawi: c. Bcwtrmg plattd (S cm).

Annual. In shallow water, in marshes and in seasonally inundated places. It is often found in rice fields but is not considered to be a serious pest

(O Hyp]. Old World tropics and W Australia: Ban, Ind, Nep: As, Bh, Mn, Mp, Or, Rj, Sk, Up, Wb.

Limnocharisr. 2 species

Limnocharis flava (Linnaeus) Buchenau [*Damsonium flava* (Linnaeus) Miller]: Fig. 255

Leaves radical; petioles thick, triangular in transverse section; blades ovate to suborbicular, inrolled when young, rounded or emarginate at apex, cuneate at base. Inflorescence a terminal, 2- to 15-flowered umbel, shorter than the leaves. Petals pale yellow with darker base, ovate to rhomboidal. Stamens numerous, surrounded by a whorl of staminodes. Carpels numerous, laterally flattened into globose heads. Fruit of flat and thin-walled nutlets. Seeds horseshoe-shaped.

Perennial or annual. In shallow water, drying mud and in floating mats of vegetation. The disseminules are flattened nutlets, dispersed by adhesion to animals and by water. It is eaten and used as fodder in Asia. Large populations in S India have become a pest. It is apparently increasing its range,

{(0) Hyp/(Ple)]. Tropical America: <Ban, <Bur 1955, <Cey, <Ind: <Kl 1961.

LOBELIACEAE see CAMPANULACEAE

LYTHRACEAE: 30 genera

Annual, perennial or shrubby. Stems often inflated when submerged or floating. Leaves whorled, opposite or sometimes alternate, simple, entire, without stipules. Inflorescence simple or complex, usually based on repeated axillary cymes. Flowers bisexual, radially or bilaterally symmetrical, sometimes heteromorphic, sometimes cleistogamous. Sepals 4-6 (-7), united below into a tube, the lobes valvate, often with folds or appendages between the lobes. Petals 4-6 (-7) or absent, caducous, often crumpled in bud. Stamens usually as many or twice as many as the sepal lobes, rarely more or less. Ovary superior, free from the sepal tube, (1) 2- to 6-locular; septae separating the locules often incomplete; placentation axile or free-central. Fruit a capsule.

Scrivastava, R. C. and Singh, A. N., The family Lythraceae in Madhya Pradesh. *Journal of Economic and Taxonomic Botany* 14(2): 409-420 (1990). I would particularly like to thank Mr P. Thomas Mathew, NBPGR, Thrissur, Kerala for his help and for allowing me to use his unpublished work.

Excluded: *Lythrum salicaria* Linnaeus and *L. tribracteum* Salzmänn ex Sprengel; — found in NW Himalayas but not extending south into India.

1. The placenta of the capsule running up into the style; septae of the ovary complete; capsule at first opening with a lateral slit or lid, later opening irregularly below; petals usually brick red or absent; (flowers in sessile or stalked axillary cymes or sometimes some solitary or in terminal heads)

Nesaea

I. The placenta of the capsule not running up into the style; septae of the ovary incomplete; capsule opening by longitudinal slits or irregularly but not opening with a lateral slit or lid; petals usually pink to purple or absent

2. Flowers in axillary cymes; capsules without fine horizontal lines, dehiscent irregularly

Ammannia

2. Flowers solitary in leaf axils or in simple terminal spikes; capsules regularly dehiscent, opening by valves, each with fine horizontal lines

Rotata

Ammannia: 25 species: tropical to warm regions of the world

Stems 4-angled, usually swollen if growing in standing water. Leaves decussate, sessile. Flowers radially symmetrical, in sessile or stalked, (1-) 3- to 15-flowered, axillary cymes. Sepal tube campanulate to urn-shaped, often becoming globose in fruit; sepal lobes 4 or rarely 5, with or without folds or appendages between the lobes. Petals 4 (5) or absent. Ovary (1-) 4- (5)-locular, without a disk at the base; style very short to longer than the ovary; stigma capitate. Capsule dehiscent irregularly. Seeds numerous, less than 1 mm long-

Annual or short-lived perennials. Seasonally submerged, emergent or floating. Pollinated by insects or autogamous. The disseminules are sticky seeds, dispersed by animals or in mud. Graham, Shirley A. A revision of *Ammannia* in the western Hemisphere. *Journal of the Arnold Arboretum* 66: 395-420 (1985).

1. Styles (0.5-) 1-5 mm long

2. Sepal tube 4-winged, at least 4 mm wide; capsule shorter than and completely enclosed in the sepal tube

A. octandra

2. Sepal tube not winged, 3.5 mm or less wide; capsule as long as or longer than the sepal tube, at least partly exposed

3. Leaves papillose; axillary cymes sessile or nearly so; sepal tube leathery; capsule ellipsoid

A. desertora

3. Leaves glabrous; axillary cymes distinctly pedunculate; sepal tube membranous; capsule globose

4. Petals 2 mm or more long; capsules 2-3.5 mm in diameter; styles (1.5-) 2-3 mm long; sepal lobes erect in fruit

A. auriculata

4. Petals not more than 1.5 mm long; capsules 1-1.5 mm in diameter; styles 0.5-1 (-1.5) mm long; sepal lobes reflexed in fruit

A. multiflora

1- Styles less than 0.5 mm long

5. Cymes and flowers distinctly stalked at anthesis; cymes lax ^A- *senegalensts*

5. Cymes and flowers sessile or nearly so at anthesis; cymes head-like

6. Leaves and sepals glabrous; sepal appendages absent ^A- *–wu*

6. Leaves and sepals hairy; sepal appendages distinct, visually longer than the sepal lobes ⁷ _R

A. vertialtata

Ammannia auriculata Willdenow [*A. senegalensts* auct. »nd., non Lamarck]: Fig. 256

Stems 10-30 (-57) cm tall, erect or decumbent, usually 4-angled, simple or with ascending branches. Leaf blades linear-lanceolate to lanceolate, (0.6-) 1-5-6 (-9) cm long, (1.7-) 3-8 (-14) mm wide, mostly longer than the stem internodes, base cordate with auricles, tips acute. Cymes pedunculate, (1-) 3- to 15-flowered; peduncles (13-) 2-4 (-6) mm long; Pedicels of the central flowers 3-17 mm long. Sepal

tube \pm campanulate, becoming \pm globose in fruit, (1-) 2-3 mm long, 1.5-3.5 mm broad, with 8-10 green longitudinal ribs at anthesis; sepal lobes reduced to 3-angled teeth; sepal appendages smaller than the lobes or absent. Petals purple, violet or white, 2-5 mm long, deciduous. Stamens 4 (8). Styles (1.5-) 2-3 mm long. Capsules globose, 2-3.5 mm in diameter, exceeding the sepals. Seeds discoid.

Annual or perhaps sometimes perennial. In wet places, marshes, river banks and rice fields. Used as a counter irritant for rheumatic pains.

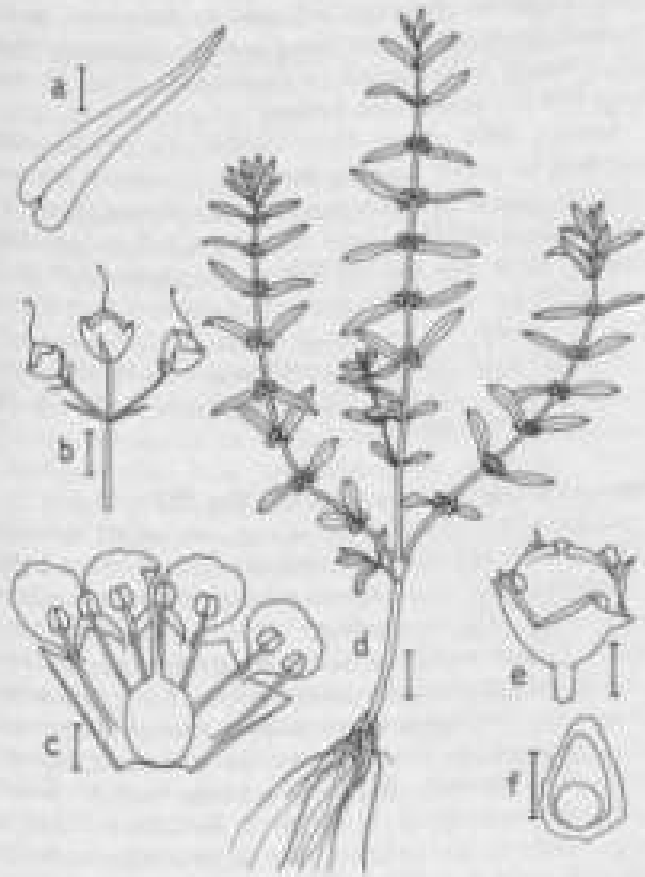
{(O)? Hel/Ten}. Warm and tropical regions of the world: Ind, Nep, Pak: Bh, Hp, Hr, Jk, Kl? Kt? Pj, Rj, Up, Wb. ?-1400 m.

Ammannia baccifera Linnaeus [*A. salicifolia* auct. Ind, non Monti, *A. baccifera* subsp. *aegyptiaca* (Willdenow) Koehne]: Fig. 256

Stems (7-) 25-50 (-100) cm tall, glabrous, decumbent or erect, usually much branched, the branches ascending and shorter than the main axis. Leaf blades linear-lanceolate to oblanceolate, (4-) 10-40 (-70) mm long, (0.5-) 1-8 (-16) mm wide, glabrous, mostly longer than the stem internodes, becoming smaller towards the apex of the stem, base gradually narrowed, rarely truncate or cordate, apex acute to subobtusate. Cymes compact, globose, sessile or nearly so or flowers solitary. Flowers sessile or nearly so; pedicels at centre rarely more than 1 mm long. Sepal tube broadly bell-shaped or obpyramidal, (0.5-) 1-2.5 mm long, 1-2.5 mm in diameter, with 8 longitudinal ribs; sepals 4 (5), lobes deltate, \pm two-thirds as long as the tube, purple-tipped; sepal appendages absent. Petals minute or absent. Stamens 4, included; filaments red; anthers yellow. Styles 0.1-0.3 (-0.5) mm long. Fruits bright red to purple. Capsules globose, 1-1.5 (-2) mm in diameter, partly exerted from the sepal tube. Seeds \pm 20, \pm globose, concave on the inner side, rounded on the back, 0.3-0.4 mm long, bright red.'

Annual. In wet or regularly inundated places such as marshes, river banks, rice fields, etc., but rarely found in permanent water. Often abundant and gregarious. The ripe fruits form small purple clusters making the plants visible from a distance. Used locally in medicine as a counter-irritant and considered to be poisonous but used as to reduce the sexual libido of animals. The larger more branched plants with subcordate leaves are often recognized as subspecies *aegyptiaca*.

{(O Hel/Ten)}. Tropical and warm parts of Asia and Africa and perhaps also Australia, introduced in the New World (Caribbean) and Europe: Bhu, Bur, Ind, Nep, Pak?: <An, Ap, As, Dl, Gj, Go, Kl, Kt, Mh, Mp, Or, Pj, Rj, Tn, Tp, Up, Wb. 0-1800 m.



Re 256. *Ammannia auriculata*: a, leaf (5 mm); b, inflorescence (2.5 mm); c, flower dissection (1 mm). *A. baccifera*: d, whole plant (1 cm); e, fruit (0.5 mm); f, seed (0.25 mm).

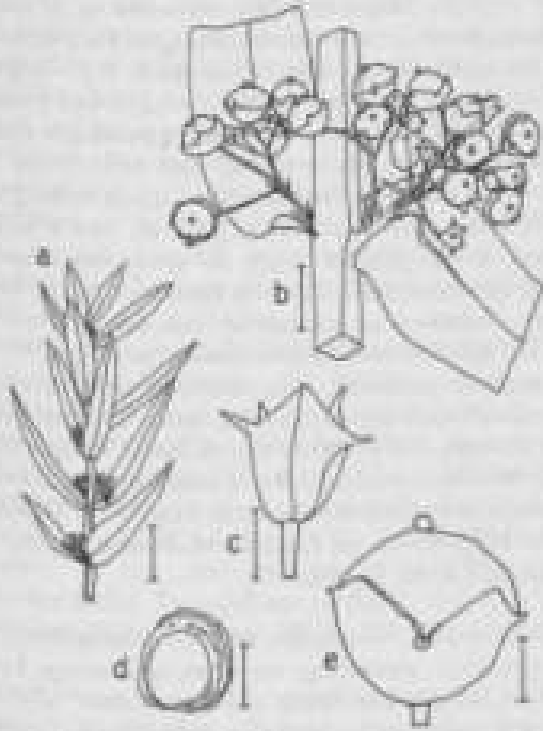


Fig. 258. *Ammannia senegalensis*: a, flowering shoot (1 cm); b, inflorescence (2 mm); c, sepals (0.5 mm); d, seed (0.25 mm); e, fruit (0.5 mm).

Annual. In low-lying moist areas, edges of tanks, marshes and rice fields.

© Hel]. S and SE Asia: Bur, Cey, Ind: Ap, Kt, Tn.

Ammannia smegalewis Lamarck: Fig. 258

Stems 10-30 cm tall, erect or suberect, simple or sparsely branched, square in transverse section. Leaf blades sublinear to oblanceolate, 5-30 mm long and 1-6 mm wide, base auriculate-cordate to subcordate or rarely gradually narrowed, tip acute or obtuse. Cymes axillary, compact, globose, subsessile*. Peduncles 1-4 mm long. Flowers 3-7 (-15) in axillary cymes; pedicels (0.5-) 1-1.5 mm long. Sepal tube broadly campanulate, becoming globose in fruit. 1-1.25 mm long, with 8 longitudinal ribs; sepal lobes 4, deltate, ± 1 mm long; sepal appendages liorn-like in bud or absent. Petals 4, obovate, up to ± 1 mm long. Stamens 4, inserted at the middle of the sepal tube. Styles minute. Fruits bright red to purple. Capsules globose, ± 1.7-2.5 mm in diameter, partly exerted from the sepal tube. Seeds ± globose, flattened on 1 side, ± 0.4 mm long, rather rough on the curved part.

Annual. In wet or regularly inundated places in a places.

[O Hel]. Warm and tropical Africa, naturalized in Europe and India, apparently confined to the Pune and Satara Districts, discovered in 1895 persisting until at least 1948: <Ind: <Mh 1895.

Ammannia verticillata (Ardino) Lamarck [*A. salicifolia* Monti]: Fig. 259

Stems 10-30 (-50) cm tall, sparsely branched, square in transverse section, with wings on the angles, not swollen when growing in water. Leaves linear to lanceolate or elliptical, (8-) 15-35 mm long, (2.5-) 4-17 mm wide, scabrid, base of upper leaves usually rounded, apex acute. Cymes lax, sessile or nearly so; pedicels 0.5-3 mm long. Sepal tube 4-angled, 2-2.5 mm long, scabrid; sepal lobes 4, tooth-like; sepal appendages usually longer than the sepal lobes or obscure. Petals 4, minute or absent. Stamens 4. Fruits remaining enclosed in the sepal tube. Styles 0-0.25 mm long. Capsules globose, 0.5-1 mm in diameter, shorter than the sepal tube. Seeds ± globose with 1 side flattened, ± 3.5 mm long, rather rough on the curved part.

Annual. Wet and marshy places, river banks, sometimes standing in temporary water and rice fields. Flowering and fruiting from July to October. It does not occur in India; published reports are misidentified

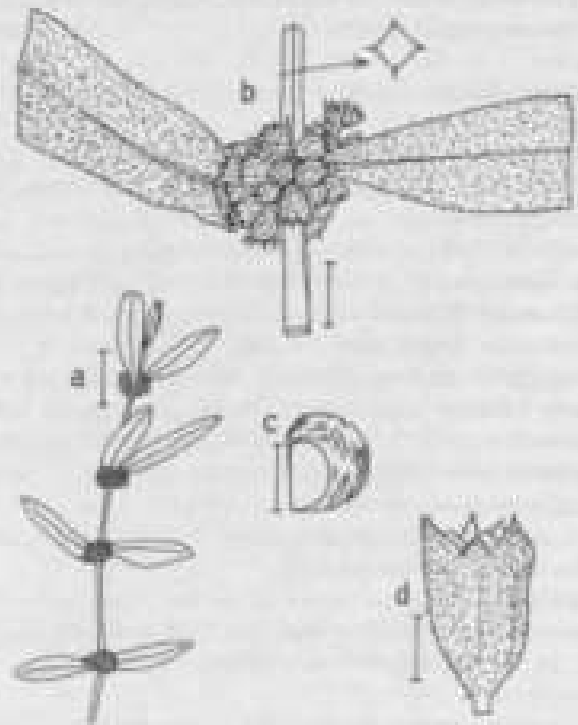


FIG. 259. *Ammannia verticillata*: a, flowering shoot with hairs omitted (1 cm); b, flowering node (2 mm) with transverse section of the stem (inset); c, seed (0.25 mm); d, sepals (1 mm).

Ammannia batrifrra (which has glabrous leaves and sepals and lacks sepal appendages) 01 misidcmificd *S'titufti fmatmta* {which has large bracteotw}.

© HeJ]- O?ntral and SIC Asia absent in India bui present in Sind (Pakistan), naurali/ed in S Europe l'ak-

Number: 50 species: tropical to warm regions of the world, most in Africa

Sis IDS 4-angled or some times inflated and abnosi leafless, leaves opposite, rarely whorled or alternate, >c.*ile. lmtMi¹ to *Cfl&X£*. Flowers in sessile or stalked axillary or terminal, many-flowered, bracteate heads or rarely solitary. Sepal tube campanulate to unshaped or semiglobulate; sepal lobes 4-8, with or without appendages Petals 0-8, corrugated in bud. Siemens A-TS. Ovary 2- to Mocular, sepuun complete and three-lobed continuous with the style: style *VBythem* $\frac{1}{2}$ longer than the ovary; stigma capitate. Capsules opening with a lid. iater bnegulfui) *hckm*. Seeds nuincrois.

Annual or perennial. PoIbnsted In bosecta or autogamous, The diMcmnuies are sticky wttls, probably dispersed by animals and in mud. Some are cultivated for decoration.

1. Leaves cordate and sinuately lobed at the base: [H'lals absent *N. brwipes*

1. Leaves alternate at the IKLW: petals pink, suborbicular or very rarely ebseni *N. prostrata*

Nesaea brucipvs Koehne [*Avimaimia cordate* Wight et Amoul: Fig. 260

Stems $\frac{1}{2}$ to 1-40 cm Uill or protuberant and retroflecting below, simple or sparingly branched. Leaf blades elliptic to ovate, 2-3.5 cm long, 0.2-0.8 cm wide, cordate to sinuately lobed at the base, obtuse or subacute at the apex. Cymes 1- to 3-flowered. Flowers subsessile; bracteoles \pm as long as the sepals. Sepal tube broadly lobed, \pm 2 mm long, glabrous, lobes 4 (5), up to 5 mm long, pinkish; Mpa] appendages uliaie. Stamens 4 (5), \pm 1.5 mm long. Petals minute or absent. Style up to 0.5 mm long. Capsules globose, 1.5-2 mm long, red. Seeds 3-4, ovoid, \pm 0.2 mm long.

Annual. In swamps. Usually in lowland phum, along river banks and on wet soil.

[O HeJ]. Perha] c title mit it> iht- (ndsut sabcotitinent; »?Bitn. »?Cey, »?did: Ap, Clj, Co, Kl, Si, Lk, Mp, Or, Pj, Rj, Tn, Up, Wb. 0-1000 m,

Nesaea prostrata (F. Maithflon ex Hillwyn) Suresh [*N. nitrola* Ja {Heyne ex C. B. Clarke} Kochne]; Fig. 260

Stems erect or decumbent, 6-25 cm tall. Leaf blades linear-lanceolate to oblanceolate or oblong, 0.7-5.5 cm long, 2-11 mm wide, glabrous or hairy. Cymes sessile or

nearly so. 1- to 2-flowered. Bracts sessile or nearly so: bracteoles lanceolate to almost oblong, as long or longer than the sepals. Sepal tube broadly lobed, 4- (5)-angled, 2.5-3 mm long. Bract hairy, with long hairs $\frac{1}{2}$ to 1 mm long or shorter than the tube: «-jml npjw-ndages shorter or longer than the tube. *Am. iwuilh- %oh hajl* at the $\frac{1}{2}$ of Petal! A *tj*, *atommt* to wborbirubr. \pm half 811-ibg M^or -shorter than the *ep* l k>bc*, pink \gg *tKI&f* absent. Stamen 4 [5]. Stigma R«Be or nrarh «- GajpSUTE glolKise or neaiK vi. • U mm in rJLitt-U't. Seeds 3-4, globose, Huttertrd $\frac{1}{2}$ to 1 mm long on one side. 0.4-0.6 mm long, brown in reddish-brown. Siliqua lough.

Annual or [H'rcnnial. Not confined to wetlands but sometimes found in wet areas; in ponds along streams and in fallow rice fields. It is weffidaliy like *Ammannia tuffleta* but is easily distinguished by the bracteoles which are almost as long as the sepals.

KG) Hcl]. India. Sri Lanka. Australia: Cey, Ind: Ap, Kl, Kt. Lk, Rj, [n.l'p. Wb.

Rotala [Amrlrtia]: 46 species: almost cosmopolitan

Stems erect, ascending, creeping or floating, 1- to 2 m tall. Leaves opposite or whorled, linear-lanceolate to ovate, sessile or shortly petiolate. *capfiarj* to linear or suborbicular-ovate



FIG. 260. *Nesaea prostrata* (F. Maithflon ex Hillwyn) Suresh [*N. nitrola* Ja {Heyne ex C. B. Clarke} Kochne]; Fig. 260. a, flowering branch; b, flower; c, capsule; d, fruit; e, stem node.

to cordate at the base. Flowers radially symmetrical, often inconspicuous, sometimes cleistogamous, usually solitary in leaf axils, sometimes terminally congested into spikes. Sepal tube campanulate to urn-shaped or globose in fruit; sepal lobes (3) 4 (-6), with or without appendages. Petals 0-6, minute or large and showy. Stamens (1-J 4 (-6)). Ovary 2- to 4-locular, without a disk at the base; style very short or long (some distylic); stigma capitate. Capsule dehiscent by 2-4 valves; each valve with fine horizontal lines. Seeds numerous or few, 0.3-0.6 (-1.5) mm long.

Annual or perennial. Pollinated by insects or autogamous; some species distylic. The disseminules are seeds which are sticky when wet; dispersed by adhesion to animals (mostly birds) or in mud. Some are weeds in rice fields and irrigation ditches, others cultivated for decoration. Cook, C. D. K. A revision of the genus *Rotala*. Boissiera 29: 1-156 (1979); Joseph, K. T. and Sivarajan, V. V., *Rotala* Linn. (Lythraceae) in Peninsular India. Proceedings of the Indian Academy of Sciences (Plant Sciences) 99(3): 179-197 (1989).

i. Lower leaves alternate (upper leaves occasionally irregularly arranged in clusters); upper bracts scale-like, resembling bracteoles; stigmas 2-lobed

R. floribunda

L Lower and upper leaves decussate or whorled; bracts not scale-like, not resembling bracteoles or bracteoles absent; stigmas capitate, not 2-lobed

2. Leaves on lower part of the stem in whorls of 3 or more

3. Petals absent

4. Bracteoles leaf-like, partly or completely enclosing the flower at anthesis, at least twice as long as the sepals; sepal tube \pm 1 mm long *R. occultiflora*

4. Bracteoles scarious, linear, not enclosing the flower at anthesis, rarely exceeding the sepals; sepal tube 0.5-0.7 mm long *R. mexicana*

3. Petals present

5. Sepal tube at anthesis urn-shaped (constricted just below or at the mouth), \pm 2 mm long; sepals, petals and stamens 3 or very rarely 4; leaves in whorls of 4-8 (-10) *R. verticillaris*

5. Sepal tube at anthesis campanulate (widest at the mouth), 0.7-1.5 mm long; sepals, petals and stamens 4; leaves in whorls of 7-20 or more

6. Petals rather insignificant, white, up to 0.8 mm long, shorter than the sepal lobes; anthers inserted level with the point of attachment of the petals; nectar scales not lobed *R. cookii*

6. Petals showy, pink or white, \pm 2.5 mm long, much longer than the sepal lobes; anthers inserted below the middle of the sepal tube; nectar scales 2-lobed *R. wallichii*

2. Leaves on lower part of stem in decussate pairs (rarely in whorls of 3 at the tips)

7. Stipule-like outgrowths present on the nodes between the leaves or bracts: sepals, petals and stamens 6

R. hexandra

7. Stipule-like outgrowths absent; sepals and petals 5, 4 or 3; stamens 1-5

8. Petals pinnately divided into linear segments (petals 2-3 mm long) *R. fimbriata*

8. Petals entire or lobed, not pinnately divided or absent

9. Bracteoles absent; dwarf, mat-forming plants with creeping stems *R. simpliciuscula*

9. Bracteoles 2; dwarf or not, stems erect above, not mat-forming

10. Appendages present between the sepal lobes

11. Seeds bright red; sepal lobes 3, 4 or rarely 5, bright red *R. malampuzhensis*

11. Seeds yellow or brown; sepal lobes 4 or 5, green to pink or brown

12. Sepal lobes 4

13. Leaves and bracts broadly ovate-cordate; sepal lobes acutely triangular, much longer than wide; sepal appendages \pm 1 mm long, apiculate *R. illecebroides*

13. Leaves and bracts linear to orbicular, never cordate; sepal lobes shallowly triangular, much wider than long; sepal appendages not more than 0.25 mm long, obtuse *R. ritchiei*

12. Sepal lobes 5

14. Bracteoles longer than the total sepals (tube, lobes and appendages), with a midrib; style at least 0.5 mm long, petals obovate, flowering branches compact, sepal lobes sharply triangular *R. densiflora*

14. Bracteoles equal to or shorter than the sepal tube, without a midrib; style not more than 0.25 mm long, petals elliptical, flowering branches lax, sepal lobes shallowly triangular *R. rosea*

10. Appendages between the sepal lobes absent

15. Sepal tube constricted above (urn-shaped); capsule valves induplicate (flowers in remote inflorescences, sepal lobes 4, stamens 2, capsule valves 4) *R. serpyllifolia*

15. Sepal tube not constricted above (campanulate); capsule valves not induplicate

16. Leaves and sepal lobes with a cartilaginous margin; capsules opening by 2 valves

17. Flowers distinctly stalked; anthers borne above the petals; petals showy, exceeding the sepal lobes (NE India and Myanmar)

R. subrotunda

rowed at the base, minutely bifid at the tip. Floral bracts like foliage leaves; bracteoles capillary, up to 0.5 mm long. Flowers monomorphic, cleistogamous or chasmogamous, sessile. Sepal tube campanulate, membranous, translucent, 0.7-1 mm long, splitting and disintegrating as the fruit ripens; sepal lobes 4, deltate, 0.5 mm long, pink; sepal appendages absent. Petals 4, obovate, pale pink, up to 0.8 mm long. Stamens 4, inserted on the lower half of the sepal tube; anthers borne level with the base of the petals. Nectar scales entire. Style no more than 0.25 mm long. Capsule globose, ± 1.2 mm in diameter, opening by 2 valves. Seeds 4-8, semi-ellipsoid, ± 0.5 mm long, brown.

Annual. In coastal wetlands and flooded paddy fields. Flowering during and shortly after the rainy season. It is locally abundant, found growing with other aquatic annuals such as *Limnopoia vieeboldii*, *Wiesneria triandra*, *Nymphoides indica* and *Hydrilla verticillata*. The description above is based on plants and differs slightly from the type description. *Rotala vasudevianii* is based on a single collection from Kerala, AJwaye. It seems to be no more than a somewhat small-flowered *R. cookii*, it has monomorphic leaves but this is likely to be environmentally induced; it is not a convincingly distinct species.

IQ Vit(Ten)}. Endemic to SW India: *Ind: Kl Jul-Nov (Ernakulam and Malappuram Districts).

Rotala cordata Koehne [*R. diversifolia* Koehne]: Fig. 261

Superficially like *R. densiflora* but stems with white wings running directly onto the margins of the leaves; bracteoles minute and very much shorter than the sepals; flowers constantly 4-merous; sepals without appendages; sepal lobes usually minutely serrate; styles 1-1.5 mm long; stigmas exerted.

Annual or perhaps sometimes perennial. In wet places.

(?) Ten/Hyp?}. From NE India and E Nepal through tropical SE Asia to Irian Barat: Ban, Bur, Ind, Nep: Bh, Or, Sk, Wb.

Rotala densiflora (Roth ex Roemer et Schultes) Koehne; Fig. 261

Stems erect, sometimes creeping below, up to 40 cm or more long, 4-angled, 4-winged, usually branched or sometimes simple. Leaves decussate below, sometimes in whorls of 4 above, very variable in shape and size (even on a single plant), linear-lanceolate to ovate or oblong, 2-35 mm long, base obtuse to cordate, tips acute or acuminate. Floral bracts almost dimorphic: on main stem and lower branches like foliage leaves, on branches above bract-like and scarcely exceeding the flowers; bracteoles longer than the sepals, with distinct

midribs. Flowers monomorphic, sessile. Sepal tube campanulate, ± 1 mm long; sepal lobes 5 or rarely 4, triangular to shallowly triangular, ± 0.5 mm long; sepal appendages linear or capillary, as long or up to 2 times longer than the sepal lobes or very rarely rudimentary. Petals 5 or rarely 4, bright pink or rarely white, 0.5-1 mm long, at least as long as the sepal lobes. Stamens 5 or rarely less, inserted on the lower half of the sepal tube; anthers borne level with the sepal lobes. Style 0.5-1 mm long. Capsule as long as the sepal tube, opening by 3 valves. Seeds ± 0.5 mm long.

Annual. In shallow water at the edges of tanks and ditches, in floating mats of vegetation, in marshes and in rice fields. It is a rather attractive plant with showy pink petals.

[O Ten/Hyp]. From the Pamirs through northern Pakistan and northern India to Assam, absent from the N Indian Plain but widespread in Peninsular India, extending to Sri Lanka and Northern Australia, naturalized in N Italy: Ban, Bur? Cey, Ind, Nep? Pak: Ap, As, Bh, Go, Hpjk, Kl, Kt, Mh, Mn, Mp, Or, Rj, Tn, Up, Wb.

Rotala fimbriata Wight: Fig. 262

Stems erect, sometimes creeping below, up to ± 50 cm long, weakly 4-angled. Leaves decussate, lanceolate to oblong, 1-3 cm long, tips obtuse; lower leaves cuneate to cordate at base; upper leaves cordate to auriculate at base. Floral bracts like upper leaves, usually somewhat auriculate at base; bracteoles acute triangular to subulate, rarely more than 1 mm long. Flowers monomorphic, sessile. Sepal tube campanulate, 2-2.5 mm long; sepal lobes 5 or rarely 6, deltate, ± 0.5 mm long; sepal appendages absent. Petals 5 or rarely 6, bright pink, pinnately divided into linear segments, 2-3 mm long. Stamens 5 or rarely 6, inserted at the base of the sepal tube; anthers exerted, borne level with the stigma. Style ± 2 mm long. Capsule elongate-ellipsoid, ± 3 mm long, opening by 3 valves: Seeds semi-ellipsoidal, ± 1.5 mm long.

Annual. In shallow water in ponds, temporary pools or in marshes. An attractive plant with showy flowers.

[O Hyp/Ten). Endemic to S India: *Ind: Ap, Go, Kt, Tn.

Rotalafloribunda (Wight) Koehne: Fig. 262

Stems shortly creeping at base, erect above, up to 40 cm long, slender, branched towards the tips. Leaves alternate, opposite or in clusters (on the same plant); submerged leaves linear, up to 50 mm long and 2 mm wide, flaccid; aerial leaves linear to lanceolate, rarely more than 5 mm long and 0.5 mm wide, rigid and somewhat ericoid in appearance, at base cuneate to

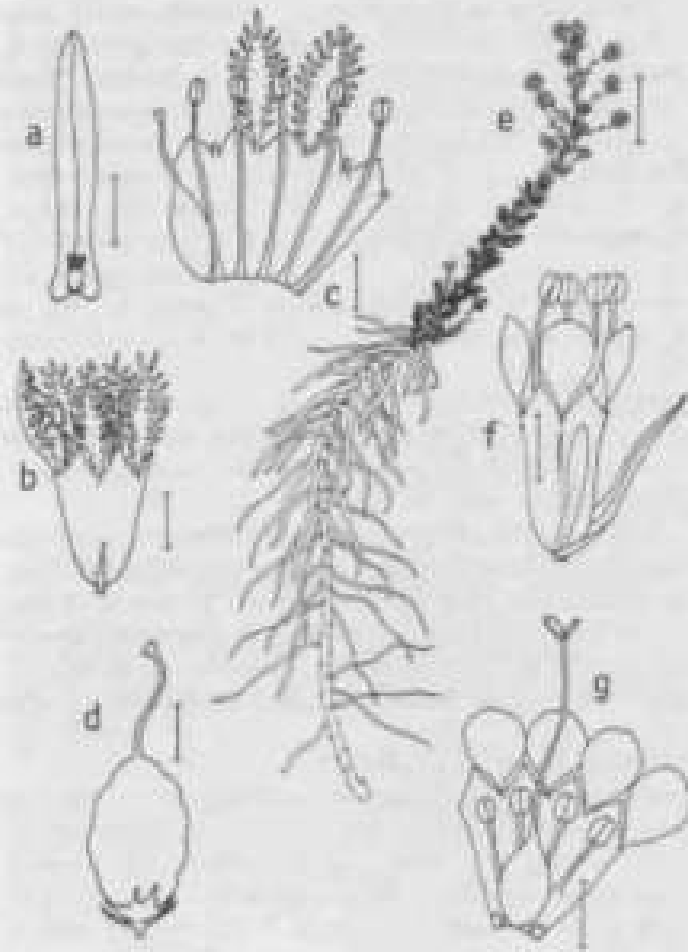


FIG. 262. *FtoMln fimbriatrr*. a, bract with flower (5 cm); b, stem with bracteole (1 mm); c, flower (1 mm); d, fruit (<1 mm). *W. fimbriatrr*. e, flowering shoot (3 cm); f, bract and bracteole (1 mm); g, pin (1 mm).

perennial or perhaps also annual. It grows in dense patches on rocks and in small rock pools. It is very attractive, flowering in December and January: it is called Mahabaleshwar heather. It is remarkable for its combination of aquatic and xerophytic characters, it shows relationships to the Asiatic species *R. istUB&ffiW* and to the E African species *fi, nrpifu*. [0? Vit/Hyp 11-I,-1, **Endcmk to W India**: *Ind: Mh (Maria Uueshw; IF J.± 1500 m,

Stems erect, sometimes creeping below, up to 40 cm or more long, sharply 4-angled to 4-winged. Leaves sessile, lanceolate to oblong, 1-3 cm long, base obtuse to cordate or auriculate, tips obtuse, with Mipumike appendages on the nodes near the leaf bases up to 2 mm long, similar but smaller structures on internodes between the leaf bases. Floral bracts linear, not more than 1 mm long; a second pair of small bracteoles sometimes found in the axils of the floral bracts. Flowers protogynous, shortly pedicelled, nectariferous. Sepal tube 1-2 mm long; sepal lobes 6, shallowly triangular, ± 0.5 mm long; sepal appendages none. Petal 6, obovate to oblanceolate, ± 1 mm long, usually with 6

Floral bracts at base <1 mm long, leaf-like, at tips thin-linear to lanceolate, relatively thick, up to 3 mm long. Flowering dense, terminal, ± racemose. Dimorphic, heterostylous. Subvillous or with up to 1 mm long peltate stipules long-jointed. Sepal lobes 4, distinct, ± 0.5 mm long; sepal appendages absent. IVUK 4. Ovary 4. Style 4. Anthers 4, inserted on the lower third of the style tube; filaments either 1 mm or 1.5 mm long; anthers either included or exerted and borne above the petals. Style either ± 0.5 mm or ± 0.3 mm long; stigma deeply 2-lobed. Capsule ovoid to ellipsoidal, opening by 2 valves; seeds sub-ellipsoidal, ± 0.4 mm long.

Perennial or perhaps also annual. It grows in dense patches on rocks and in small rock pools. It is very attractive, flowering in December and January: it is called Mahabaleshwar heather. It is remarkable for its

combination of aquatic and xerophytic characters, it shows relationships to the Asiatic species *R. istUB&ffiW* and to the E African species *fi, nrpifu*.

Rotala fwxandra Walltch ex Koehne: Fig. 263

Stems erect, sometimes creeping below, up to 40 cm or more long, sharply 4-angled to 4-winged. Leaves sessile, lanceolate to oblong, 1-3 cm long, base obtuse to cordate or auriculate, tips obtuse, with Mipumike appendages on the nodes near the leaf bases up to 2 mm long, similar but smaller structures on internodes between the leaf bases. Floral bracts linear, not more than 1 mm long; a second pair of small bracteoles sometimes found in the axils of the floral bracts. Flowers protogynous, shortly pedicelled, nectariferous. Sepal tube 1-2 mm long; sepal lobes 6, shallowly triangular, ± 0.5 mm long; sepal appendages none. Petal 6, obovate to oblanceolate, ± 1 mm long, usually with 6

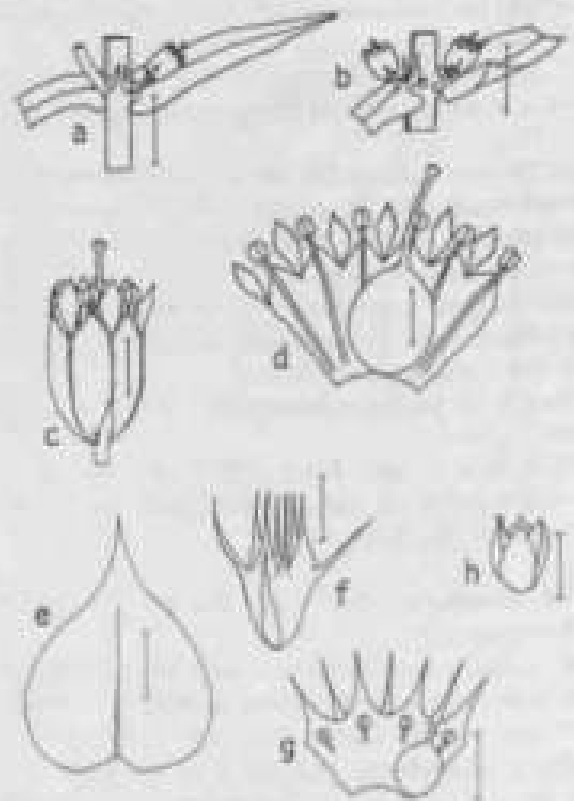


Fig. 863. *iitutoln hrxanAnz* a, node with flower (5 cm); b, node with stipules (1 mm); c, flower (1 mm); d, stem with bracteole (1 mm); e, flower (1 mm); f, stem with bracteole (1 mm); g, stem with bracteole (1 mm); h, capsule (0 mm).

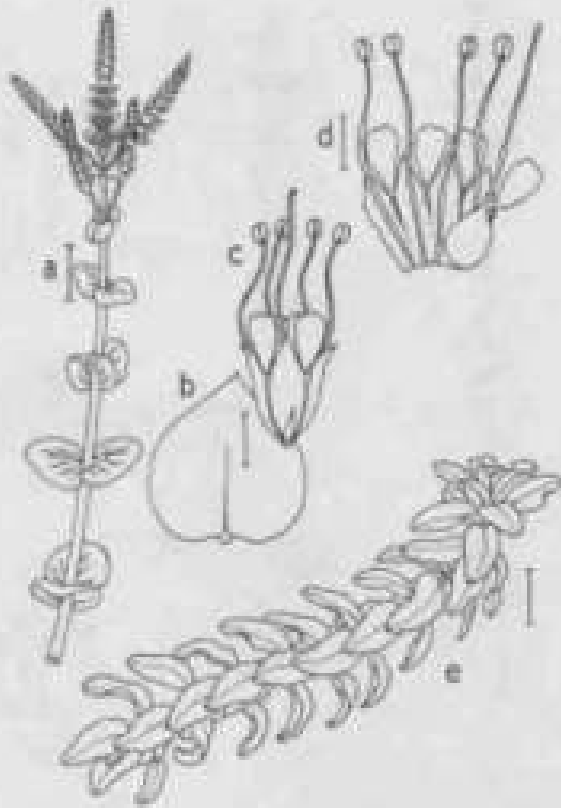


FIG. 265. *Rotala mamttthv*: a. flowering shoot (1 cm); b. bract (1 mm); c. flower with bracteote (1 mm); d. flower (11 mm); e. flowering shoot (1 cm).

Rotala marramim KIK-IIIIC: Fig. 265

Like *Rotala totunrifotia* but inflorescence tt-training compact in fniil (Mem not visible Ijclween the (lowers); bracteoles ± 0.5 mm long, ± half as long as the sepal tube; filamenis ± 4 mm long; anthers exceeding ilit- vrp;il babtt Uld peials; style ± 3.5 mm long; stigma mtoutely ("ipiare and «-arceK wid<i thitti thi- svlc.

Pefenniaj at sometimes annual. It is essentially a species of CO&S&I wetlajids. It is a coitimon plant found in streams, latinmis. temporary pond) antl Noodc-d paddy fields. VVlien submerged the leaves aie vciy ihin and palt- green to pink OS red. It Howeri AS the ivater ii-i ed<& It is cullivatcd as a deroraiivt* ;U[ii.iriimi plant but is usually sold under the name *Hotaia rotuntifotin*. Ben!. R. *folnia marrattdra* Kneltie. Anuarien- und Terrarien-/.eijj(chnfi!i!5(D): 198-201 {Vri2).

√(O) ViyH>-pl. Endemic to S India: • Ind: Kl. Kt. Tn. September-January. Near sea level.

Rotala matabarica A. K. Pradeirp, K. T. Joseph tl \. \". Sivarajan; Fig. 2lifi

Like *Rotala mamttthv* but lilcms 4-anglrd tci t-winged. with longer iniemodes: leaves DSTIORBF and prominently binnirronate at the ii|. flowers 5-mcrotis;

petals orbicular U> suborbicular. ± 0.5 mm long, ciawed ui ihr base: slihma 0.25-Q.h nun long; seeds ± 0.5 mm long, brown. Differs from ft *roam* and *R. drttiiflora* ty tat king sepal apjjendages. but having prominent nectar stales and bimiiiconate leaves.

Short-lived **annual**. Found in seasonally wet plates, tl flowers shortly after ihe onset <f ihr monsoon.

[O Ten]. Endemic to -SW India: •Ind: Kl (Kanniir Districl}. J u ly-N o vein be r.

Rotala malampvaho Kts R. Vasndevan Nair ex C. D. K. Cook; Rg. 266

Like ft. **mtw** bul flowers S-, •!- or rarely i-mcrotis; sepals bright **redj** **tecdj** bright r;d, ± 0.6 mm long.

It **ofieo** grows **intennngted** wiib *Il, rosca*, in the **field** ii may bt' distinguished li>- it> mttt-d liabii, smaller arid narrower leaves and the **itUCDM** rod of i« sepa^{s an} capsules.

.Short-lived annual, It is **OOitnKm** and uU*ⁿ gregar; **ous** iti HofKled rice fields, temporary **pools**, beside **streams** and in wet potkeu in mck-s; oitcti rnnniiiK a dt-nse **tarf**. 1 (towers vvirim two weeks of tbr onsei of the monsoon.

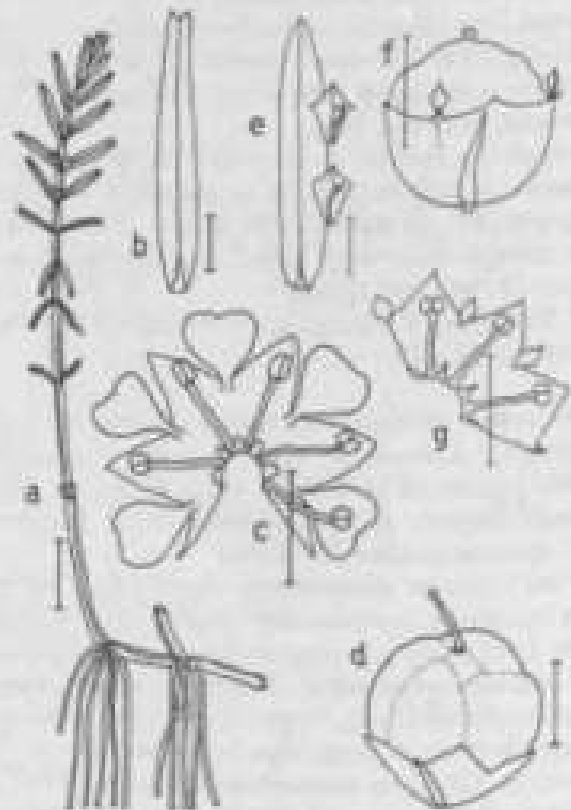


Fig. 266. *Rotala matabarica*: a, Howerinj plum [1 cm]; b. bract (1 mm); c, lower part of flower (1 mm); d. flower with bracteote (1.5 mm). *Rotala matabarica*: f. flower with bracteote (1 mm); g. flower with bracteote (1 mm).

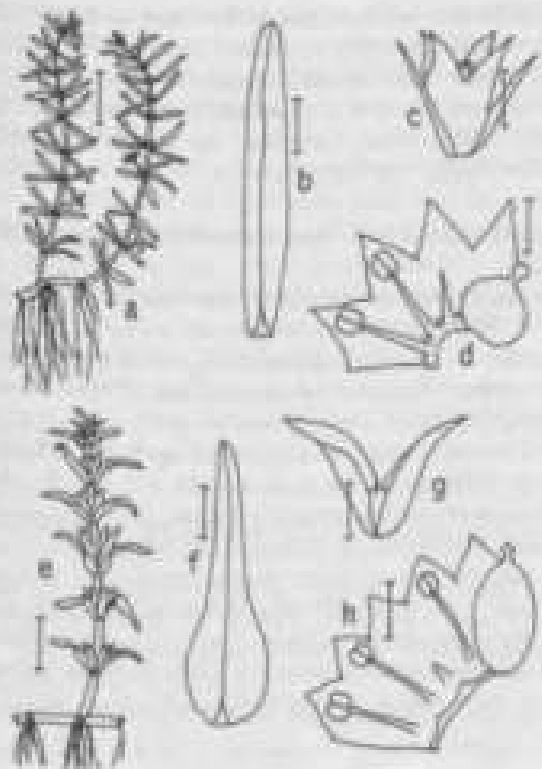


FIG. 267. *Rotula inrrirana*: a, flowering plant (ft 1 mm); b, bract (<1 mm); c, flowering plant with bract (ft 1 mm); d, flowering plant (ft 1 mm); e, bract (0.5 mm); f, flower with two bracteoles (0.5 mm); g, capsule (0.5 mm); h, capsule (0.5 mm).

(O Ten). Endemic ID SW India, between 9° N and 12° N: ilnd; KLJiJy-September.

Rotula wickströmii Chamisso et Schlechtendal [*H. pygmaea* (S. Kurz) Rajagopal et Karriyaya. *Hofia terna* (M. B. Shum.) K. Ilijira, p. Daniel et L. Hilox — originally described in the Scrophulariaceae): Fig. 268

Stems branched or simple, creeping, ascending, or floating, often in turf farming. Leaves in whorls of 3-8, sometimes decimate or imbricate. Leaves linear, up to 15 mm long, usually with 1-2 pairs of secondary veins, venation pinnate. Bracts linear, lanceolate or ovate, up to 10 mm long, usually with 1-2 pairs of secondary veins. Flowers solitary, sessile, often in the leaf axils. Sepal tube lobed, 0.5-0.75 mm long, red or pink; sepal lobes (3) 4 (5), ovate to elliptical, 0.25-0.5 mm long; petals absent. Stamens 1-4, usually included within the sepal

tube; anthers sometimes exserted. Style up to 0.3 mm long. Capsule globose, opening by 3 or rarely 2 valves. Seeds semi-circular, ± 0.8 mm long.

Annual. Usually found in shallow water or on wet mud following rain. It is sometimes very common in the tropics. It passes the winter period as seed.

[G Vtt/Tcn]. Tropical and warm parts of the world but absent from the Congo Basin, NE Africa, Arabia and the Pacific Islands: Ban. R. Ind. Ap, As, Bh, Kl, Kt.Mp.Oi.Rj.sk, Up.

Rotula inrrirana K. Ilijira: Fig. 267

Differs from all other *Rotula* species in having large, leaf-like bracts that partly enclose the flower.

It has the habit of *Rotula* but may be distinguished by the sepal tube slightly constricted at the mouth, transparent; sepal lobes consistently 5, not spreading at anthesis; capsule ellipsoidal, somewhat longer than the diameter.

Inconspicuous annual. Found in marshes and temporary wet places. It has a long life span; margins of ponds and streams. Usually found along the banks, sometimes in brackish water.

[O Vii/Ten] - SW India and M Australia: Ind: Gtt, Kl, Ki, Mh.

Rotula ritchiei (C. B. Clarke) Koelme; Fig. 268

Stems creeping or floating, usually simple above, up to 30 cm or more long. Leaves decussate, sessile, very variable in form; subterrestrial leaves linear to orbicular, up to 3 cm long but usually less, almost translucent, green to reddish; aerial leaves opposite to orbicular, up to 1 cm long. Flowers solitary, axillary, 0.2-0.4 mm long. Flowers monomorphic, disciform, pedicellate; pedicels in fruit 1-1.5 mm long. Sepal tube subcylindrical, ± 2 mm long, pink when young; sepal lobes 4, very shallowly triangular (allied to *Halimolobos* in fruit), sepals 4, acute. Anthers exceeding the style lobes. Petals 4, less than 1 mm long, usually minute and rudimentary. Stamens 4, inserted in the lower half of the sepal tube; anthers included within the sepal tube. Style very short. Capsule ellipsoidal up to 5 mm long, opening by 4 valves. Seeds semi-ellipsoidal, 0.3-0.8 mm long, straw-coloured.

An allied form of *Rotula* is *Rotula ritchiei*. Most of the plants are subterranean, only the flowering tips are emergent. Flowering from August to November, it is considered to be vulnerable and it is included in the 'Red Book' for India.

[G Vtt/Tcn?]. Endemic to SW India; Ind: Kl, Ki, Mh, Tn.

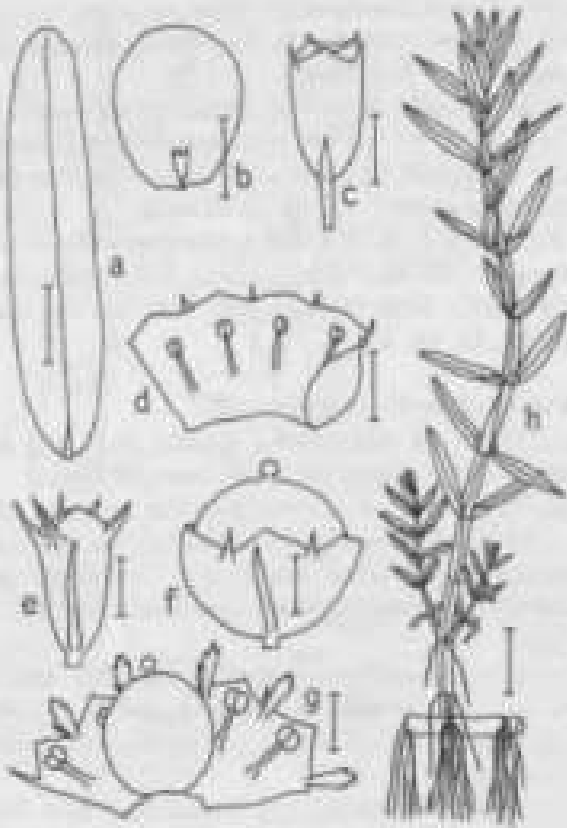


FIG. 258. *Hystera rufiflora*. a, seed (5 mm); b, bract with laciniae (5 mm); c, flower bud with bract (1 mm); d, flower dissection (1 mm); e, flower bud with bract (1 mm); f, flower dissection (0.8 mm); g, flower dissection (0.8 mm); h, flowering stem (1 cm).

Rotala rosea (Poiret) C. D. K. Cook [*R. pumila* (Roxburgh) Blatter et Hallberg, *f. repens* Halim (Blum) Koehne] Fig. 268

Stems **erect** or sometimes creeping below, rarely more than 1 m long, simple or branched from below, leaves decussate, linear-lanceolate to ovate, tips acute or obtuse, base cuneate or obtuse. Floral bracts like foliage leaves and exceeding the lower; bracteoles smaller than the sepal tube, **without** a midrib. Flowers monomorphic, sessile. Sepal tube campanulate: sepal lobes 5 or rarely 4, greenish or pinkish, shallowly triangular, ± 0.2 mm long; sepal appendages **subulate**, longer than to shorter than the sepal lobes or sometimes rudimentary. Petals 5 or rarely 4 or rudimentary, pink, distinctly longer than wide, ± 0.2 mm long, as long or shorter than the sepal lobes. Stamens 5 or less, included within the sepal tube. Style absent or up to 0.25 mm long. Capsule about 1 times as long as the sepal tube, opening by 3 valves. Seeds 0.3-0.35 mm long, yellow to silvery.

Annual. Usually found growing in shallow water or on wet mud. Common and often locally dominant in

rice fields and around tanks. The size and form of the flowers and the habit are very variable. The yellow to brown colour of the seeds is characteristic.

JO Ten/(Hyp)}. S and SH Asia, extending in Japan to 40° N: Ban, Bur, Oy, Ind: Af, As, Bh, Go, Kl, B. Mh.Or.Pj. Rj.Tn. Up.Wb.

Rotala rotundifolia (F. Hamilton ex Roxburgh) Koehne Fig. 269

Stems branched and somewhat woody below, creeping or floating, up to 40 cm or more long. Leaves decussate or rarely in whorls of 3, sessile or shortly petioled, rather variable: submerged leaves linear to orbicular, up to 2 cm long, green to grey, red or purple; aerial leaves obovate to orbicular, up to 2 cm long and 2.5 cm wide, green or occasionally red on the upper surface; leaf nerves distinct, pinnate, green or occasionally red. Floral bract distinct from foliage leaves, ovate 1-4 mm long; bracteoles lanceolate, equal to the sepal tube in length. Flowers monomorphic, subsessile; inflorescence a distinct, many-flowered, terminal raceme: pedicels (tense at early anthesis becoming lax in fruit (stem visible between nodes). Sepal tube

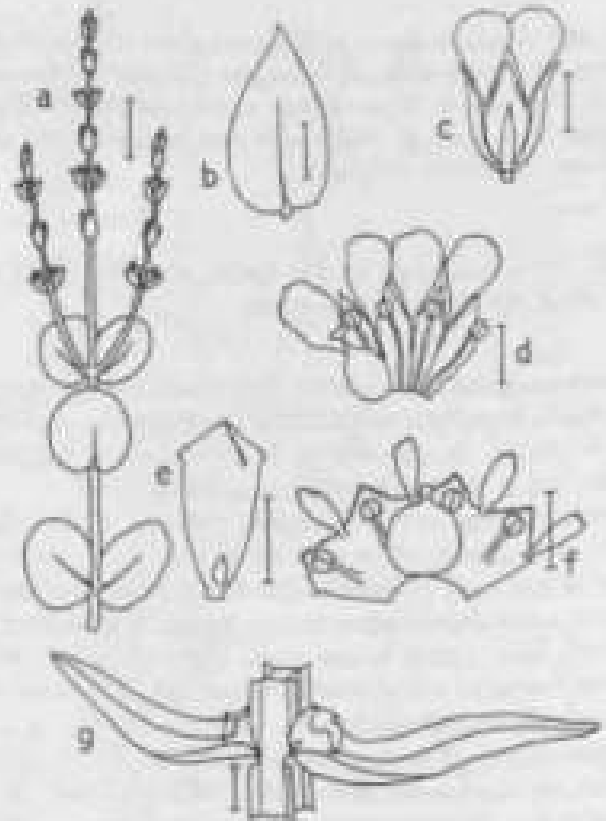


FIG. 269. *Rotala rotundifolia*: a, flowering shoot (1 cm); b, bract (1 mm); c, flower bud (1 mm); d, flower dissection (1 mm); e, flower dissection (1 mm); f, lower division (1 mm); g, flower dissection (1 mm).

pnUate, ± 1 mm long, with 4 rib-tike nerves; sepal lobes 4, iriaiigittlar, up io 1 nun long; sepal appendages ab«tir, **p^t^s** -1. obovjte, bright rose, i>-J times as long *** die sepal **tobot**. **StAMUU** -1: **BitmeQO** inserted near the base of Lhc sepjif iube, ± 1.5 mm long; anthers included within the sepal mbc. Style ± 1 mm long. **Capule** ± **liS** mm in diameter, opening by 4 valves.

Sceda semi-ellipsoidal. ±0.5 mm long,

Perennial or [KThaps sometimes annual. It is found growing submerged, partly floating, **Ctneifnmt** or **trc* ro iil** in **vci** places. It is mosiK found in motiiiuiin-**ma** regions, reaching 2650 m in China,

[Q)? Vit/Hyp/tTcn/l*k')]. -S and SE Asia, from India lo Japan: Ban, Bhu, Bur. hid. Nep, Rafc Ap, Av B". JO, K(. Mh, Ain. Mp, Or, Pf, Sjt, Up, Wb.

Rotula rotunda ((.- Hamilton ex D. Don) Hara |R. rotunda Koenig); Fig. 369

Like *R. rotunda* but lcatcs **ctmeate** in pbtusc ai the **luc** (never **cordattt**); petals arc **smaller** (tmi **exceed** **Jnf** > 1 mm long); style* vttry shun (± 0.1 nun !«tigh capsules exceed the sepal lube.

Annual or **pfirhapa** soinc-times perennial. Wei places. (KG)? Ten/Hyp|. Lndcmic io Nepal: #Nrp (**tun-** **tingar**).

Rotula mftylilijhtu (Roth) Bicmckamp ffl. *m«« (Roh) C. B. Clarke; Fig. 370

Stems creeping bcltnv and antediltng above or with axillary shoots; erect flowering shoots up to 25 cm long, slender, terete, rod and shining- **Leaves** (e, when submerged 1m ear and deep reddish* brown, when aerial linear h> hvn.iilK nvate or even **orbiculaj** at ba. ie. 2-1.5 mm long, green, tips acute or obtuse, **base** (iiiiicinc. Flora) bracts **green** or **tinged** with red, smaller than foliage leaves. mreiv **exceeding** ^ "i"t long, lanceolate to oblong; bracteolcs caducous, **ntar**-lain:cohue, ± 1.5 mm **long**, Flowers in dense. ier-nunaj. jit-duiiculatc. ipikc-Jike **raceme**^ **racwea** up ^{tr} 35 mm |orig. Sepal lubi- urn-like, constricted a('he tnp, 2,5-3 nim long: sepal lobes -1, widdv ileltate, * 0-5 mm long, **iepal** Appendages absent. Petiis 4. "rativ^ic, somewhai longer than the sepal lobes. Stamens 4, **Included** within the **sepal** tube. Si vie ^ ' nim long. Capsule **theater** than the sepal tiibc, opening by 2 valveit. Si-eds ± tl.7 mm long,

Annual or perennial in permanent water. It groivs submerged in rivers, streams and lakes but ii also found in standing water in seasonally inundated areas. **l'** flowers as the wafer rccr.dr*. **!l<- shoot*** art- often ^uBhtly pat ked and mrl-toi tmng.

KO> *Tirti*). C and \W India aittl **Pakistani** Ban. Jncf, ^{1>}ak; Bh, Cj, Kt, Mh, Mp, Rj, l'p, Wb.



FIG. S70. *Rotula irtpyttifu* Un: a, fliiwcring slnot (1 cm); b, mb-int-r^il ^IHMI (1 ao); c, **inflorcKcmt** <2 mm); d. **Howir** wnd ftjjiiri **Utd hracteafa** (/ nunj; o. **Rawer** direction (1 mm).

Rotula xiirtflitiusctifa (S. Kin/) Koelnir: **FSg.27**

Stems braodaed and creeping brlovi. ascendJng ;uid usually simple above, 1-i cm long, 4-angk'd. leaves .somrwhnl jjetinlatc: lower leaves narrowly obiong to oblong, 2.5-5 mm long, 0.5-2 mm widi-; **Upper** Leaves suiiicwh.ii **smaller**, oblong to ovate-oblong, lips obtuse or retuse. Floral bracw lcaf-liiM.; utsuaitv shortly staked; **bracteolei Bbftent** l'lowcrs monoincuphic. disimrth **pedicellate**; pedivrl <.)>-1 mm l^ujj. **s*-j>:il** nibi- **cvm*** pamilatc al amthesis becoming heinispherital in fruit. 0.25-0.25 mtti long, bright **rcdj** **IQpsJ** **lebei 9 ur** rarely 4. delLiie ai **Bpthcgfa bet<iuiii^** flullnvuK tMiuii>nlar in fmir Oar^l.MkT) itim loti); wrpjl **nili^i 15or** rarely 4, erect in hud. IVuN jInt-nt. Sunira* I **or** ocranon-allv 2, LUstlUit OH itir **IOmm** bilf 0| ihr srpa) rilhe; anthers level with ihr **tcpat btbn**. **Style «V0** **ihori**. Capsule glnbosc. Z 1.4 linn hi illiuielrr, * l'wit fi ;is long **Kt** ihe st'p;ils, ijijietijnn b> t \.il\i s. S< **crln** trini |fyi iJonn t(t heirnspln"riral, ± l.)* mm long.

Aiiiin.i]. It is, i rfwarf. mat-lbrmin^, amplliiifiiiis plant that **SUPERfidMOy** resembles *Utatineambigua*. Ap^aierilly not oul/c^rcid in th is **CCIO** iIT.

(OTen). Endemic to Bangladesh: tlian (Chiitagong).

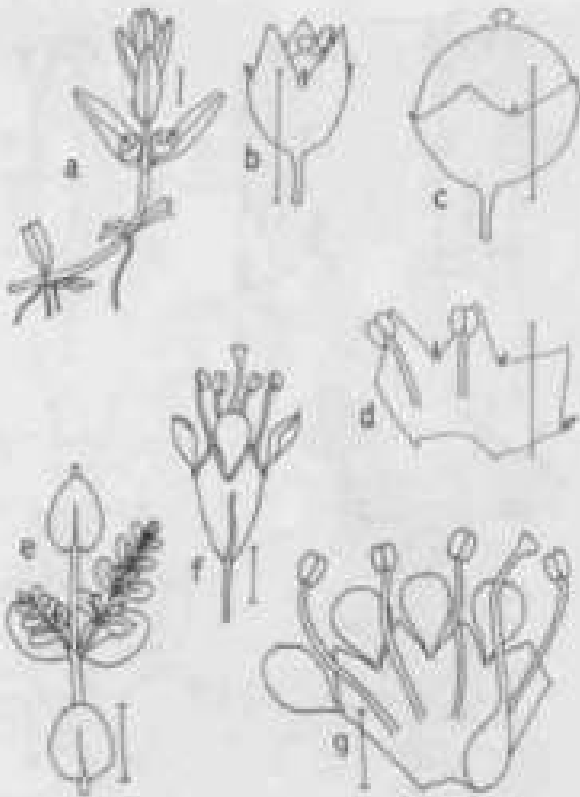


FIG. 271. *Kaiula timidusaii* a. Branching shoot (1 mm); b. lower (<1 mm); c. fruit (1 mm); d. flower (1 mm); e. dissected flower (1 mm); f. part of inflorescence (1 cm); g. flower (1 mm); h. lower dissection (1 mm).

Rotala subnana (Wallich ex S. Kuntz) Kochner: Fig. 271

Like *R. tuiira* but shoots usually taller and more branched; flowers distinctly pedicellate borne on lateral branches (never on the main axis); petals relatively large and showy (up to 1 mm long); anthers and stigmas exerted above the perianth.

(O) Ten/Hyp?). Endemic to ME India and Upper Myanmar. Saginjp »Bur, •Ind: MM, December-April.

Lintula intricata Linnaeus: Fig. 272

Stems creeping and somewhat woody below, arising erect above, up to 20 cm long but usually less. Leaves in whorls of 4-10, sometimes decussate at the base: stem leaves capillary, 10 mm or more long, rarely more than 1 mm wide; aerial leaves linear to oblong or oblanceolate, up to 2.5 cm wide; leaf tips truncate or minutely bifid. Floral bract leaf-like, usually in whorls of 4 or rarely 8 or 2; bractlets capillary, up to 0.8 in long. Flower monomorphic, sessile. Sepal tube membranous, confluent at the mouth (urn-shaped), 2-3 mm long; sepal lobes 3 or rarely 4, deltate, ± 0.5 mm long; nectar appendages present but small folds so men present.

Petals 3 or rarely 4, ovate to cordate, pink, + as long as sepals, usually persisting in fruit. Stamens 3 or rarely 4, inserted at about the middle of the sepal tube; anthers mainly reaching the sinuses of the sepal lobes. Style very short. Capsule globose-ellipsoidal, opening by a lid; seeds ovoid, 0.2-0.4 mm long.

Annual or perhaps also sometimes perennial. Found in standing water in pools and along the marshy margins of ponds. It dries as the water recedes.

(O) Vit/Hyp/T*U]. Endemic to SE India and Sri Lanka; •Cey. *Ind; Ap, Mp, Tn.

Rotala tuiira (J. D. Hooker) Koehne: Fig. 272

Stems creeping and branched below, erect or floating and usually simple above, up to 10 cm or more long. Leaves in whorls of up to 20 or more; submerged leaves linear or capillary, thin, translucent, tinged with red, up to 20 mm long, at tip bifid; aerial leaves linear to oblong, rarely more than 5 mm long, in whorls of 4-10 (leaves less than 1 mm long) or rarely decussate, at base scarcely narrowed, at tip obtuse or bifid. Floral bracts leaf-like, ovate to oblong, 1.5-3 mm long, at tip acute or bifid; bractlets capillary, up to 0.5 mm



FIG. 272. *Rotala tuiira*: a, flowering plant (1 cm); b, lower (1 mm); c. (lower dissection) (1 mm); d. dissected flower (1 mm); e. dissected flower (1 mm); f. dissected flower (1 mm); g. dissected flower (1 mm); h. dissected flower (1 mm).

long. Flowers monomorphic, chasmogamous, shortly pedicellate; pedicel adnate to the bract, the combined organ up to 1 mm long. Sepal tube campanulate, membranous, translucent, ± 1.5 mm long; sepal lobes 4, deltate, 0.5 mm long; sepal appendages absent. Petals 4, obovate, showy, pink fading to white, ± 2.5 mm long. Stamens 4, inserted on the lower half of the sepal tube; anthers borne level with the top of the sepal lobes. Nectar scales 2-lobed. Style up to 0.5 mm long. Capsule globose, ± 1 mm in diameter, opening by 2 valves. Seeds semi-ovoid, ± 0.7 mm long (perhaps larger — ripe material rare)

Perennial. Usually found in relatively deep water but can be cultivated terrestrially. Effectively self-incompatible and rarely found with seeds. Cultivated as a decorative aquarium plant.

[VU]. NE India to Malaya and SE China: Ban, Bur: Wb. The record from the Aravalli Hills (Rj) is surely an error.

MARANTACEAE: excluded see p. 12

MENYANTHACEAE: 5 genera

Monoecious or dioecious, perennial with tufted root-stock or rhizome or annual. Leaves alternate; petioles sheathing at the base; blades linear to orbicular or trifoliate. Inflorescence of simple or branched racemes or cymes or in dense heads or clusters. Flowers bisexual, radially symmetrical, often heterostylous. Sepals (4) 5-7 (8), united at the base. Petals (4) 5-7 (8), united at the base, often fimbriate inside. Stamens 5, united to the petals. Ovary superior, 1-locular with 2 parietal placentas. Fruit a capsule or sometimes berry-like.

Excluded: found in wetlands in the Himalayas but does not extend further south in India: *Menyanthes trifoliata* Linnaeus.

Nymphoides. 20 species: cosmopolitan

Dioecious, gynodioecious or monoecious, annual or perennial, some rhizomatous, some with banana-shaped root tubers. Flowering shoots sometimes with a single node and a single leaf, thus resembling petioles. Leaf blades submerged or floating, broadly ovate to orbicular or reniform, entire or crenate, green above, often dark below. Flowers solitary or in clusters, supported by floating leaves, often appearing to arise from the petiole or from the base of the leaf blade, unisexual or bisexual, usually distylic; adventitious root tubers sometimes present at the base of the inflorescence. Sepals triangular. Petals white or yellow, mostly fimbriate inside, often with crested midnerve and margins. Capsule sometimes regularly dehiscent but often opening irregularly or sometimes indehiscent.

Bottom rooted with leaves floating on the surface, submerged leaves may or may not be present. Pollinated

by insects or wind, some species autogamous, others distylic, gynodioecious or dioecious. Disseminules seeds, dispersed by adhesion to animals or by water or indehiscent capsules with unknown dispersal. The tubers of some species eaten locally. Seeds are used locally in medicine. Some are cultivated for ornament. Sivaranjan, V. V. and Joseph, K. T. The genus *Nymphoides* Seguiet in India. Aquatic Botany 45(2-3): 145-170 (1991).

Excluded: an aquatic plant found in the western Himalayas which does not extend further south in India: *Nymphoides peltata* (S. G. Gmelin) O. Kuntze [*Limnanthemum nymphoides* (Linnaeus) Link].

1. Flowering stems with several nodes (alternating leaves bearing flowers at intervals or the node at end of the petiole-like stem bearing 2 or more leaves); petals yellow

2. Flower clusters subtended by 1 leaf only (bracts scale-like); leaves clearly dotted with black glands beneath; seeds densely hairy and almost spherical {tropical S India} *N. aurantiaca*

2. Flower clusters subtended by 1 leaf and 1 or 2 leaf-like bracts; leaves dotted with minute (not visible with naked eye) glands beneath; seeds disk-like with marginal hairs (Himalayas) *N. peltata*

1. Flowering stems 1-noded (flowers apparently arising from the end of the petiole); petals white

3. Leaves monomorphic, all floating and associated with inflorescences

4. Petal lobes not fimbriate and without hairs (except at the throat), each lobe with a smooth but undulate longitudinal crest along the centre on the inner surface and with smooth, crest-like, undulate margins *JV. hydrophylla*

4. Petal lobes either fimbriate or with hairs, crests (when present) fimbriate or toothed along the margins

5. Flowers bisexual; petal lobes usually 1 cm or more long, uniformly and densely fimbriate with multicellular, cotton-like outgrowths on the inner surface and along the margins, without any longitudinal folds or crests; seeds 1-2 mm in diameter *JV. indica*

5. Flowers unisexual; petal lobes rarely more than 0.6 cm long, with fimbriae confined to midribs, longitudinal crests and margins; seeds 3-6 mm in diameter *N. macrosperma*

3. Leaves dimorphic; basal leaves in rosettes, not associated with inflorescences, usually submerged; fertile leaves not in rosettes, all floating and each with an inflorescence

6. Flowers unisexual; stigmas with 2 whorls of long, radiating hairs; anthers blue to purple

N. krishnakasara

6. Flowers bisexual; stigmas without hairs; anthers yellow

7. Petal lobes 3-5 mm long, the innermost fimbriate tooth-like, less than 0.5 mm long; anthers exerted beyond the petal tube*;

7. **Beta**] lobes \pm 8 mm long, the marginal limb ha it-like, mostly more than 1 mm long; **atthen** included within the petal tube

^. *parvifolia*
V. sivarajonii

Nymphoides aurantiaca (Dalzell) O. Kunze [*Ximnanthum bijonm Thwaites*]: Fig. 273*

Rhizome purplish-red, elongate bearing leaves and 1 lower at regular intervals. Petiole-like shoots with several nodes, up to 15 cm long, simple. Petioles 1.5-6.3 cm long, purplish-red; leaves on **Sewering** stems alternate; blades of floating leaves oval-orbicular, 2-8 cm in diameter, dotted with blackish-purple glands beneath, deeply cordate at the base, with a narrow sinus, purplish-brown on the abaxial (lower) surface. Flowers bisexual, weakly disyllic, in lax **raft** (1) 2-4 (lower). Pedicels up to 5 cm long. Bract sheathing, oblong-lanceolate, up to 6 mm long and 2 mm wide, dotted with reddish glands. Sepal lobes (4) 5, ovate-lanceolate, 5 mm long, purplish-red, glandular, margins membranous.

Petal lobes 3-7 mm long, orange; lobes (4) 5, obovate-oblong, tip to 4-7 mm long; orange, imbricate at base and each with a small tuft of multicellular yellow. Pluricellular hairs, margins finely imbricate. Anther lobes 1-2.5 mm long. Disk glands minute or absent. Capsule depressed-globose, 3-6 mm long, 3.5-4.5 mm diameter, usually 12-15 seeds. Seeds flattened, \pm 2 mm in diameter, densely covered with minute spines.

Annual or perennial, Shallow ponds, particularly in the coast. It comes into flower with the southwest monsoon.

(O) Kph]. **Endemic to S India** and Sri Lanka; **Oy**, **Ind**: Kl, Ki, Mh. Records from the Ilang arc probably **wrong**.

Nymphoides hydrophylla (Loureiro) O. Kuntze [*N. asiatica* (Roxburgh) O. S. Doelt] Fig. 274

Rhizome short, erect. Petiole-like shoots up to 85 cm long, slender. Petioles up to 23 cm long; blades of floating leaves oval-orbicular to orbicular, 4-13 cm long and 1.5-12 cm wide, green sometimes with purplish blotches, without glands, rather thin, deeply cordate to hastate at the base, coarsely crenate; **nerves** obscure above, prominent on abaxial (lower) surface. Flowers **bisexual** or sometimes female, weakly disyllic, in unilobed-like **Chen** of 10-20 or more flowers, borne on a floating leaf. Pedicels 2.8-6 cm long. Bracts ovate \pm 2.5 mm long. Sepal lobes 5 (6), linear-oblong, 5-3 mm long, lips subacute. Petal lobes up to 2 mm long, with a ring of glandular hairs above, throat yellow or sometimes white within; lobes 5 (6), ovate-lanceolate, 7-10 mm long, **pore** white, with a longitudinal **crest** along the centre on the inner surface and with thickened margins, without hairs but with some glandular hairs at the base, **obtus**. Stamens inserted halfway up the **tube**, **anthers** subfile, \pm 1.5 mm long, 5 or 6, each suborbicular, with papillose hairs at the apex. Capsule broadly ovoid, 5-6 mm long, 3.5-4 mm diameter, **reticulate** irregularly. Seeds minute (1-1.5 globose, \pm 2 mm in diameter, yellowish, with prominent, slightly imbricated tubercles.

Mostly annual, sometimes perennial. **Dactylis** (in mud) lake. v. m. and R-m] orary [HK]S. some in W in slowly flowing water. The **stem** may give rise to new shoot*. It (lower) fruits as long as it has sufficient water. Gregarious and common, sometimes growing with *Nymphoides indica*. It is monoecious and dioecious but bisexual flowers are self-compatible. * V. S. Nair, R. Heierostyly and breeding system of *Nymphoides indica* (Roxburgh) Kuntze [sic]. Journal of the Bombay Natural History Society 72: 677-42 (1976). The leaves are used in medicine for ulcers and bites, it is also claimed to be an antidote.

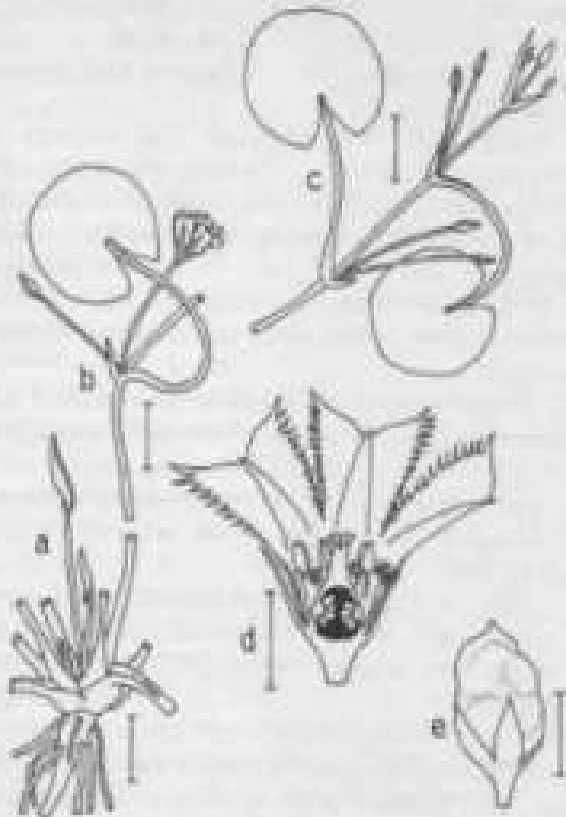


Fig. 273. *Nymphoides aurantiaca*: a, whole plant (2 cm); b, flowering node (2 cm); c, shoot tip (2 cm); d, flower in longitudinal section (5 mm); e, fruit (2 mm).

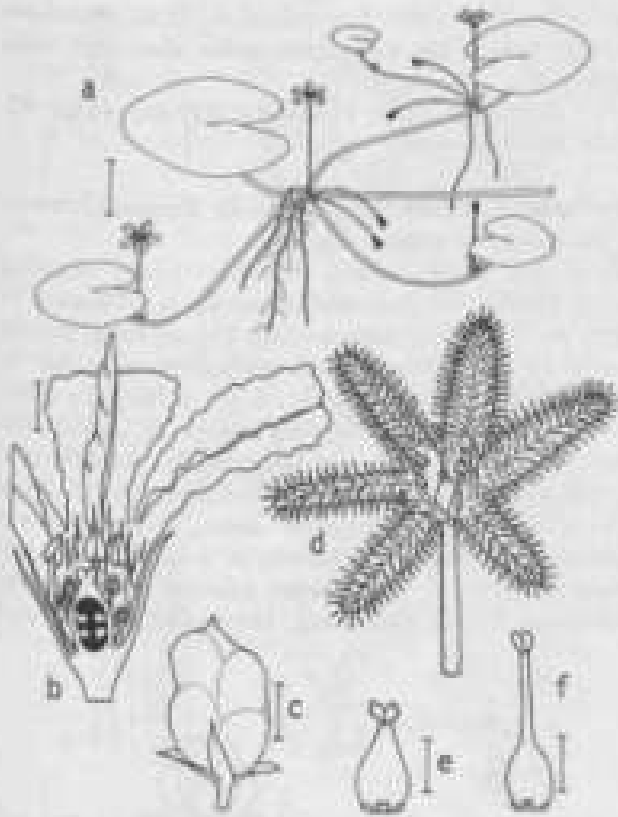


FIG. 274. *Nymphoides hydrophyte*. a, shoot with floating leaves and inflorescences (2 cm); b, flower in longitudinal section (0 mm); c, fruit (2.7 mm). *N. indicum* d, thrum flower (6 mm); e, ovary with thrum style (2 mm); f, ovary with pin style (2 mm).

I(O) Eph}. Tropical Asia: Ban, Cey, Ind, Nep, Pak: V Ap, As, Bh, Dl, Go, Hp, Kl, Kt, Mh, Mn, Mp, Or, Pj, Rj, Tn, Up, Wb.

Nymphoides indica {Linnaeus} O. Kuntze [*Limnanthemum indicum* Grisebach, *L. kteinianum* Grisebach]: Fig. 274

Rhizome oblique, up to 5 cm thick, with numerous scars and scale leaves, sending out long stolons which develop new plantlets. Petiole-like shoots up to 150 cm long, simple, flexible. Petioles up to 16 cm long but when flowering rarely more than 2 cm long; blades of floating leaves oval-orbicular to orbicular, up to 27 cm long and 30 cm wide, glossy green above, pale and gland-dotted below, rather thick and leathery, deeply cordate at the base, coarsely crenate; nerves obscure above, prominent on abaxial (lower) surface. Flowers bisexual, distylic, in umbel-like clusters of (3-) 15-50 flowers, borne below a floating leaf. Pedicels up to 12 cm long. Bracts sheathing, oblong-lanceolate, up to 8 mm long and 5 mm wide, rather thick. Sepal lobes

(4-) 5-7 (-8), ovate-lanceolate, up to 7 mm long, margins hyaline, tips obtuse, reflexed with age. Petal tubes up to 2.5 mm long, the throat yellow or sometimes white; lobes (4-) 5-7 (-8), linear-lanceolate to oblong-lanceolate, up to \pm 17 mm long, pure white or white with a yellow or orange base {sometimes entirely yellow in other regions of the world}, inner surface and margins densely fimbriate, with multicellular, cotton-like outgrowths. Anther filaments broadened at the base, up to 2.5 mm long, yellow; anthers \pm 3 mm long, yellow. Disk glands 4-8, each suborbicular, ciliate at the lips with papillose hairs. Styles either \pm 1 mm or \pm 3 mm long. Capsule ellipsoid to obovoid, 6-8 mm long, 4.5-6 mm in diameter, dehiscent irregularly. Seeds globose, 1.2-2.1 mm in diameter, yellowish-white, smooth and shining or with a few small tubercles.

Annual or perennial. Generally common and abundant in fresh and brackish water. In lakes, tanks and pools but rarely in flowing water. Flowering and fruiting as long as enough water is available.

{(O) Eph}. Pantropics: Ban, Cey, Ind, Nep: An, Ap, As, Bh, Gj, Go, Jk, Kl, Kt, Mh, Mn, Mp, Or, Pj, Rj, Tn, Up, Wb.

Nymphoides krishnahesara K. T. Joseph et V. V. Sivarajan: Fig. 275

Vegetative parts like *At. parvijoiia* with sterile radical leaves that may remain submerged but differ in having winged or sheathing petioles. Florally like *N. macrosperma* with flowers unisexual; petals folded backwards and arched upwards with a short dorsal crest; filaments 1-1.5 mm long; anthers \pm 2 mm long, spirally wound, blue to purple; stigmatic lobes 15-20, linear, \pm half as long as the carpel, papillose; seeds 5-10, discoid, \pm 3 mm in diameter, rough.

Annual and perhaps also sometimes perennial. Found during the monsoon season in shallow, temporary pools on laterite. It has been reported that male and females usually grow about 1:1. It flowers from August to November. In the original description Joseph and Sivarajan misinterpreted the shape of the petals and the morphology of the stigmas. The flowers are pollinated by wind — a unique feature in this family.

i{G)? Eph}. Endemic to northern Kerala: *Ind: Kl (Kannur District).

Nymphoides macrosperma R. Vasudevan {Nair}: Fig. 276

Rhizome up to 2 cm thick, developing elongate stolons. Leaf blades up to \pm 20 cm in diameter, green and gland-dotted below, rather thick and leathery. Fertile shoots dimorphic; primary shoots petiole-like, up to 2.5 m long, each bearing a single leaf; secondary

1. Stems and the abasial side of the midribs without spines; leaf blades flat and usually flexible; seeds less than 4 DUD long

2. I*af slieaih* sloping, rowded w> broadly rounded, never au nail ate

3. Male SHW female (lowers borne on the same branches (male flowers towards the apex hm also together with female (lowers): female flower enclosed within a spathe: wrd coal pits hexagonal {South Andaman Island) *N. hhtgii*

3. Male and female flowers borne on different brunt ht-s (or even plants); female Flower naked or enclosed with in a spathe; seed coat pits squarish to hexagonal (widrsprt-.nl' *V. trnm-*

2. Leaf sheaths truncate or lacerate to auri dilate

4. Seed coat pits ± f)12 mm lung, irregularly arranged in longitudinal rows of 12 (Sri Lanka)

N. grossareolata

4. Seed coat pits less than 0.1 mm long, arranged in regular tonyit.ud.inal row* of moi'e than ii*

5. Seed coat pits rectangular, wider than long (±0.03mm long, ± 0.t mm wide), arranged ladder-Like, more than tiO in each longitudinal row (N India)

6. Seeds 1,7*1-2,74 mm lung: anther l'sporAug-iate, Q.56-1,3 nun long *JV. minor*

6. Seeds 2.6-3.5 mm long; anther 4-sporangiaie,],?t-1.8 nm long *N. ogtirutiitis*

5. Sect! coai pits squarish to hexagonal. ± ai wide as lo<g (0.HIM I. 0H mm lung and wide), not arranged liko ladders, les* Lhaii 50 Ln each longitudinal row [widespread)

7. Male flower enclosed within a spalhe (female flower naked)

8. Anther 1-sporangiaie. 0,5-0.<> mm long; Iciii blades without septa, marginal teeth cells not botne on mnlticeUular swellings: leaf sheaths sltghdy auritk'd; **Ipaihc** of niik-flower 0.7-1 mm long {Mudhvii Pr;idr-sh)

N. kutziana

8. Anther 4-S]ur,ingiaie, (0.8-) 1.1—J4 mm long: **leofl&defl whfa or without septa**, marginal teeh cells borne on mulliceltutar swellings; teal >lnMihs with large auricles; spaihe of malt-flower (1.4-) 1.6-2J mm long (widespread)

\. imiica

7. Male Qower naked (fc-mviic Bower nakt-di

9. Anther -1-sporangiate: leaf margin teelh ininuie and hardly visibl- with the imaidi-d tfft

N. gratineia

9. Am he i 1-sporangiate; leaf margin teeth visible with the unaided eye

JV. maUsiana

Najas gram'mea RaHencau-Dclilc: Kig. 2⁷⁸

MoDoedOttli, slender or robust, often p^{earing} fVather-Kkc above liecause n> closely packed leaves-Sit-ms withoxu *)>int4, 0.4-13 mm m diameter. I[^] sheaths (1.4-) 2-4 (-5) long (including auricle at- late: spirit- idls), 0.9-2 (-2.7) mm wide, deeply atnicu^{late:} auricles (0.4-) fl.8-1.2 (-2.1>) mm long (including ^*- spines), (0.16-) 0.2-0.3 (-0.5) mm wide, serrulate with 3-14 spineion each side and 1-7 on the inner edge. apex acue. I/CJS blades, flat, (9-) H-25 (~^> mm Itmg, (0.24-) 0.5-0.9 (-1,1) mm wide (including iM¹ teeth), (0,2-) 0.4-^0.8 (-A19) mm wide (excluding tet-thj; limrgins minutely serrulate, with unkvtlulai teeth, invisible to the unaided eye. ih<' teeth U**~' 34^60 (-74) on each margin. 0.02-0,07 (-G.1?)\&* long, not liornc on nuiliicellular swellings; midi<• without teethj st^pia absent; fibres mostly present along the midrib and along the margin,-!. Mule fleiWWS nak<< anUier 4-sporungiate, 0.7-1.3 (-2.7) mm long. Fi'i¹ (lowers naked, L6-:i,7 ram long. Seeds eliptical-oblong, 0-2(>-) !.f>-2.4 (-4.2) mm long, (0.42-) 0.5-0.7 (-0.9) mm in diamciei; seed coat pi<< squarish

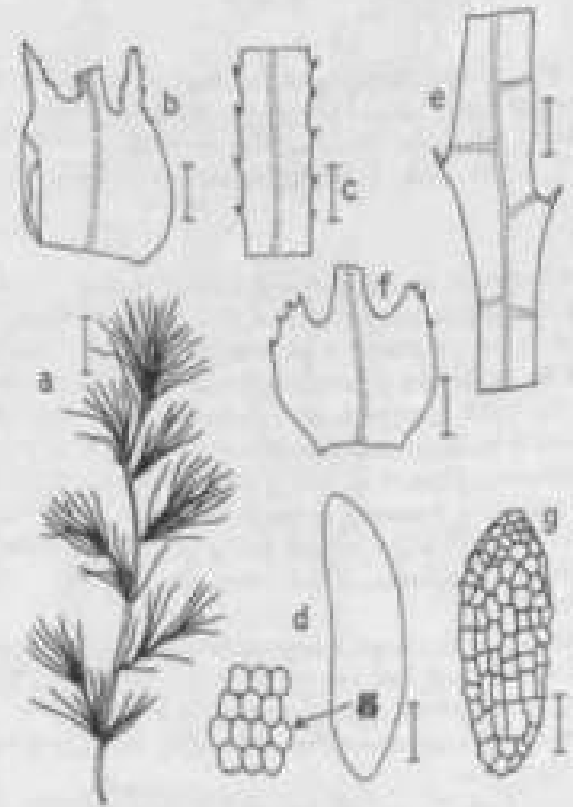


FIG. *78. *Najru gmbua*; a. luhit (I LIU); b, leM[^]>-11h (I mm); e. pan til had Wade {QJt mtni: d, lt<<d t^oe "u* (with surfiicf pattern (iuseO- V gntwrtotata: e- pan <> rthl hla<tr (U.Sumi); r.Wfshcatii (1 mm>-g,KCd (0.3 mm)

in ht-xagmi;tl or rectangular, (0.05-) 0.00-0.05 mm
 in regular longitudinal rows of (2.VI 25-35 (-GO).

P 1 a 1 (anr) probably also annual. Often locally
 dominant in siumting li'esh or brackish **water**. It can be
 distinguished from the other species by the usually
 'spineless' **leffKS** which fan out like feathers at the
 tips of the stems.

((©)? Vil). Warm and tropical **Europe**, Africa, Asia
 and Australia, saturation¹ tjj N America; Ban, Bur,
 Cey, Ind. Nep; Ap. Kl. Kt, Mp, Rj, Tn, Wb,

*Mojo*fpwarcolata* L. Tries!: Fig. 278

Mviutct-iaiiis. slender. Stems without **SpinQS**,
 £ J-5 nun in diameter. IAMI sheaths truncate to
 ^«fate, ± 2-1 mm long (including the spine cells),
 ± 2.25 mm wide, serrulate nr h< iniatic with ¹t-fi spines
 w <-:urif side; auricles fl.:M):J(nun long lincttirfing (he
 spine cells), **0.3S-G3** mm wide, serrulate or lai iniaie
 with 4-6 spines an L:ich side hui none on th« in mi
 sⁱf^, apex iicmninate, I.caf blades flat, flt-Kible,
 1S-17mm long, 0.5-0.8 inoi **wide** ^including ihe
 tecUi), 0.35-0.4 mm wide tenth if ling lhc- u-cili);
 margins serrulaif. wiili '.*-15, conspicuous spiny tre-th;
^{ll}<" tn-th 0.08-0.17 mm long, borne on miner small
 multicellular swellings; midrib without teeth: **septa**
 clearly visible up to the margins; fibres absent. Male
 flowers naked, anther 1-sporangiate. ± 0.8 mm long-
 Female **Bower*** «aked. Seeds dliprical-oblong,
 = ! -I" mni long, ±0.6 mm in diameter, clearly pitted:
 ^ed coat pits ± 0.1*2 mm **long**, irregularly shaped,
 irregularly **arranged** in longitudinal rows of 12, cell
WWs raised.

Annual or perennial

KO Vii]. Endtmic lo Sri **Lanka**: •Cey (EDawewa).

Najas indica (Wiflrct-now) Cliiamtsso fJV. *iuUrotmarpha*
 l'iifTith. *N. fitricuhUt* A. **BraUD**, A. Bjjnorvar, *sfnitom*
 Rrndlc. *N. latemta* Rrndk", *N. ftnvitfuia* var, *m'nvtt*
 kl ""ll(-!FiK. 279

Probably dioecious but perhaps monoecious.
 *<*ml[.]. Stems without spines, ± 1^1.3 inm in tliamc-
 "u". **Leaf** sht'aihJi aiiricilate. nuncaie or lacerate.
1-6-8.7 mm long {ind tiding (he spine **cells**).
1*'3.2 mm wide, senuJate <»r l>ciniatic *viih 4-10
 s spines on each side; auricle 0.22-1 run long (includ-
 ing die spine cells), 0.2-0.64 <-0.8) mm wide, serrulate
 of latiniatr with -f-J 0 spines on each side but **none** '>>
 the nine- edge, apex **ratier** obtuse. Leaf blades flat,
 liable, 10-26 mm long. 0.3-1.2 mm wide {including
 trttf locih). 0.2-0.5 (-0.H) mm witk- (**exdttdiog** the
 teeth); margins sen ulire, **with** ti-2(f, conspicuous spiny
 teeth, the teetli 0.14-0.4 mm long, **bonie** un bm-ul
 mukicellular swt-ilings, rlciiiy visibtt- to the. n;iked c<.

nsidrib mostly **without teeth**; septa clemly visible up TO
 ihe nriirgins; fibres absent. Mute flowers home in
 vp.ithe, (1.3-) 1-'& inin long; anihcr 4-spor3ngiatf,
 (D.&-) 1.4-1.fi mm long. Female ilowers naked. S***(js
 elliptical-oblong, 1.3-2.B mm long; 0.6-0.8 mm in
 diameter; seed mat pits squarish u» hexagonal, over-
 lapping but in **regular** longitudinal rows of **26-S5**.

Perennial and perhaps HJW annual. A poorly under-
 stood species in the p;wi and frequirnh misapplied
 and has evpn been **CoffStidered** synonymous wiib
N. miitar. h may br distinguished from fifi *fnvohta* and
N. mimrrby leaves with large teeth ant! large septa; leaf
xhcMh with auricJi's; *anther* 4^parM)giatc; **9CGd** coal
 piis m-ci-lapping (looking liltt a brick wall, the other
 two species have the pits arranged in rows hkr
ladders),

((O)? Vit/, Jrt dia, Sri *L-uiht*, Myanntar and perJiajis
 Vi(unnn: Ban, Bur, Cey. **Ind**: As? Gj, Ki, Mh. Or? Tn.
 Up, Wb.

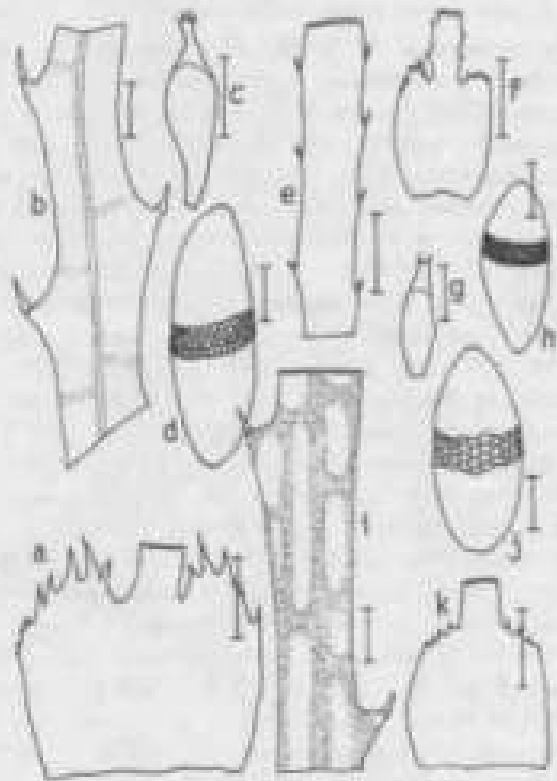


FIG. 279. *Najas indica*: a. leaf with serrulate margin (1 mm); b. portion of sheath (0.3 mm); c. flower (1 mm); d. leaf cross-section (1 mm); e. leaf sheath (1 mm); f. flower (1 mm); g. flower (1 mm); h. flower (1 mm); i. leaf sheath (1 mm); j. leaf sheath (1 mm); k. leaf sheath (1 mm) with Mirfart pattern (1 mm).

Najas kingii Ren die: Fig. 279

Like *N. tereah* but male and female flowers borne on ilir varnc branches (male flowers towards the apex bill also together with female flowers); female flower in a spiihle; weds 1.6—1.9 mm long, 0.5-0.8 mm in diiunc- ten seed coal pi is hexagonal, regularly arranged. (20-) 24-30 in each longitudinal row.

Perennial or perhap* sometimes annual. Recorded in rice fields in Vietnam. Cultivated as ;t ornamental in aquaria.

KG)?¹ Vii|. SE Asia: bid: An (South Andaman).

Najas kurziaua Rendic: Fig. 279

[ike .N. India but leaf blades lack septa and fibres or some fibres on or near both sides qf the midrib and eventually near each margin; male spa die 0.7-J (-1.8) mm long; anther I-sporangiue, 0.5-0.155 (-1) mm long; st^{^vth} 1-1 ;i mm lung. 0.4-0.5 mm hi diameter, with 16—20 rows oi" squarish to hexagonal seed coat pits.

Perennial or perhaps .sometime* annual.

({©)? Vii|, Endemic to India: *Ind; Mp.

Najas matesiana de Wilde [JV. *grumirwa* var *minor* Rendk\ *N. gramineti* var. *angustifolia* RendleJ: Fig. 280

Monoecious, slender. Stems without spuies, 0.5-1 HUM in diameier. Leaf sheaths (1.37-) 1.5-2.5 (-3.4) long (including spine cell?); 0.95-1.5 (—1.9) mm wide, auric- iilair, serrulate or lacerate with 3—10 spines on each side; auricles 0.34-0.65 (-1.13) mm long (i&d pding the aptnes), 0.23-0.48 (-0.5(3) mm wide, serrulate or lacerate with 5-10 spines tin each side and 0-3 on ihe inner edge, apex acuminate. Ixaf bl;ides flat. 10-J 9 mm long, (0,29-J 6.4-0.5 (-0,56) mm wide (including the teeth), (0-15-) 0.2">-0.35 (-0-44) Odlit wide (excluding teeth); margins serrulate, with (12-) 20-^0 (-50). somewhat inconspicuous teeth; the teeth 0.05-1 mm long, not borne on miittict-Hular swellings; midrib without teeth; septa absent or rarely present then visible only Mp u> half way to the margin; fibres absent or rarely present along the midrib and along the margins. Male flowers naked; anther I~*poranf>iau\ 0.5-0.8 (-1.1) mm long. Female flowers naked. Seeds elliptical-oblong, {O.iM 1.2-1.3 (-1.4) mm l<ng. fl.:M-0.48 mm in diameier; seed coat pits squarish to hexagonal or rectangular, 005-0.04 (\A)?>) mm long, in regular longitudinal rows of (20-) 30-35 (-40).

Annual. Often common and locally dominant. It is usually wrongly identified in Holistic works and is nun h more widely disiibuuid than the cited list *uggest.s.

{O \lt|. Tropical Asia and Australia: Ban. Bur, Ind: Kl. Ki, Pj.

Najas marina Linnaeus¹. Fig. 280

Diocious, robust, rather brittle and very spiny. Stems with spines. Leal bases rounded, not auriculate,

I-S.fi mm long. 1-5.5 mm wide, entire or serrulate with 0 or 1 (-3) spines on each side. L^af blades Be>hy<< HMi.illy undulate, usually hard and brittle, (4-1 3<>-¹¹) (-65) mm long, (I-) 2-5-4.5 mm wide (including th* leath). 0.4-2.5 mm wide (excluding *pines); ttUBttfB* serrulate, with ft-10 (-14). conspicuous spiny teeth. the teeth up in 2 tnm long, the spine cells visible CO ate naked eye, borne on large uuihicetiuiar SwelHngs; >''' abaxiaJ side of the midrib with (0-) 2-8 (*-<H ^lth, septa absent; fibres absent. Male flowers borne W Spathes, ±2.5 mm long. Female flowers naked, 2~ⁿ >^{lin} long. Seeds oraie., slightly ;isy(nmetriral, 1# - 7 ^ i^{mTl} long, 0.8-3.3 mm in diauu'U-r; seed coat pit* very irreg- ular in shape and number, not arranged in reguJS* longitudinal rows.

Mostly annual. In India there are surprising^ few records: it is found in still and flowing &c*B water.

|(G) Vit|, Almost throughout the Old World. A very variable specie*. Three subspecies are knovm fr^{om} India.

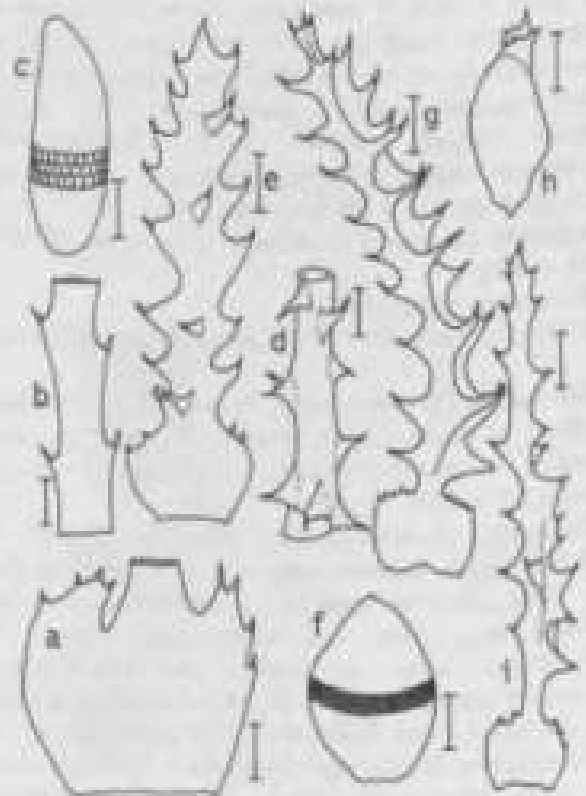


FIG. 280. *Najas marina* F. v. *h-ai* shtnth (U.3 mm); b. part of W.A blade ((J.3 mm); c. «;«l {0.3 mm) wkh smfarc patterP <uls<-t). *s. mainan&ttp, merhut*; d, p.trt of *wm> <-¹ mm) -. laf ofyar. *kashmirtnta* (1,7 mm); f, sued (1 mm) with surface patterd litm-i), *N. marina* mbsp. *nrmittn*; g. leaf (2 mm); h, male flwer in spaihe (1 mm). *N. mnrinn* i&trp- mtrv\edia; i. leaf (2 mm).

Najas marina subsp. *marina* var. *kasftmirensis* L. Triest: Fig. 280

Stems not very spiny, \pm 1-5 (-12) spines in 2 cm. Leaf blades 30-50 (-65) mm long, (2-) 3-4 (-5) mm wide (including teeth), (0.7-) 1.2-1.7 (-2.4) mm wide (excluding the teeth); margins each with 8-10 (-14) teeth; seeds (6.1-) 6.6-7.3 (-7.5) mm long, 2.2-2.6 (-3) mm in diameter.

Annual. In lakes and rivers. Sometimes locally abundant but mostly rather rare.

10 Vit[. Endemic to India: •Ind:Jk, Rj.

Najas marina subsp. *intermedia* (Gorski) Casper: Fig. 280

Stems not very spiny, (0-) 2-10 (-15) spines in 2 cm. Leaf blades (4-) 8-20 (-50) mm long, 1.1-3.3 (-4) mm wide (including teeth), 0.4-1.5 (-2) mm wide (excluding teeth); margins each with (2-) 4-8 (-12) teeth; seeds (2.8-) 3-4 (-5.1) mm long, (0.9-) 1.2-2 (-2.8) mm in diameter.

{O Vit}. Temperate to tropical Eurasia: Ind, Pak: Gj, Mp.

Najas marina subsp. *armaia* {Undberg fil.) Horn af Rantzien: Fig. 280

Stems very spiny, (10-) 15-25 spines in 2 cm. Leaf blades 6-20 (-24) mm long, (11-) 1.5-5.3 mm wide (including teeth), 0.5-2.3 mm wide (excluding teeth); margins each with 4-10 teeth; seeds 2.5-3.5 mm long, 0.8-2.1 mm in diameter.

Annual or perennial. It sometimes develops turions for surviving the dry period.

I(O Vit}. S Europe, Africa, Asia Minor, Sri Lanka and Australia: Cey.

Najas minor Allioni: Fig. 281

Monoecious, slender or robust. Stems without spines, less than 0.5 mm in diameter, plumose or bushy towards the apex because of closely packed curved leaves. Leaf sheaths truncate to lacerate, 1-2.26 mm long (including auricle and teeth), 1-2.4 mm wide, serrulate or laciniate; auricles 0.13-0.37 mm long (including teeth), 0.3-0.4 mm wide, serrulate or laciniate with (3-) 8-13 spines on each side but none on the inner side, apex rather obtuse. Leaf blades flat, flexible, (5-) 7-22 mm long, (0.3-) 0.6-1 (-1.8) mm wide (including teeth), (0.2-) 0.4-0.5 (-0.7) wide (excluding teeth); margins serrulate, with (6-) 10-18, conspicuous, spiny teeth; the teeth (0.07-) 0.2-0.3 (-0.5) mm long, borne on small or broad, multicellular swellings; midrib occasionally with leath; septa clearly visible up to the margins; fibres absent. Male flowers enclosed within a spathe; anther 1-sporangiate, 0.56-1.3 mm long. Female flowers naked. Seeds elliptical-oblong, slightly curved at apex, \pm 1.74-2.74 mm long, 0.45-0.65 (-0.73) in diameter, clearly pitted; seed coat pits rectangular,

broader than long, \pm 0.03 mm long, \pm 0.1 mm wide, arranged regularly and ladder-like in longitudinal rows of (60-) 80-100.

Annual. Characteristically found in habitats which show great fluctuations in water level or even dry out annually such as tanks, reservoirs and rice fields.

{O Vit}. Temperate and warm areas of Europe, N Africa, Asia and N America: Ind, Pak: As? Bh, Pj.

Najas oguraensis Miki: Fig. 281

Like *N. minor* but leaf sheath only slightly auricled; anther 4-sporangiate, 1.3-1.8 mm long; seeds 2.6-3.5 mm long, 0.6-0.8 mm in diameter; seed coat pits 80-100 in each longitudinal row.

Annual.

(0 Vit). N India, Nepal, China and Japan: Ind, Nep, Pak?:Jk.

Najas tenuis, Braun ex Magnus: Fig. 281

Monoecious or perhaps also dioecious, slender. Stems without spines. Leaf bases sloping, lacinate, rounded or broadly rounded, never auriculate, 1.8-3

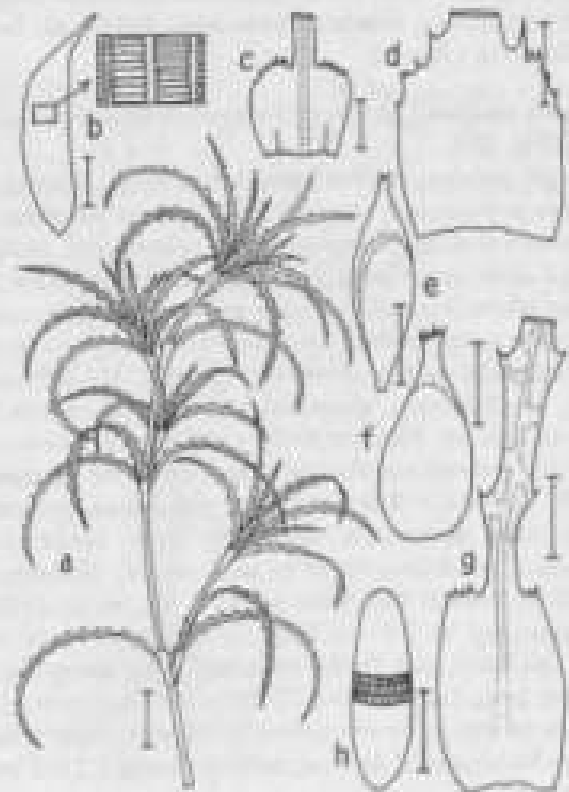


FIG. 281. *Najas minor*: a, habit (2 cm); b, seed (0.5 mm) with surface pattern (inset); c, leaf sheath (1 mm). *N. oguraensis*: d, leaf sheath (1 mm); e, male flower in spathe (1 mm). *N. tenuis*: f, male flower in spathe (1 mm); g, leaf sheath and base of blade (1 mm); h, seed (1 mm) with surface pattern (inset).

(-3.5) nifiJ long_h 1.3-2.4 <-3J > mm wide, serrulate or laciniati- wili li t-12 (-18) spines on each side. Leaf blades Hat. 15-25 mm {9-3-30 mm} long, 0.5-J (-1.3) mm wide (including teeth); margins serrulate, with 5-15 (~30), conspicuous, spiny teeth; thr *teeth* 0,14-0.4 mm long, the spine cells visible m ilu- **naked** rye, borne on multicelluLir swellings: midrib without **teeth**; septa clearly visible up to the margins; fibre* absent. Malt- flowrrs **borne** in spat lies. Female flower* **naked** or borne in spathes. 1.6-3.7 mm Jong. Seeds elliptical-oblong, 1.2-2.4 mm long, 0.45-0.8 mm in diameter: seed coat pits s-rjtii.irish to hexagonal, iti regular longitudinal rows of 25-35.

PerenniaJ and annual. In lakes, tanks, pools, ditches and rice fields. **GOBUDON** ami **widespread**, often misted with *N. graminea*, sometimes locally dominant.

1(0) Vitl. India, Sri Lanka, Myanmar and SW China: Bur, Ccy, Ind: Ap, Bb, Kl. Kt. Mp, l*j, Rj, Tn.

NEMIMBONACKAE: 1 genus

Wlutmbty. 2 **tpedfcf** and numerous varieties {*S'ftumbo tulai*, N America; iV. *nudfrra*, warm A.ia and Australia, naturalized elsewhere)

Ni. Xiuc-min *rt al Lotus*. Wuhan Instiuc of Botany, Acadatnia Sinica, Science Press: i^'ii, 1-163, pi. 1-inr? (iy87)—in Chinese

Nelumbo mtcifera Gac'ttncr [*Nttmdium* *sperianum* Willde- now]: Fig. 282

large, perennial, with milky lalcx. *Stems* dtmorphk; stem It-1 **horizontal, vegetative** stolons or rhizomes or thickened storage rhizomes. leaves alternate; petioles up to 3 m or more long, bearing niuneiois spines; leaf hlades when **immature** floating, when ntnature raised al>ove the water surface, peltate, reniform lo orbicular (eccentrically petiaie when wsrj voing). 10-HM) cm ur more in diameter, glaucous, nerves prominent bid without spines. **Flowers** 8-20 (-40) cm in diameter; **pedicel*** exceeding the petioles. Perianth **segments** 14-30, the outer 2-5 somewhat persistent, greenish-white and somewhat sepaNike, (he inner ones caducous, petal-like, while to pint or red. Stamen* tip to 200 or **more**; filament* up to 1 cm long; anthers elongate, up to 1.2 cm long, connectives each with a conspicuous and fleshy terminal appendage, up to 4.li mm long. Carpels (J-) 12-30 (-40). borne singly in cavities in the pithy **obconical receptacle**; fruit a head of very hard-coated nuilm; nutlets ovoid. ± 2 cm long. ± 1 cm wide.

Widely known as lotos or lotus. The juvenits arc submerged, the adults have floating or ftnergeni leaves. It flowers almost throughout die year. The (lowers **have** (hermo^jenetic stamina! connectives and arc strongly

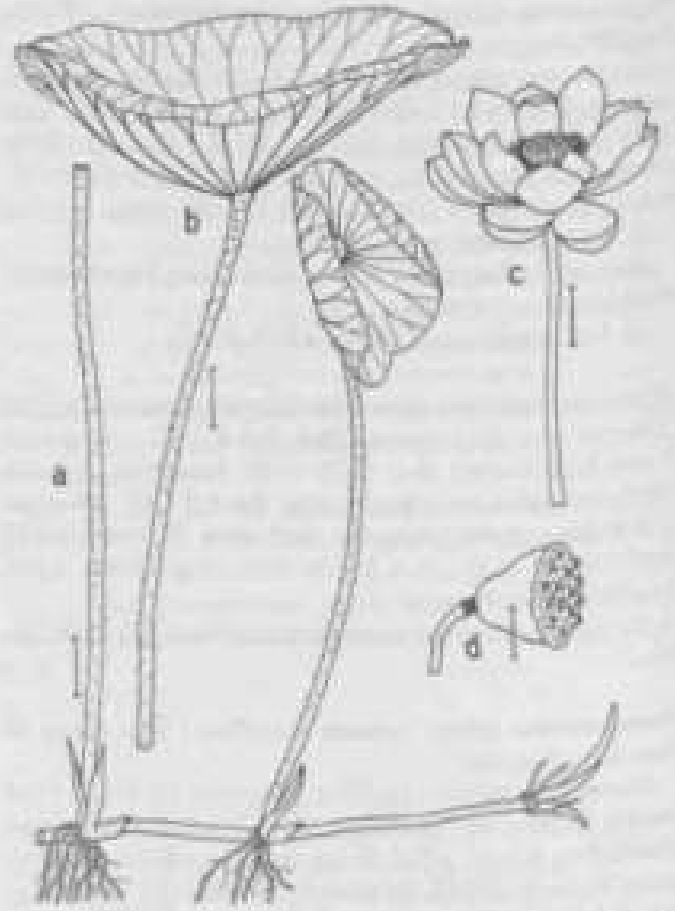


Fig. 282. *Xrlumko nudjera*: a, M>lon with two leaves (S cm); h. leaf blade (A cm); c, flower (3 cut); d. frtdting **bead** (2 cm).

scented; pollination is by insects, il is particularly attrac tivi- to IK-I: ^ *tkbtm&Q* honey is much in demand. The disse m in tiles are large and hard nude is, the *dispersal* mechaniMi) is not documented but liee **HUUt** arc probably iransporlKd by water, in mud and hy animal. The nuitets may remain viable for several hundret *ftsn* in tnud — Priestly, D- A. and Posihumus. M- ^{A*} Extreme longevity oi lutus serds from Pulantien- **Nacure 299: L4S-149** (19S0). It is width fultivated as a crop for iw edible lhi/uini^, **edible** nuts and **for bone** it is also grown lur ornament, the leave* arc* used lo serving foixl. h)s **Mfited** G» Hindus CptKlina¹ dewted to Brahma); tlje buds, art- ml letted daily early in lh« morning for worship in teniples. It is UMT! in mediting the seeds for skin diseases ;ind diinhoea. ihe rhi(>)i^{ll<™} **Bar** piles and ringworm,

It is very widely cultivated in India and it is *difficult* to determine where it is truly native.

[**Eph/Hyp**]. Warm Asia and Atistralia, n *naturalized* elsewhere: Ban, Bhu, Ind, \ep, Pak: Bh, Dl, Go, Hr, Jk, Kl. Kt. Mh. Mp. Pj. <Rj. Tn_T Up, Wb.

NYMPHAEACEAE [including BAJLOACEAE, excluding CABOMBACEAE]: 6 genera

Stems submerged, contriaed and corm-iikr or elon-
K<n'. rhizomatoua or stokmiferou*. Leaves alternate,
usually radical; petioles submerged, long ami flexible:
leaf Made* submerged or floaiing, rarely eiaergent,
cordate or peltate, linear to orbicular or sagittate.
Hi'...-h solitary, bisexual, radfeHj lymmetirfcal
4-6* free or Based to the ovary- Peials rarely absent,
usually numerous, often gradually passing tmo sttmesa
Of Stamfnodes. SL.nnens numerous. Carpels -V30 i>
more, united or partially united; stigmas on ;t disk wiit
radiating rays. Fruit an Irregularly dehiscent berry.
Seeds numerous, sometimes aril late.

Perennial or annual. All species are submerged or
cpihydals, occasionally some leaves may becottC
emergent when plants are overcrowded. Miira, R L
Biirclayaceac and NyriTphaeaceae. Fascicles of Flora of
India, 20: 1-2, 11-25 (1990).

Excluded: t>ctasionalty ciiniiv^iu-d but aljpparently not
becontirtg naturalised: *Naphar*, *Victoria*.

1- Plants bearing spini^; priioles of mature leaves
inserted ai the centre of ihc blade

2. Leaf bladt-s Iwaiing spfetes OH both surfvti'vs; leaf
marRin* not ttrned upwards; siaminndes absent;
carpe Qarjr a ppe-ndaf; e s * bw* n t *Euryatt*
J. Leaf blades bt-ai'ing spines on ibe lower (abaxial)
surface onJy; teafmaigku aimed opriprd. staminodes
replacing ihr inner siiiintns; (. 'irpclliwy appendagtrs
presen

Victoria

1. Plajus without spinet (M'liolts of the malurr leaves
inserted at the broader and notched end of (he blade

3. Siemens fused tu lthe petals; siaminodes absent;
leaves mostly submerged

Barrfaya

S. Stamt-ns It it- from the pctajs; sLaniinodes present;
leaves mosdj Mnnring, sometimes emergent Or sub-
merged

4. Sepals 5 or 6; ovary superior petals nai spread-
ing, scale or stamen-Jite; seeds without arils

Nuphar

4- Sepals 4; ovary semi-inferior; petals spreading,
petaloid. show'; seeds with bell-shaped arils

Nymphaca

Bairtaya [*Hydroilemmy*]: 2 species: tropical SKAsia

Bmrtaya *Iwigifitia* Wallich: HR- 283

Stems wiili ctnins and slender rbi/omes. Pc(ioles
&-2S im long; leaf blades usually toUilly submerged btn
occasionally emergent for short periods, linear-oblong,
12-28 (-40) cm long; 2-6 cm wide, membranous, the
base cordate to almost sagittate, the margins undulate,
h = tip obtuse. Peduncles K>-35 (-80) cm long. Sepals

hypogynous JS, 5, tincarellipiii.il. 15^3-5 cm long, green-
ish-our m outside, purple inskk', with midrib extended
into^ a ,Vr> mm long latL Pemls 8 to numerous, perigy-
nuns, united bdOW into a tube, shorter than the sepals,
greenish outside becoming pink, red or purple iaiidc-
Suumn> numerous, fused to the petals] staminodes
absent, tarpcls up to 10, united, Inferior; siigniatk disk
conkal, Fniit ;ui irregularly dehiitent, *)0- to 5fX)-seeded
lx;m', 1-1.5 tin across. Seeds gloxise. ± I mm in diaiut'-
ter. Covered in fine hooked spines, released in white
pulp.

Perennial. In Streams or rarely in pools, usually in
forested regions or rubber plantations. Ju\rmlc» and
adults are usually submerged, but sometimes season-
ally emergent, li is pollinated by insects and b also
sometimes autogamous; the flowers sometimes do not
even open- The disseminuii'S are seeds with hooked
spines released in pulp, dispersed by animals (wild
pigs in Malaysia). It is cultivated for decoration.
Kufner, J. ICRfeirung sow Haltung und Vermehrung
von *Bnfdaya Itrngt/olia* Wallich. Aqu,H-Planta
119-126 (1994).

[Ros]. SE Asia: Bur, Ind: An.

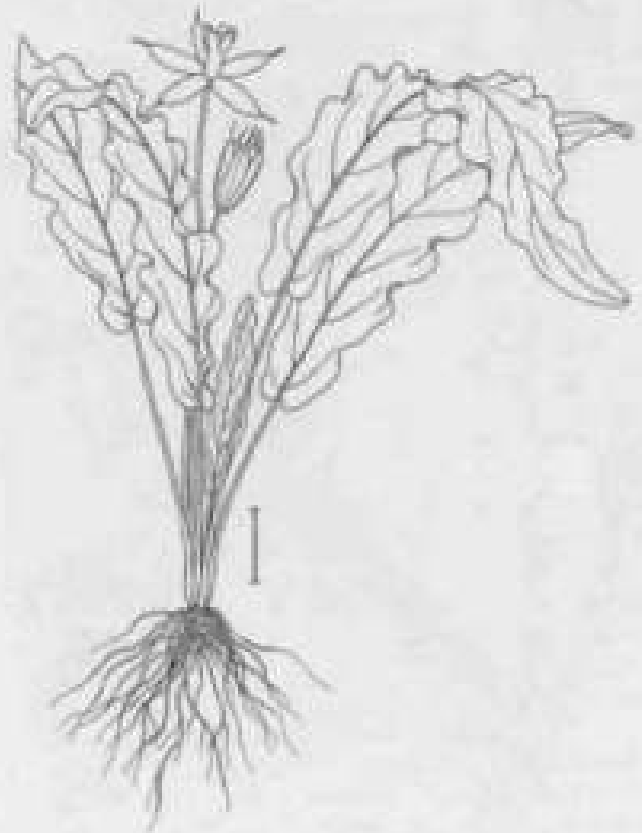


Fig- 283. *Banfoya tnungifoia*: whole plam with flmvers and
emergel leaves (B tni).

Euryalr. 1 species

Euryateferox Salisbury - Fig. 284

Stem a short, thick **rhizome**, leaves in rosettes; petioles densely prickly; mature leaf blade* **floating**, petiole, orbicular, up to 1 in or more in diameter. Both surfaces with spines, margin just upturned. **Flowers** often submerged and **leisiogetious**, 5-6 cm in diameter. **Sepals** 5, with prickles, epigynous. **Peduncles** 30-35, epigynous, shorter than the sepals, blue to violet or red. **Stamens** 78-92: staminal **absent**. **Carpels** 16, united, inferior; stigmatic disk obconical. **Fruit** crowned with **pointed tepals** covered with stout prickles. Seeds with pulpy aril.

Annual with **perennial** **Found** in **naier** up to 1 m deep in **lakes**, pools or in slowly **flowing** water. Juveniles are submerged; the adults have **floating** leaves. Although **apparently specialized** for pollination by insects (with scent and nectar) it is highly **antogamous**, often with **precocious cleistogamy**. **The** **disseminules** are large seeds with pulpy arils. **The** dispersal is probably by animals (fish and birds*) and

also by water. It is **extensively** cultivated in northern Bihar, **East Bengal** and **Kashmir** it is **becoming** rare and may now be **extinct**. **Its** seeds, **fruits** and **rhizomes** are eaten locally by **humans**; it is also used **medicinally** and cultivated for **decoration**.

! (©) lipli). **N India to Ceylon, Manchuria and Japan**: **Ban, Ind: A*, Bh., Jk., Mg., Mti. (Jr., Rj., Tp., Up., Wl.)**.

Nymphaea: ± 40 species plus numerous hybrids and varieties: cosmopolitan

Plants **Without** spines. **Stem**, slender or with **rhizome**, a **connate** or **tuber**. **Petioles** sinuate; **leaf blade*** with a **sinuate** margin, mostly **orbicular**, **leathery**. It is submerged usually (in **shaded** places). **Peduncles** borne above the surface, strongly **prolonged**. **Sepals** 5, green or sneaked with red, **peels** numerous, **thick** passing into stamens. **Stamens** numerous, with **Without** **apertures** **live**. **Carpels** 3-8. **or** partially united; **fruit** a **lucy** ripening below **water**. **Seeds** with bell-shaped arils.

Perennial or **annual**. **Found** in **lakes** or **flowing** up to 1/2 m deep, in a **wide variety** of habitats. **Some** **species** **are** **found** **in** **the** **mountains** **of** **the** **Himalayas** **and** **the** **Andes** **and** **the** **Rockies** **and** **the** **Sierras** **of** **the** **United** **States** **and** **the** **Caribbean** **islands**. **The** **leaves** **are** **usually** **orbicular** **or** **obovate** **and** **the** **petioles** **are** **usually** **sinuate** **or** **obovate** **and** **the** **stamens** **are** **usually** **numerous** **and** **the** **seeds** **are** **usually** **large** **and** **the** **fruits** **are** **usually** **submerged**. **The** **rhizomes** **are** **usually** **horizontal** **or** **erect** **and** **the** **leaves** **are** **usually** **orbicular** **or** **obovate** **and** **the** **petioles** **are** **usually** **sinuate** **or** **obovate** **and** **the** **stamens** **are** **usually** **numerous** 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toothed, waxy, ± elliptical-orbicular to round, 5-25 (~45) cm long and wide, the radial slit to the centre or to within 6 mm of the centre, glabrous on both surfaces, the adaxial (upper) surface green (sometimes blotched with purple), the abaxial surface reddish-purple, the margin entire or with broad obtuse teeth. Flowers barely emergent. Sepals lanceolate to ovate-lanceolate, 2.5-5 (-9) cm long, green often with purple streaks, obscurely veined, persistent in fruit. Petals 6-16, white, pinkish, blue or bluish-purple, the outer ones lanceolate to oblong-lanceolate, 2.5-7.5 cm long. Stamens (15-) 20-40 (-65), 1.5-3 cm long, not separated from the petals by a gap; anthers not flattened, yellow with white or blue apical connective appendages up to 4 mm long (usually less than one-quarter as long as the anther). Stigmatic disk surrounded by short (1-3.5 mm long), incurved, carpel appendages. Fruits 1.5-4 cm in diameter. Seeds ellipsoid-globose, 0.5-1 (-1.5) mm long.

Perennial or annual. Common and often locally dominant in permanent and temporary water. It grows in shallow pools or water up to 2 m deep. The

flowers are fragrant; they open during the day and close at night; after pollination they tend to remain closed day and night. Leaves, petioles and peduncles are eaten locally; most parts of the plant are used in medicine to cure various complaints.

Plants resembling *N. nouckali* with the abaxial (lower) leaf surface green with purple spots and growing in the hills may belong to the African species *N. caerulea* Savigny; plants proliferating from the sinus of the leaf blade may be *N. x daulwniana* O. Thomas a hybrid involving *N. micrantha* Guillarmod et Perrier de la Bathie and perhaps *N. caerulea*.

(O) Ephf. S and SE Asia: Ban, Bur, Cey, Ind, Pak: An, Ap, As, DL, Go, Jk, Kl, Kt, Mh, Mp, Or, Pj, Rj, Tn, Up, Wb.

Nymphaea pubescens Willdenow [*N. rubra* Roxburgh ex Andrews, *N. nouchaii* auct. Ind., non N. L. Burman, *N. fotoauct.* Ind., non Linnaeus]: Fig. 285

Leaf blades mostly floating, green above, brownish or purple below, ovate to round, 15-36 (-59) cm long and wide, the abaxial surface dark green and glabrous, the adaxial (lower) surface greenish, brownish or purple, densely covered with short hairs or the hairs sometimes restricted to veins, the margins sharply dentate, although the teeth sometimes absent on the apical part of old leaves; teeth 3-7 mm long, 7-15 mm apart. Flowers borne well above the water. Sepals ovate-lanceolate to obovate-oblong, 2.5-8.5 cm long, uniformly green with 5-9 white veins, decaying as the fruit develops. Petals 10-25, white to pink or deep red, the outer ones oblanceolate, 2-7 cm long. Stamens 25-70 (-90), yellow or red, separated from the petals by a gap; anthers flattened, 1-4 cm long, without appendages. Stigmatic disk surrounded by large (5-10 mm long), yellow, finger-like appendages which close over the stigmas after the first night of lowering. Fruits globose, 2.5-4 cm in diameter. Seeds ellipsoid to globose, ± 1.4 mm long, ± 1 mm wide, almost black with a white aril.

Perennial or annual. It is common and often locally dominant. It mostly grows in shallow permanent and temporary water. It is a very fragrant night-flowering species; after pollination the flowers usually remain open during the day but the stigmatic appendages lie over the stigmas. The rhizomes with roots are eaten as vegetables; the leaves are often used as fodder. Most parts of the plant are used medicinally.

I rather suspect that the Indian species should be merged with *N. lotus* Linnaeus. A cultivated race of *N. pubescens* which does not develop seeds and has red immature leaves, crimson petals and red anthers is sometimes found naturalized in permanent water and in decorative pools; is often called *N. ruha*.

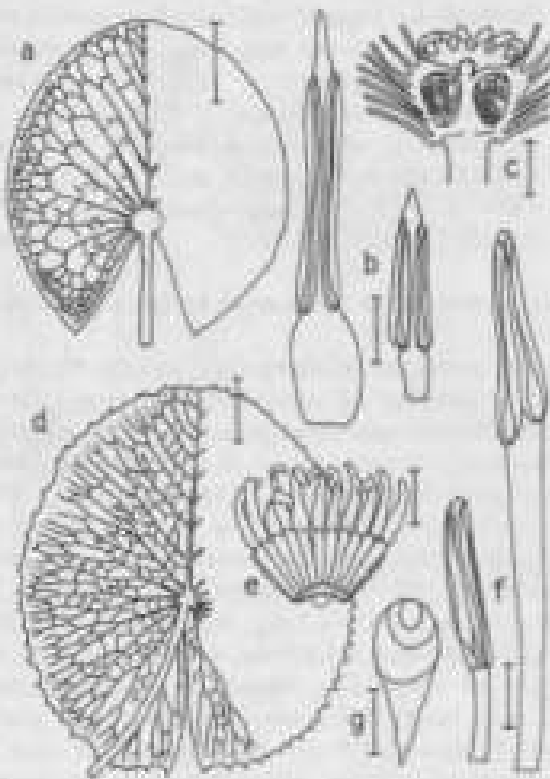


Fig. 285, *Nymphaea nymphaea*: a. leaf blade (6 cm); b. largest and smallest stamens (2 mm); c. flower in diagram a in longitudinal section (1 cm). *N. pubescens*: d. leaf blade (3.5 cm); e. stigmas with appendages (1 cm); f. largest and smallest stamens (2 mm); g. seed with aril (1 mm).

1(0) Eph]. S and SE Asia: Ban, Bur, Cey, Ind, Pak: An, Ap, As, Bh, Dl, Gj, Go, Jk, Kl, Kt, Mh, Mp, Or, Pj, Rj, Tn, Tp, Up, Wb.

ONAGRACEAE: 24 genera, 2 with aquatic species
Herbs. Leaves sometimes with stipules, alternate, simple; leaf blades entire, pinnately veined. Flowers bisexual. Sepals 4 or 5, valvate. Petals 4 or 5, free. Stamens as many or twice as many as sepals. Ovary inferior, 4- or 5-locular; style simple; stigma capitate. Fruit a capsule, opening by valves or disintegrating irregularly. Seeds numerous.

Excluded: several species of *Epilobium* have been reported from wetland habitats in the Himalayas.

Ludwigia [*Fissendocarpa*, *Jussiaea*]: 75 species: almost cosmopolitan

Herbs, sometimes woody at base. Stems erect, ascending or creeping and often rooting at the nodes, when submerged or floating often swollen and spongy or bearing silver-white, inflated pneumatophores. Leaves cauline or in floating rosettes, opposite or alternate, mostly entire; stipules absent or reduced. Flowers bisexual, radially symmetrical, borne singly or clustered in the axils of leaves or in a terminal inflorescence. Sepals (3-) 4-5 (-7), adnate to the ovary, persisting in fruit. Petals as many as sepals or absent, yellow or white, entire or notched at tips, contorted in bud. Stamens as many or twice the number of sepals; anthers versatile or basifixed. Ovary inferior, as many locules as sepals; stigma slightly lobed, hemispherical or capitate; placentation axile; fruit a capsule, dehiscing by longitudinal slits or flaps, by terminal pores or irregularly; seeds numerous, sometimes dimorphic with some smooth and others corky.

Annual or perennial. Found in a large variety of aquatic habitats, submerged, floating, emergent or seasonally submerged. Pollinated by insects or autogamous. The disseminules are seeds (sometimes dimorphic), some dispersed by water, others by unknown means. Some species reported to be weeds in irrigation systems, others cultivated for decoration. Raven, P. H. The Old World species of *Ludwigia* (including *Jussiaea*), with a synopsis of the genus. Reinwardtia 6: 327-427 (1963); Sreemadawan, C. P. Notes on Indian species of *Ludwigia*. Bulletin of the Botanical Survey of India 8: 79-80 (1966).

Excluded species: *Ludwigia repens* Forster [*L. natans* Elliot]; from N America was reported from Bangladesh in 1966 but has probably not persisted or it was incorrectly determined.

1. Petals creamy white with yellow at the base, 5; stems usually floating and bearing bunches of spongy, gas-filled, spindle-shaped pneumatophores *L. adscendens*

1. Petals yellow, 4 or rarely 5; stems usually erect or if floating then without bunches of spindle-shaped pneumatophores

2. Capsules enlarged and inflated above, narrow below; seeds dimorphic in several rows and free above, in 1 row and embedded in cubes of endocarp below; pollen grains shed singly *L. linifoha*

2. Capsules \pm uniform from top to bottom; seeds not dimorphic either several or in 1 row or either free or embedded in endocarp; pollen grains shed in tetrads

3. Stamens twice as numerous as the sepals; shrubs or subshrubs

4. Capsules terete, 8-ribbed; bracteoles borne above the base of the sepal tube, persisting in fruit; petals rather inconspicuous, usually not exceeding the sepals *L. octovalv**

4. Capsules 4-angled with 4 nearly flat sides, 4-ribbed; bracteoles at the base of the sepal tube, not persisting in fruit; petals showy, usually twice as long as the sepals *L. peruviana*

3. Stamens as numerous as the sepals; herbs

5. Capsules rarely more than 1.5 cm long, \pm terete, impressions of the seeds not visible through the capsule walls; seeds in several rows in each valve, 0.3-0.5 mm long; young stems and leaves usually green *L. perennis*

5. Capsules usually more than 1.5 cm long, \pm 4-angled, impressions of the seeds visible through the capsule walls; seeds in 1 row in each valve, 1.3-2.2 mm long; young stems and leaves usually tinged with red *L. prostrata*

Ludwigia adscendens (Linnaeus) H. Hara [*Jussiaea* Linnaeus]: Fig. 286

Stems prostrate or ascending, usually floating and bearing bunches of silver-white, spongy, gas-filled spindle-shaped pneumatophores, the flowering portions ascending, up to 50 cm or more long. Leaves with petioles 0.5-2 cm long; leaf blades broadly oblong-elliptical, 0.4-7 cm long, 0.7-4 cm wide, glossy green with pale nerves, narrowly cuneate at the base, acute or rounded at the tips. Flowers solitary in leaf axils; pedicels 2.5-5.5 cm long, hairy above the middle, bracteoles deltoid, \pm 1.2 long, 1.3-1.5 mm wide, borne at base of sepal tube. Sepals 5, deltoid-acuminate, 5-13 mm long, 2-3.2 mm wide, hairy or glabrous. Petals 5, obovate, 9-18 mm long, 6-12 mm wide, creamy-white, yellow near the base. Stamens with pollen grains shed singly. Capsule glabrous or hairy, 1.2-3.5 cm long, 3-4 mm in diameter, terete, brown, with 10 conspicuous darker brown ribs, thick-walled, irregularly dehiscent. Seeds in 1 row in each valve, visible through the capsule wall, \pm 1.5 mm apart.

• M. 3 mm long, **Brao** embedded to cubes of woody ftidocarp 1.2-1.5 nun high. 1-1.2 mm thick.

Perennial or perhaps sometimes annual, found in wet swampy places, iMtaily Rooting oo the twee. It is often gncganotufbrnut^ MLUS mi tin- surface, the mats often become colonized by other species. It flowers .md fruits throughout the year.

I(O)J Pie/Hyp). Subtropical Himalayas, India, cast to China, Malaysia arid Australia: Ban, Bur, Cey, Ind, Nep: Ap. As, Rh, Dl, Go, Kl, Ki. Mb, M{>, Or, Pj. Rj, T«, Up, Wb. 0-1500 m.

Ludwigia linifolia (VafuJ) RoJla Rao 1/.. *Hydrophyllum* (G. Hun) F.xcell, ju a iifn fstitndatarpa H a i n e s]: Fig. '2 * i '•

Stems erect, 5-300 rm mil. often becoming woody at lfee baic, L-iitigiüu-. thread-like pnccttnstophoFes arising from buried and submerged root*. Leaves witi petioles 2.5-1H nnn long; leaf blades lanceolate 10 oblcmg-elHp- 'ical. 1-10 cfl lung, uü—3.5 nm wif^c, juirrowly cuLifaic •i the basir. ^cmnitKUC ai the lips. Flowcts solitary in "1"J] iixils. subs<*ssi:r or Up lu 4 mm long; br<u:U' deltoid, ± 1 mm long, ill the base of tin- sirpal tube, ^1=4 (">). Eancedate, 2-4 mm long. Peutk 4 (5), efliptical. 2-5 mm long. 1-2 mm wide, yellow fading to

orange-yellow, Siamcn-s ivvite as niany as itie sepals; polkn grains *xhed* singly. Capsule finely hairy, 1.b~\$ cm long. 1-1.i! mm in (Jiameiti, Subteretg, enlarged in d<- upperJtixth lo third, thin-wallrd. irregularly dehUcem. frribb^d. Scod* in the knKZ par! of the capsule iit 1 row i" CBCb vnlvc, visibk' through the lower pan. of the capsule wail, 0.7-^0.85 mm long, each firmly cmbtdtdid in cubes of woody onducarp; sixth in III' upper inflaid pan of the capsule in SCVCIII raws in *ab* \alvc. rrrf, ovoid, Q.SS-0-8 mm lunj; paler *lrown* than the lower seeds.

Animal. Foqnd in *mn* places, particut&rfy in tt-mpo *ary* pools. It often *QCOipk** jJalfoi' *water* whrrr the main slrm is often surrounded by fine, silvrr-while, thread-Ukd HofkUtög pneuouitophoreti which *msj* also arisf from buried rmiis. Soniniu-u-s ihc; plants art- very small when growing on drying mud. Differs from other Indian species ta baling dimorphic Mt*tt.

1G Ten 'Hyp]. Faniropirs, probably native in Anjrica: Ban. Bh. Bur. Ccy, bid. Ncp: o\ti. As, Bh. Gj. Co, KJ, Mp, Mz, Or, Rj. Tn. 0-500 in.

Ludwigia octavah'is (Jarquin) Raven [*fuviaea sufftvii-* ofsa LiJinat-us, *L. odmfatvissaibgp, tesstifUiTa* (Michaux) Raren): Fig. 287

Variable in ptibi-stucc elthee sparsely appressed hairy or densely patently hauy Stems robust, usually much branched, up to 4 no tall, often betommj; woody at ilie base, leaves with petioles up to ± 1 cm long but usually less: leaf blades linear Lo subovate, 0.7- H.S cm long, O.i-4 cm wide, narrowly or broadly cuncate at the base, iUtcmiatu at die tips. Flowtrs solitar^P in leaf axils; pedicb Up to 1 cm long bin usually less; hracle-olea reduced o* subulate and up to t cm long, bone above the base of the sepal tube, persisting on the capsuif. Sepals f. ovate o* lanasofcite, 3-15 mm lung, 1-7. "i no wide. Petab 4, brondlv ubowite or cuneaus emarginau, 2-17 mm long. 2-17 mm wide, yeDow. St;irru'is S; pollt'n grains shed in tetradi. Capsule 1.7-4.5 (-ti) <in long, 2-8 mm in diameter, terete or nearly so, thin-walled, pale brown with 8 darker ribs, regularly dehiscent, Seeds i" several rows in each valve, not visible through the capsule wall. Free, rounded. 0.6-4K75 nun long, 0,">O_7 nun in dianit-u-i iiu hiding the prominent and inflated rapac.

A pan tropical weed. Founrl in wet and swurapy places rivert, ditches, canals or UMiks, mosdy near cultivated land. It i* a very variable species *meth* four subspecies. Two <l these are found in hidia: *tudwigia iKvt>alvi* Mibsp. *wtwahw* is characterized by being subgtabroit5 or having appressed hai^ sad UMMS thai arc lanreolate or linear \ *Ludwigia udovalvis* subsp. *S\$tsUi/tdrB* (Michaiix) Raven is characterized by havinjf numerous, long, erect hairs on emergent parts and



••<. K86- *Ludnigw ndxaiutry. si, cntd^CSM sh&MU .irisinj; from i (loaltaig sicm {2 cm): b, Uuwer (5 mm); r.. fmLi (1 mil; d. (sTini). l. tmifoliii: e. flower (S mm): f, spiral pan af (I mmhtf, hasal part of Hie früN {1 mm).*



FIG. 187. *Ludwigia octovalvis*: a, fruit (1 cm); b, lower part of stem (5 mm); c, stem section (2 mm); d, seed (0.3 mm). *L. pumila*: e, flower (3 mm); f, stem section and ovary (1 mm); g, longitudinal section of fruit (1 mm); h, longitudinal section of fruit (1 mm); i, seed (0.2 mm).

leaves rather wide-lyrate (or elliptical or almost ovate, up to 10-15 cm long and up to 1.5 cm wide. In India there are numerous intermediates so I have tried to separate them.

(O) Hb. Tropics of the World: Bati, Blm. Bui, Cey, Ind. Nep: An, As, Bh. Go, KJ, Kf, Mb. Mp, Mz, Or. Rj. Sk. Tn, Up, Wb. 0-1500 m.

Ludwigia perennis Linnaeus [X, *patujima* Roxburgh]: Fig. 887

Stems up to 1 m tall, often becoming woody at the base, leaves with petioles up to 2-15 cm long, winged; leaf blades narrowly elliptical to lanceolate. 1-11 cm long, 0.3-2.7 cm wide, narrowly cuneate at the base, mucronate at the tips, new ones solitary in leaf axils; pedicels subulate, up to 1 mm long. Sepals 1, deltoid, 1.6-3.5 mm long, 0.7-1.8 mm wide. Petals 4-5, elliptical, 1.5-2 mm long, 0.7-2 mm wide, yellow. Stamens 4-5, the stamens are the sepals; pistil 3-16 (19) mm long, terete or nearly so, thin-walled, pale brown, irregularly or irregularly dehiscent.

often ± nodding. Seed* in several rows in each valve, purple, not visible through the capsule wall. free, elliptical-ovoid, 0.3-0.5 mm long, 0.2-2.2 mm in diameter. style very narrow and thick.

Annual. Found in wet places, sandy river beds, along streams, common in rice fields. Sometime* it resembles *L. inifolia* but may be distinguished by having as many stamens as sepal lobes and the seeds at the top of the capsule without corky disks.

(O) Hell. Africa. Afghanistan. India: east <> S. Malaysia. Australia and New Caledonia: Ban, Bhu. Ind, Ne.p. Pak: <AB, Ap, Ar, As. Rh, i-j. Go, Ki. Kl, Mp, Or. Pj, Rj, Sk, Tn. Up. Wb. (> ISOM

Ludwigia pinifolia (Unnaeus) H. Haru (synonym) Fig. 288

Shrub-like; rhizome-like perennating at the base. Stems 4 m tall, the stem is hairy, with lanceolate, (2-4) 4-15 (-45) cm long, 0.3-4 cm wide, narrowly cuneate at the base, flowers solitary in leaf axils. pedicels (-6.5) cm long: bractlets reduced or subulate.



FIG. 288. *Ludwigia pinifolia* W. A. flowering branch (2 cm); b, stem section (1 cm); c, fruit (3 mm); d, flower (1 cm); e, seed (0.5 mm); f, longitudinal section of fruit (1 cm).

Leaves spiral-tristichous, linear, sword-like to narrowly **elliptical**, margins prickly at least towards apex. Inflorescence subtended by leaf-like bracts, unisexual, of 1 or more heads. Flowers without bract*, **bractcolea** and **perianth** Female flowers 1-locular; stigmas sessile or nearly so. Male (lower) in dense spikes, **not** clearly recognizable as individual links. Fruit a globose to **oblong** mass of free or united woody or fleshy **drupes**, Seed **endowed** in a hard, bristly **pyrene**.

This **genus** is taxonomically complex. Many species are **coastal** **Others** are in mountain forests but they hardly qualify as wetland plants. It is **very** difficult to know what **species** to include. The following **species** is **widespread** in the **hotter** and **moister** parts of India and is usually found in wet places; it is also often **planted**.

Pandanus fasciatus L. var. *P. odoratus* (L.) Injannaes fil. nom. illeg. ! • toidniu aucL Inel., noil Solander ex S. Parkinson! Fig. 289

Leaves usually less than 2 m long and 8 cm wide. Prickles on leaf margins white (a cultivated variety *var. laevis* is without spines). Inflorescence bracts creamy-white and fragrant. The female inflorescence a solitary, terminal head. Stigmas 'U'- or V-shaped, Male **inflorescence** of 9-13, up to 6 cm long **spikes**.

Common in coastal regions in salt water **Quarries** and **mangroves** here often found in fresh water in *she**, and swamps, along **rivers** and streams and in seasonally inundated places where it sometimes forms **thickets**. It is often cultivated: the leaves are used for weaving, A perfume is **extracted** from the bract*, **male** (lower) are used as decoration and it also makes a useful fence. It is perhaps no more than a variety of *Litsea* Pacific species *P. iftonus*.

India: S and SE Asia; (>y. Inri: Ap. <D1, Gj. Go, Kl, Kt. <Rj, Tn.

PH11 YD RACEAE: 4 genera

Philydron: 1 species

PitHydron taniginasum B. & M. et Solander ex Gaertner. %290

Stem short, corm-like, **perennial**, **epiphytic**. in 1 ranks, crowded at the stem base, linear, 40-80 cm long, glabrous, soft. Scapes 30-100 (-120) cm tall, woolly-hairy towards the apex. Flowers **bisexual**, bilaterally symmetrical, sessile, solitary in the axils of spathe-like bracts, **bracts** 2-7 cm long, **bracts** during anthesis. Perianth petals-like, yellow, 2-seriate; outer segments 2. 1.2-2 cm long, ± 1 cm wide, actile at the tips; inner segments 2. united at the base. 4-8 mm long, ± 2 mm wide. Stamen 1, inserted at the base of the **ovule**, adaxial **perianth** **tegument**, 7-9 mm long; filament flattened; anther 2-locular, spirally twisted:

pollen released in tetrads, Ovary superior, **1-locular** style 1, simple, **elongate**. Fruit a capsular, 5-10 mm long, 4-5 mm wide. Seeds numerous. ± 1 mm long, arranged on parietal placentas.

Annual or perennial, Occurs in ponds and *etc.* but also found in swamps and wet savannas. Also sometimes found in rice fields but not reported as a serious weed. Pollinated by insects. The *etc.* are seeds, dispersal unknown.

UQ) HelJ. SE and E Asia and NE Australia Bur. *etc.* Art

POACEAE [GRAMINEAE]: 651 genera

Stems creeping, ascending or erect, when **perennial** often differentiated into sterile shoot* (rhizome* at stolons) and flowering shoot (culms); culms cylindrical, closed at nodes and usually hollow at internodes* (in some aquatic filled with spongy aerenchyma*)* leaves solitary at nodes, **alternate** and 2-ranked. usual consisting of sheath, ligule and blade: sheath* *etc.* during the culm, open or **closed**, sometimes *etc.*

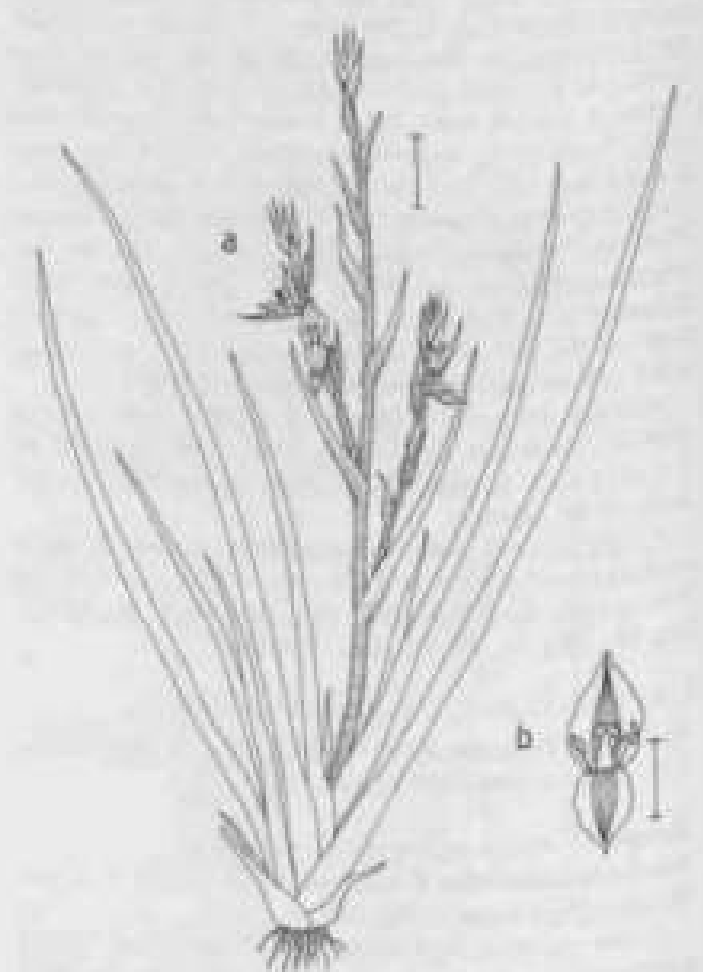


Fig. 289, *Philydron taniginasum*: a. (flowering plant) (1 cm), b. flower (1 cm).

ligules placed at junction of sheath and blade, membranous, a fringe of hairs or rarely absent; leaf blades usually long and narrow (grass-like), rarely broad, rarely with a stalked base (pseudopetiole). Inflorescence very variable, made up of spikelets. The axis of the spikelet (rachilla) usually bears at the base 2 empty bracts (glumes); the axillary buds of the following bracts (lemmas) usually develop a branchlet bearing 1 leaflet (palea) and the sessile flower. The unit consisting of lemma, palea and flower is called a floret. Flowers mostly bisexual, sometimes unisexual or sterile. Perianth of 2 or 3 minute, membranous or fleshy scales (lodicules) or absent. Stamens hypogynous, usually 3, rarely 1-14; filaments long and delicate; anthers opening by longitudinal slits, usually versatile. Ovary Mocular; ovule solitary, anatropous; styles usually 2, rarely 1 or 3; stigmas usually plumose. Fruit mostly a caryopsis with a thin pericarp fused to the seed.

Annual or perennial. Pollinated by wind or autogamous. The disseminules are caryopses; a fruit usually enclosed in 2 bracts (lemma and palea). Because of the importance of the grasses there is an enormous amount of literature; the following is the best general survey: Watson, L. and Dallwitz, M. J. The grass genera of the World. C. A. B. International, Wallingford. 1-1038 (1992); for India: Bor, N. L., The grasses of Burma, Ceylon, India and Pakistan (excluding Bambuseae). Pergamon Press, Oxford, i-xviii, 1-767 (1960); Roy, G. P. Grasses of Madhya Pradesh. Botanical Survey of India, Howrah. 1-180 (1984); Sreekumar, P. V. and Nair, V. J. Flora of Kerala — Grasses. Botanical Survey of India, Calcutta. 1-470 (1991).

Excluded: the following wetland species are found in the Himalayas but do not extend south: *Agrostis stohnifera* Linnaeus; *Arthraxon breviaristatus* Hackel; *Catabrosa aquatica* (Linnaeus) Palisot de Beauvois; *Glycerin plicata* (Fries) Fries; *G. tonglensis* C. B. Clarke; *Neyraudia arundinacea* (Linnaeus) Henrard; *Phalaris aquatica* Linnaeus [*P. nodosa* Linnaeus, *P. tuberosa* Linnaeus]; *P. arundinacea* Linnaeus; *Poa palustris* Linnaeus; *Spodiopogon cotulifer* {Thunberg} Hackel.

The following may grow in damp or moist places but are not considered to be wetland plants: *Arihraxon costriatus* (Griffith) Narayanaswami ex Bor; *A. jubatus* Hackel; *A. lanceolatus* (Roxburgh) Hochstetter; *A. nudus* (Steudel) Hochstetter; *A. quartinianus* (A. Richard) Nash; *Bothriochloa pertusa* (Linnaeus) A. Camus; *Chrysopogon aciculatus* (Retzius) Trinius; *Crypsis schoenoides* (Linnaeus) Lamarck; *Cynodon arcuatus* J. S. Presl ex C. B. Presl [*G. intermedius* Rangachari et Tadulingam]; *C. dactylon* (Linnaeus) Persoon; *bichanthium annulatum* {Forsskal} Stapf; *Digitaria dliis* {Retzius} Koeler [*Panicum adscendens* Humbolt,

Bonpland et Kunth., *D. marginata* Link]; *D. setigera* Roth ex Roemer et Schultes; *D. stricta* Roth ex Roemer et Schultes; *Garnotia exaristata* Gould; *G. tenella* (Arnott ex Miquel) Janowsky; *Imperata cylindrica* (Linnaeus) Ratischel; *Iseilema antheophoroides* Hackel; *I. taxum* Hackel; *I. prostratum* (Linnaeus) N. J. Andersson; *Manisuris myuros* Linnaeus: *Ind, »Pak; *Pennisetum hordeoides* (Lamarck) Steudel; *P. purpureum* Schumacher; *Polypogon viridis* (Gouan) Breistroffer [*P. littoralis* AT. mutica]. D. Hooker, *Agrostis semiverticillata* (Forsskal) Christ, A. *verticillata* Villars]; *P. monspeliensis* (Linnaeus) Desfontaines; *Rottboellia exaltata* Linnaeus fil.; *Setaria intermedia* Roemer et Schultes [*S. tomentosa* (Roxburgh) Kunth]; *S. paniculifera* (Steudel) Fournier ex Hemsley; *S. pumila* (Poiret) Roemer et Schultes [*S. pallide-fusca* (Schumacher) Stapf et C. E. Htibbard]; *Sorghum halepense* (Linnaeus) Persoon; *Sporobolus diander* (Retzius) Palisot de Beauvois; *Thysanolaena maxima* (Roxburgh) O. Kuntze.

Confined to saline conditions: *Myriostachya wightiana* J. D. Hooker; *Porteresia coarctata* (Roxburgh) Teleoka [*Oryza irilkoides* Griffith]; *Sporobolus tremulus* (Willdenow) Kunth; *S. virginicus* (Linnaeus) Kunth.

1. Leaf sheaths strongly inflated and spreading from the culm, usually functioning as floats (leaf blades 3-5 cm long and 0.7-2 cm wide, ovate to ovate-oblong, without a prominent midrib; spikelets awned; usually floating) *Hygroryza*

1. Leaf sheaths not strongly inflated, but if inflated then enveloping the culm

2. Leaves membranous and translucent; mesophyll of only 2 layers of cells; spikelets of two, 7-nerved glumes enclosing two, 7- or 9-nerved lemmas, the uppermost containing a bisexual flower (W Ghats)

Hubbardia

2. Leaves not membranous, not translucent; mesophyll with many more than 2 layers of cells; spikelets not as above

3. Inflorescence partly enclosed in a nut-like, globose to fusiform utricule (a modified sheath) which has a pore at the apex only and sometimes bears a rudimentary blade; utricule hardened at maturity and enclosing the caryopsis; exerted part of the inflorescence bearing male spikelets only

Coix

3. Inflorescence not enclosed in a nut-like utricule

4. Inflorescence of clustered or solitary spike-like racemes which appear to arise in leaf axils along the culm (spike-like racemes terminating lateral branches, but branches often short and in clusters, so that several spikes may arise from each node, some enclosed by leaves at their bases; spikelets in opposite pairs) *Hemarihria*

4. Inflorescence not of lateral spike-like racemes arising in leaf axils along the culm
5. Inflorescence a large (up to 1 m or more long), silky-haired panicle
6. Spikelets in pairs, 1 sessile, each with 2 flowers; lower floret sterile *Saccharum*
6. Spikelets solitary, all pedicelled, each with (2-) 3-7 flowers; lowest floret bisexual, male or sterile
7. Lemmas with long silky hairs; base of leaf blades clasping the culm; rachilla glabrous or shortly hairy; lowest floret bisexual; rhizomes knotty *Anmdo*
7. Lemmas glabrous; base of leaf blades clasping the culm; rachilla with long, silky hairs; lowest floret male or sterile; rhizomes stout but not knotty *Phragmites*
5. Inflorescence not a large, silky-hairy panicle
8. Tip of raceme axis prolonged into a bristle-like extension
9. Spikelets not arranged in neat rows along the rachis; rachis flattened *Pseudoraphis*
9. Spikelets arranged in 1 or 2, neat rows along the rachis; rachis flattened
10. Lower glume well developed, although sometimes small *Paspalidium*
10. Lower glume absent or reduced to a minute scale *Paspalum*
8. Tip of the raceme axis not prolonged
11. Inflorescence 1-2.3 cm long, a single, simple, more or less spike-like raceme (culms delicate, usually floating, up to 180 cm long; spikelets in pairs; SW. India) *Limnopoa*
11. Inflorescence usually more than 3 cm long, not a single, spike-like raceme
12. Inflorescence consisting of dense, globose or cylindrical clusters of spikelets on a central axis, each cluster being subtended by 2 or more bracts or sterile spikelets; in the lower and middle parts of the inflorescence the clusters being remote and distinct, above merging into an uninterrupted spike-like panicle *Elytrophorus*
12. Inflorescence not consisting of globose or cylindrical clusters of spikelets
13. Inflorescence a terminal, dense, cylindrical, spike-like panicle
14. Leaf blades amplexicaul at the base; floating culms containing a white pith; lemma and palea of upper floret gaping at the apex *Hymenachne*
14. Leaf blades not amplexicaul; floating culms hollow without pith; lemma and palea of the upper floret closed at the apex *Sacciolepis*
13. Inflorescence not a terminal, dense, spike-like panicle
15. Spikelets in pairs (usually one sessile and the other pedicelled or both unequally pedicelled)
16. Lower glume awned; glume and awn flat; awn up to 2 mm wide and 30 mm long, with scabrous margins; inflorescence consisting of digitate or solitary, erect, glabrous, spike-like racemes (giant herb) *Vossia*
16. Lower glume absent or if present then not awned
17. Inflorescence a large, loose panicle, composed of numerous verticillate, spike-like racemes or first order branches, which in turn bear spike-like racemes
18. Pedicelled spikelets 2-flowered, the lower floret sterile, the upper floret male; sessile spikelets slightly flattened laterally; lower glume keeled, 7-nerved, with numerous upwardly curved spines *Veiviveria*
18. Pedicelled spikelets sterile, with 2 glumes which sometimes enclose a reduced lemma; sessile spikelets flattened abaxially; lower glume 2-keeled, with 8-11 nerves, scabrid on the keels *Hemisorghum*
17. Inflorescence of 1 or more, simple, 1-sided, spike-like racemes arranged along the main axis or (1-) 2-7 spike-like racemes arranged in pairs or subdigitally on branches
19. Lower glume present; rachis disarticulating at the nodes; lemma of the upper floret membranous, usually awned *Ischaetnum*
19. Lower glume usually absent; rachis continuous and tough; lemma of the upper floret leathery, awnless *Paspahan*
15. Spikelets not in pairs
20. Spikelets in 1-sided spikes or spike-like racemes; spikes or racemes usually digitate or distant along the axis
21. Back of the lemma of upper floret turned away from the rachis and away from the lower glume *Bachiari*[^]
21. Back of the lemma of upper floret turned towards the rachis or towards the lower glume " glume present
22. Lower glume absent *paspalum*
22. Lower glume present, although sometimes small
23. Glumes acuminate or awned, rarely on¹? acute; lemma of upper floret not mucronate *Echinochloa*
23. Glumes without awns, if acuminate then with the lemma of upper floret mucronate
24. Lemma of upper floret acute, not mucronate; spikelets plano-convex *paspalidw*^{nl}
24. Lemma of upper floret mucronate or shortly awned; spikelets terete or somewhat flattened *Urochloo*

20. Spikelets in \pm open panicles or panicles contracted and spike-like
25. Spikelets with 3-9 flowers
26. Lemmas entire at the tip; nerves on the lemmas glabrous *Eragrostis*
26. Lemmas notched or toothed at the tip; nerves on the lemmas hairy
27. Spikelets sub-terete; lemmas rounded on the back *Diplachne*
27. Spikelets laterally flattened; lemmas distinctly keeled on the back *Leptochloa*
25. Spikelets with 1 or 2 flowers or spikelets sterile
28. Ligules absent *Echinochloa*
28. Ligules membranous or a fringe of hairs
29. Glumes absent (spikelets strongly flattened abaxially) *Paspalum*
29. Glumes present, sometimes unequal or the lower absent
30. Glumes and lemmas tipped by a thickened, laterally flattened crest, which appears as if nipped by pincers *Acroceras*
30. Glumes and lemmas not tipped by a thickened, laterally flattened crest
31. Lower glume absent (spikelets planoconvex, awnless) *Panicum*
31. Both glumes present
32. All spikelets unisexual; male and female spikelets on different branches of the same panicle; upper branches ascending, bearing female spikelets; male spikelets pendulous; style base not persistent *Zizania*
32. All or most spikelets bisexual (not differing in size, shape, colour and position)
33. Glumes and lemmas tipped by a thickened, laterally flattened crest (appearing as if nipped by pincers) *Acroceras*
33. Glumes and lemmas not tipped by a thickened, laterally flattened crest
34. Ligules reduced to a fringe of hairs
35. Glumes separately and precociously deciduous; spikelets 1-flowered *Sphaerocaryum*
35. Glumes persistent or falling together; spikelets 2-flowered
36. Glumes unequal, upper one as long as the spikelet, lower one much shorter; spikelets slightly flattened abaxially *Panicum*
36. Glumes equal to subequal, broad and convex; spikelets small, terete to globose
37. Glumes much shorter than the spikelet; lower floret bisexual, the upper one female *Coelachne*
37. Glumes about as long as the spikelet or only slightly shorter; the lower or upper floret sometimes male *hachne*
34. Ligules membranous, with or without a fringe of hairs
38. Spikelets borne on a ring-like swelling (lower glume and top of the rachilla swollen to a ring-like callus) *Eriochloa*
38. Spikelets not borne on ring-like swellings
39. Lower glume much shorter than the upper one; upper glume equalling the sterile lemma; upper glume and sterile lemma as long as the spikelet and enclosing the fertile floret (spikelets slightly flattened abaxially and awnless) *Panicum*
39. Both glumes either absent or reduced to a 2-lobed rim or scale-like and then neither one as long as the spikelet; if sterile lemmas present then usually very small
40. Sterile lemmas absent; glumes completely absent or reduced to an entire or more rarely, obscurely 2-lobed, somewhat thickened rim *Leersia*
40. Sterile lemmas present but usually very small; glumes present but very small and scale-like or reduced to an entire or 2-lobed rim
41. Leaf margins smooth or scabrid *Oryza*
41. Leaf margins tuberculate-spinose *Porteresia*

Acroceras: 15 species, tropical to warm regions of the world, most Madagascan endemics

Excluded: *Acroceras munroanum* (Balansa) Henrard; not found in wetlands.

Acroceras zizanioides (Kunth) Dandy [*Panicum latifolium* auct., Ind., non Linnaeus]: Fig. 291

Culms 60-120 cm tall, often stoloniferous and rooting at internodes. Leaves borne along the culm; ligules reduced to a rim fringed with hairs; leaf blades linear to lanceolate, 7-15 cm long, 8-30 mm wide, usually cordate at base. Inflorescence a panicle of 1-many, 1-sided racemes, 10-25 cm long; racemes inserted on a central axis, usually spreading only slightly. Spikelets 2-flowered, 5-6 mm long, disarticulating below the glumes, subterete, glabrous, awnless. Lower floret male or sterile, the upper bisexual. Glumes 2, unequal, each with a thickened, laterally flattened crest at the apex. Lemmas similar to the glumes, with laterally flattened apical crests (appearing as if nipped with pincers). Paleas with a more or less recurved callous tip. Caryopses oblong, abaxially flattened, adaxially convex, tightly enclosed in a hardened lemma and palea.

Perennial. Not confined to wetlands but mostly found in wet places and often growing seasonally submerged, otherwise floating or emergent.

{Hel/Ple}. Pantropics: Ban, Bur, Ind: As.

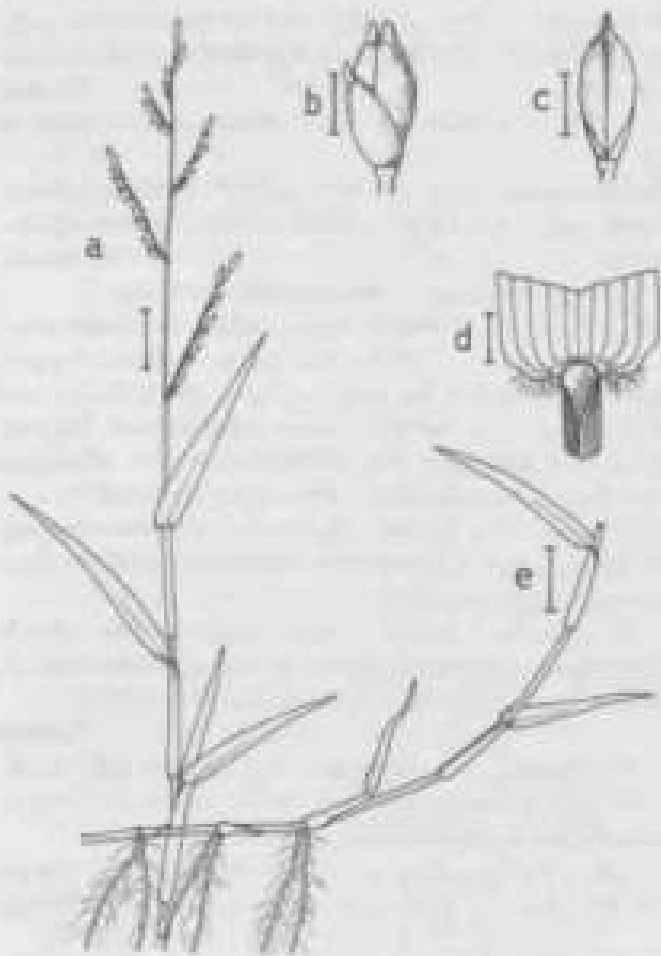


Fig. 291. *Atmtctai liianioitts- 9*, lowering culm (2 cm); b, spikdci viewed from the front (2 mm); c, spikrkt viewed from the back (2 mm); rt. ttgufe (1 DUB); ft, b; i>t' *i culm (2 cm).

Antiiln. S species

Armdn donax I.innaeus: Fig. 292

Rlii/omes creeping, kritmy. Culms mostly **erect**, (Q.4-) 2-4 (-fi) m tall, **often with** stilt roots below. Leave* cauline: untile* short, membranous vmh minutely **hairy** margin, the hairs up to <O mm long; leaf blades (10-) 50-75 (-100) cm long, (2.5-) 4-5 (-8) cm wide, glabrous, rounded to cordate and clasping the culm at the base, tapering above to a lonf(fine point. Inflorescence a dense, erect panicle. 30-60 cm long, feathery, whitish to brown. Spikelew pdicetled, solitary, 2- to :- (-7)-flowm-d_h **8-18** mm lung, laterally flattened, disarticulating above **tlw** nhtnies and beiwron the HortB; rathilUi **tfiabrwa** or shortly hairy. **Florets** bisexual. **Gfoinca** % almost rquai, **abofitl** a" lotig as lbf spikelet. 5- or 5-nfn'ed. ;u uu\ lt-iunias with long silky hairs, awrted; awii ± 3 mm long.

Perennial. Often found standing in water but mostly in areas subjcci to flooding or along ditches and canals. Caryopses dispersed by wind. It is itstd for

hedging and for making ladicts. math, screens, recdn tlf miisitil instiumentls and as a source of industrial reliulow;; sometimes a weed as it can block draiNatfc diii lus. It may *be* (iistinguished from *Phmgmtts* by tin' clasping leaf bases and hairy' lemmas.

I Hell]. Tropical Asia and the Mediterranean Region, introduced in the **New World**, it is widely plained w India and is unlikely to be narive **throughout** fls* sub* **continent**: <Ccy, Ind: <<^n. <Dl_f Go_t Hp, Jk. KJ, Ma, Mp, Rj,Tn, Up.Wh.

Brachiaria [excluded from *UraMoa*]: ± 100 species: tropical to **wand** cosmopolitan

Culms erect, creeping or **floating**. Ugltlc a fringrtl membrane or a fringe of hairs. Inflorcstente a **paxtl&&** up to 2,ⁿ **an** long, of .1 -sided, spike-like i-aciemes attmp a main axis wlm.h iLsclf term in ales in a raceme. Spikelt*^{1*} **2-ftowered**, **stvokas** or **mucroate**, **terete** or **ab^i*0j** **Qatteod**, in the lower parts of the racemes in **unequally pedkadled** pairs ∅ in clusters, in the u **ppct**

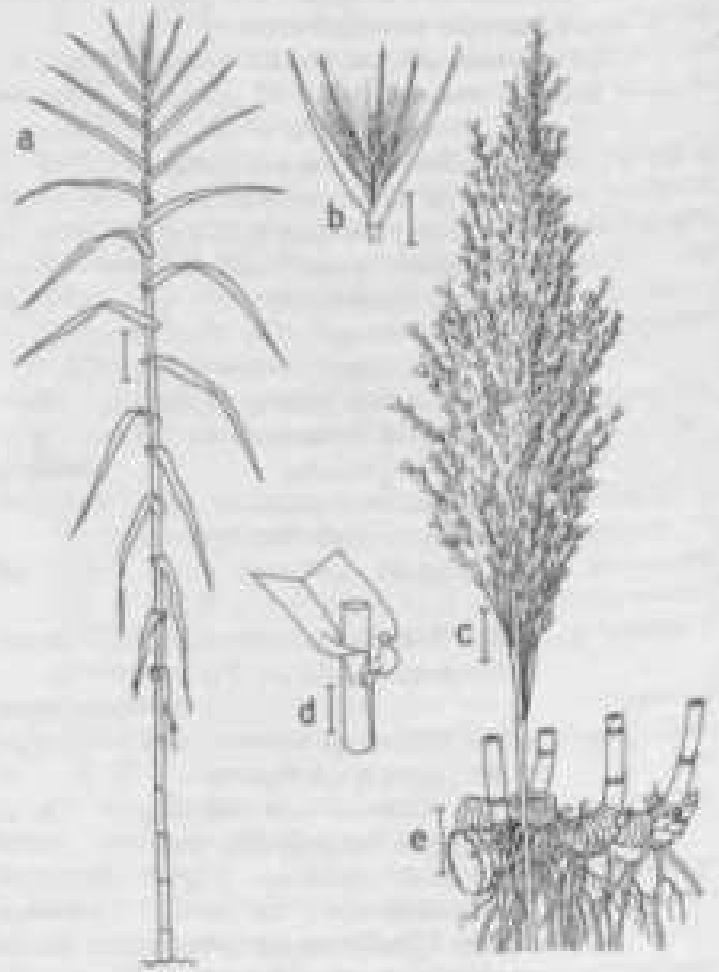


FIG. 292- *Arttiidii ilwn*; a, rird shont {U cm}; b. spik' " ' (^ tntnj; t, bfiOWtoCtce t4 cm)^ d, Ugulc (2 cmV, e, rthlome <2CITO,

parts solitary, disarticulating below the glumes; **upper** floret bisexual- Chimes A unequal: **lower** glume next to the axis (ada*il) M long its the **spikelet** or **warf** much **Showery**; upper **ffasae** as long as the **spitelec Unasa** of **lc*ret Boret** as long as u> spikelet, **shorter** or **atweat**; **i*TM of "Pi"J** **Brow** owned away from the Iowa KU.HH-. **waajery** becoming hardened at maturity. **CwyopsM Ugfetij** enclosed by the **hardened** lemma and **paka, abaMaUy Battered**, broad **oblong** in elliptical in outline.

Animal or **perennial**. Some species art- important fodder plants but (hey cnii alw **become SOHM** weeds in supply and **drainage channels**, the **defcittfen** htiw* < **Bmchiaria** and UOCMM is **pflAtanstiCJ** wime botanists **consider liwhmn U**) b< numntypif- wifli ft **mitijomm** at the only **jpedca. I have taken a rnort** irsditid; d **prtltion** [**Btarhinria** \YM lilt- lemma of the upper Henri turned away **from** lite loner glunif and ilic **radtis**).

Excluded: (he **following** may tok-ratr lemporary flifodJnK hm an **not** considered in **be** wclatid spt-ties: **Bmchiaria decumb**<™ Su.pl: **fl- dtfem (Schi** (macher) C. K. Hubbarrf: **Jl. dutachya** (Linnaeu») St-ipf: **B. uncor** **Bwappa**; B- at/^Kn IV.I: B> **ptxtaidis (ft*d)** & t. Hubbard: ft wnoto (**Bettio***) Hainrs: **B. ummuda** (H<,d,rsrncr^ Sutf: **B. wlfce™** (Reuinsi C. K. Mubbard [**a*ffW** « **utigrum** Reuinsi); **B. villosa** (l-amarck) A. Camus.

1. Stoloniferous, very robust perennial; culms erect, **MOmniaaawier** **B.muha**

1. **Stolmu** not developing, annual or OO(ven **robust** pereunil; **colms** detninbrriL or **creeping** »eli.uv. **not** "inre than ^ mm in diameter

2. **Spikclca** **glabrous**, rarely more than 2 mm long; leaves rm'eiv more than f> times -is long as wide

B. replant

2. **Spikelcts** hain, 2 nun or more long; leaves more **tisua** <i times as long as wide

3, **Lower** glume minuU*. les* ilwn cneithird as long its the spikeletn: spike Iris 2-2.S ram l<"g; inttoefr **cence** ± linear, **the** bianchns ertn or **Oldy** slighilv spreading

B. ervciformis

3. Ljiwer gliline otie-lhird to **hali** as long 88 the spikdci; sptkrU-ts 3.5-3 mm **lpng!** inlloreMCrtce **pankle-Uke**, (he **bmntes** spreading *- «>• " "

Brachiaria trvdfortnis (J. E. Smith) C-riscIHuh |Vj;jiaim **icse&M** Roth ex Rocmer <t Schulte*1: Fig 298

Culms 10-73 cm **tall**, rarely more than 3 mm in diameter, ascending frmn n **Cteegiing** base, rtMidiig at lower nodes. Ugiile 0.5-1 nun **knag**, hair; **leal** blade* 2-8 cm long, J-iinim wide, giahrous or somewhat hair> **Enfk>reKCDcc** ± linear, Mi (-10) cm long, of 2-15 ± **erect** spiko-Mke racemes, each 1-5-3 cm long;

rachis 3-angled, hairy. Spikelrts solitary, borne in 2 rows. 1-B-2.fi nun bng. up to 1.2 mm wide. **Kpmetimca** (ipped **with** purple. I-ower **ghitDe** minuiie (0.3-1 mm long), 1-nerved or without nerves; upper gluim- as long as the **Bpikelft, S-nerved Lemma** of **tower floret** ± like **Upper ggame**; lernma ol upper floret slightly shorter **than** the spikeU-v, smooth. **gloBJ?** and hardened. Palca hard like lemma of upper ilorei..

Annual. In rtct licld.i. along **ditdbes** and canals and in marshy places. Noi con lined to wetlands and also found af ft weed in mhivaied fields.

IG Hell- Medittraaiea.il eastwards to India: (k'y. Ind, Pak; Ap, Bh. GJ, Co, Hp. Kl. Mh. Mp. Rj, Tn. Up. Wb. C)2(KH) in.

Bmchiaria mutica (JFottUfcil) Siapf [**Ptiniatm nmf/hibium** Stetuk-I, **i***. **pwpuwasvKa&li**]: Flg29S

Si.lions up to » m lo>g. Qilms 50-2IH> cm tall, **6-1(1 mm in diameter, creel, rooting** at lower nodri **Ljgule 0.7-1.9** nun teng. inenibrinous and I ringed: leaf blades 10-30 cm long, (JS-) **10-S5** mm wide, **glato<W>W** scarc:eh h-tiry. Intlori-scncce spreading, 8-31) cm long.



Flu. 293> *Hmrlnariit urutijmmiv*. a, **infloreSOfiMre** (2 cm); b, **!** tiki -It i virwed from the frifnt ,ind From thf back (I nun); c, llgulc (5 mm). *B. mutictn* ti, inilm't'stence {2 cm); c, spikclei **viewed** hnn ihc front and from tdt* lwcck (1 mm); f. ligule (2 mm).

with 6-2(1 raewwe* each 8-80 CUB k>>g; flattened and winged, ± 1 mm wide, hair)¹ at the bast. Spikeitts solitary or paired, (2.5-) 5-3.5 (-5) mm long, 1.5-2 mm wide. arranged uillidly in 3 or 4 rows, glabrous or hairy. Lower {flume up tu lme*ihird as long as die spike let. 1-, 5- or 5-nervc;d; upper glume as long as ihe spik^lect, 5* or 7-nervcd, haiiy. Lemma of lower Uoret i like upper glume; lemma of upper linrei h.ndr ntd. light vtrllowish-hrt^wn, ± 2,4 mm long, Palea hyaline.

Perennial, fl is very vigorous and widely planted as a pasture gtaut*. I^tialK knoivu ai pMURagns in India. It is frtqueiuly found in aquatic bkftopta and along the lxmki of streams and ba<:kwattTS, sometimes becoming dominani in manhes^ also aobftedaoea forming floating müt-S. Under some conditions it may out compete *Typhn* and is used lo conuol it.

[Me!/(Pie) 1. Tropical Africa and America, introduced in Asia and Australia: <Iul: <An, <As, <Kl, <Kj, <Tn. <Wb.

Brachiaria ramasa (Linnaeus) Siapf [*Paniatm* ~~supernu~~ UUNCB. Clarke]: Fig. 294

Culms (J5-) 40-60 (-Iffl) cm tall, rarely more than 3 mm in diaincwr. attending from A creeping base, rooting at lower nodes. 1 igulc membranous, 0.4-1 mm long, fringed witji hairs; leaf blades 2-15 cm long, 6-8 l-l.^>) mm vride, rcirely more than f> times its long as wide, glabrous or somewhai. liain". Inflorescence spreading. (2-) 5-16 cm long, ef JMfi racemes, each 1.5-6 cm long; rachis 3-anglefl, spafscly baky. Spiktk-is. paired, 2,5-3 (-4) mm long, up i" tri turn wide, hairy. ixntG glume-anc-hbird to h;tf as long ;LS tin- spikdci (1-2 mm long). 5- or 7-nervexl; upper glume its long ;is the spikelrt. hairy. 7-nervcd. the nerves green. li*mma of lou-er floret ± like upper gluuif; lemma of upper floret hardened and rough, 2-2.5 mm Jong. Pafea deli* atf and hyaline.

Annual or perennial. Often < inuinion and ahundam. aUilost always in wel places such as rice fields, along ditches and tanals and in marshes, tt is rather variable with glabrous and hairy races

l(O) Hel). Tropics of the Old World: Cc>'. Ind: Ap. Gj, Ho, Kl, Kl, Mh. Mp, Rj. Tn. 0-2(KKJ m.

Brachiaria nptnm (UntWSUI) C A- Gardner et C. E. Uublwu-d {*Pntrimm umbrosum* Reteius, /'. *pusumbens* Nces, /'. *pnisttattm* Lamarckji RR. 294

Culms (10-) 15-35 (-5f>) <-m , ^1, rare|y nior<- t^VAn % mm in diameter, ascending from a creeping base, rooting ai lower nodes. Ligule nembraoous, 0.3-1 nun long, fringed with hairv; leaf blades ovaic-lanceolat^ 1.5-10 cm long. '1-2011)111 wide, mostly li;iry. ai the bast% mostly <: I lisping the culm, margin often wavy. Inflorescence spreading, 2-7 em long, of -5-10 (-15) liii ernes, each 1.5-5 cm IOIII; rachis Raurncd. sp>arstly

hairv. Spiktrltts paired, 1.8-2.3 mm long, ± 0.8 widt.', glabrous. Lower glume minute (0.2-0.5 long), faintly 1- or 3-nervcd; uppci glume- as 'onS ^ llu' spikclel, jhtbi-ous, 5- to 9-tu:n'cd. the nerves green-leinnia of tower floret ± like upper glume t>ui n^t more than fi-nervcd; lenimn o(upper floret b^al shaped, hardened, golden brown. ± 1.6 mm long. Palca like lemma of upper floret.

Annual «r soinctimes perennial ivhen In water. A common weed of cultivated land, particularly in n^et fields, on die hank* of channel* and <Hher^ wet ureas. It BOH dies wlu-n the water recedes. The ork-ntaiton < (he spikelets is difficult to determine; this species would he perhaps beller transferred to *VrorhUm*.

l(0) Heft. Tropical Old and New Worlds but usually considered naturalised in India: <Cey, <Ind, <Pak: <1 - <Cj. <Go, <Hpr <Kl. <Mh. <Mp, <Rj, <Tn. <Wb.

Castelinae: 10 bardy separable species: Old World tropics and subtropks

Low-growing, tufted, aintual or perennial. I^**ve!^ tauline; ligules a fringe of hairs; leaf blades linear »⁵ or<tte* lanceolaie. Inflorescence a loose, open <*X con-



PIC. 294, *Rtmhiaia tamtKti*: a. influrcscnct (2 cm), b, spikLkr viewed from the Jroul and fmrti the ba<^ i (1 mm), c, flowering shout (ir m); d, ipifdci viewed (he from iind horn (he back (1 mm).

traced panicle, ...), I., ± to cm long. Spicifefis & lowered. ...? , awnless, disaiku luting above the ghflms; rarrilla elongated fecowten due ff<>r*-ts; tower Qoret bfexua& upper Moid Iciial- Gttnorst, •iilw-tiitil. ptrsisirnL. one- d> c^fMhtrtU i(w irngifi <si die sjjitffct. temma <f lower Morci as tong4» the tpikrk-t. nerveless or nbaairdy 3^s f. Vnt'rv-i-f. -Misiu-tolui h-uiffm-d ?i nuuinn; (cttmi.i of upper JUurt shutter thjn thr kmct. remaining inetn- b anous. Segment <f ihe towrr rt<ira 2 QC A fjirvopsM ovoid, le OK-K cndim-d Hv tin- lrtnm:i .md jialra.

Prakash. V. and Jain. ^ . K. K-u hiif.ir Ki<<Ctde> of Floia of India 4:1 ^7 (1984).

1. Spikerlers 1-1.3 (-1.5) mm lonjj; suniwiv UMIHIV '2
C mirtuta

1'Spikelvts mon? Lhan 1.5 mm long; RnttBtU 3
2. Florcta gluhrtms ai the base; spQusfetS lAfSiS (-3) DUn long; mulu-rs 0,6-1,1 mm leng
C. simpliciiseuta

2. Florets densely besirtltd at the basr; Splkelett 25—4 mm long; IUULT* rt.li-) .1 mni long
C. perpusitla

Coelachne mimtUt Btir [*C. gkatim* Naik]: Fig. 295

(Ac C vntplidnsnda but spikectis 1-1.3 (-5) mm long; krtama nllfiwer florcii 1-1.2 mm lon^ UMIUIU <jt'ii>pt-r fl<ici and p;il^a 0.K-1 mm lonjf: stamens usually 2.

Annual of open rack; moist grassland, grows with BAuaatim, Utrieuianitsad Muftannia.

IG Hel?], tndt-mic to W India: •Ind; Mh (Malabar Ichswar).

Coelachneperpusffla (Armm ex Steudd) TfaWfiteE refer <> FIR. 295

like *C. simffimtnitti* but larger and more robust; in (Jo re set mt lax and spn-ading; ipiksletS 2.5—1 mm bug, widely spaced <od seWoia overlapping <m the Panicle bjiinchrs. 1-S (4) prr branch; (lorots densely bd ai the base; tt-mmn of tower floret 2-^t nun long. Anthe tt 0.6-1.1 ntan long.

Densely tufted perennial in marshy places in high-lands. A very poorly kuciwn species: Pritki<h and Jain O9S4) recognize two varieties var. *nitagirica* Prakash ft Jain and VAT. *pttput&a*.

IHel?}. « India and Sri Unka: •Ccy. •Lnd: Tn. Kl. Jnly-Nmvmhcr. 1200-S30C U,

Coelachne .<iimplirin.inda {Wigl n Arnoit) Miutro LX Bernham | (J. *puldulla* nun. Ind., n<j> ft- BmwnJ: Fig. 295

Culms tufted, pCOSTnLC& or u^cendin^, 5~4b aa long. l-<?arbliuifs Jwjear-JanrcJait. 0,5-3 cm long, lJSS mm wide. Jtiiiiorfu<-uiv branbea up to 1 (-1-^ an b>ng. d<nsely crowded wth pv^rJappin^ sptkr?l'ls. S<pkiclets

1.3-2.5 (-3) mm long; (3-) 5-9 per branch. Glumes glabrous; lower glume 0.5~1 mTi lon^ . iV-ncrvwl; upptr glume ur.5 inm long, with (4) fl (Gf nerve*. Lemma of lower floret 1.a-2.5 mm toiijf, without nerves, glabrous or<p;irM-l< ittsby, PAU-H oUawex Itrvi lite ft-nima but narrower, Stamens 3: anthers Q.3-4M mm long. I^mnia and pnf<t <^ upper ttwvi [-2 mm fnii^ . •without ntr\ps, &teclcri, bain^ alon^ iht teeUand <m the ab>liai surface. Anthers 0.6-1.1 mm tong.

Aannual. Hooded aitas, usually m't^uiius and forming dffist- mau. frequently fhimd in rici- Setffa but nm considered to be a seriou* pest. Usually fotiud i iri higher gtOUIKi Ffowt-1-itij; us it>ng as ii is wet.

[G Ilcl], SE Asia, China mid Nfadagtacar: Ccy, Ind, Nvp; Ap. Ar, As, 8h, Q, Kl, My, Mh, Mp. \g. Or. In, VVb. r>>>JO(K) m.

Cone ± 5 sprcics. in need of revision: tmpica] Asiai ihrougli ijiinxluciiions now pantropkal

Cuhas crt-a or straggiins, up to ± 4 m tall, tniern-ixles solid. Leavefl cauUfte; iigiik-v shmr, with or without ;i triiigt*; \eaX hl.wlcs H-HJO cm long rind [.~*~7 cm widr. linear io pwue4anoeflate; midrib prominent becoming



Sic. 295. *Codaehw mfoai* a. »pikr<ri (>^ tnm); b. Unm Inn in a {0.5 mm); c. Lower paira (0.5 mm). *C rimftniuxeu*: rl. -jiiil.(Jrl 11 mm); p, li>wi-riiijj pkim (J am).

wide and **white** towards the base. Inflorescence axillary, compound, **comprising 2 raceme* separated by a prophyll**. the ***n<**: **sessile and female**, the **oilier** pedunculate and **maJe**, subtended by a globose or dongaied bony utricule (**aoffictiincs caie.d involucre or qsatheote**) derived from a modified leaf sheath. Female raceme enclosed within the **utricule, comprising 1 tewfe** spikelet and 2 pedicels; **Katie** .-pikelet **female**, with membranous glumes and lower **Bore!** reduced to a lemma; pedicels free, stow, with or without vestigial spikelets. Mule lacmi¹ pi fjci ting **from the mouth of the Utricle**, the spikelets in pairs or triplets and pedicels free; lower glume papery, (literally winged; both usually fertile).

Annual or **perennial**. Sometimes Healing. **usti.tlk** emergent. Flowers **unistxual, eutbrccdiag Or BgUBJD**-spermous. The **disscroinulcs are** single female spikelet surrounded by £ utricule, dispersal unknown. The **m\onomy isMinewhiU** confused and in need of revision. **U«d** as food, fodder, medicine and decoration. see: Jain, S. K. and Deb Kumar Banerjee, Preliminary **ijljsai-vii(io(i,"j** on the **ethnobotany of the genus o»x**. **Ex monk Botany 28i 3JM2 (19711**.

Excluded: *Coix putilanim* ialansa; not rtrpont^d from wetlands.

1, Annual- lower glume of the male "(pikelets narrowly or hardly winged: spike let-; 2-4 mm broad; leaves linear-lanceolate. 10-40 cm long, 1-3.5 cm wide

C. lachryma-jobi

1, Perennial: **tower** glume of the male spikelets broadly winged: spike lei* **EM&** mm broad; leaves linear-acuminate. 10-90 cm long, 1.5-6 cm wide

2, Culms creeping or floating, up to \$0 m or more long; upper surface of **the leaf blade*** with conspicuous glands which bear bristle-like hairs; utricule abruptly constricted at the neck into a beak

C. aquatica

2. **Colnuerect** up to 3 m or more tall; upper **mrface** of tin- **lead** bl;ie> ^lahnms; **utricule Dot** abruptly constricted **AI** the neck, without a beak *C. gigantea*

Coix aquatica Roxburgh: Fig. 296

Like *C. gigantea** but culms **a** eeping tir floating, up to 30 m or more long, when in water swollen with **floating rooti**; **Qppet** surface oJ **the leaf blades** with conspicuous glands which bear bristle-like hairs: utricule abruptly constricted at the neck into a beak or at the **middle**, remains of the leaf blade often apparent.

Perennial, Found in water, often forming large floating mats. It may be no more than an aquatic state of *C. gigantea*. The **distribution** given below is based on literature and is probably inaccurate.

(Ple/Hyp/Eph/- SE Asia: Ind, Nep: cAn, As. Hp, Kt. Mp, Rj. Or. Wb.

Coix gigantea |. G. König ex Roxburgh [*C. iningtlata* Hackel]:FiR. 29(i

like *C. hu-hytyma-fobi* but perennial; **caitosetect**, b^ m tall; leaves linear. 10-9(1 cm long, 1.5-6 cm wide, upj^1 surface glabrous, without (Hands; utricule not abruptly constricted at the neck into a beak, (IM **©***** (-18) mm long, dull white; lower RIUMIC of the **male** spikelets b[>.itUy winged; spikelet-s f-f mm broad.

Perennial. Not confined to wet places but **i sometimes** a serious weed in rice field*.

fHeHJ, SE A<i.i Bur, Oy. Ind: Kl, Mp. Wb.

Coix heh rymajob fLrhpaeng Fig. 296

Culma tufted. (lo-> **25-100** (-lrr(i) **cm tall** **Leaf** blades Umeoialc to linear-hvnceolate. **10-40** cm long- with 1-5V cm wide, upper surface usually **gabrOUil ef** **small tubercule-based** hairs. Utricle **aurroundtdtoB** **female** spikelet **cylindrical** to ovoid or globose. **1>->** 8-12 (-1J) mm long, while **BoyeHnwisli-whiic-** or bluish-grey, terete or partly flattened, smooth or with **long***** diniil ridges. Male spikeletM (5-) «-12 (-15) mm **UW**



Fig. 296. *Coix aquatica* three utricles (5 mm). & *gigantea** (5 mm). **b**, mirlet* (5 mm). **C** *haymmjoth* c, flowering shoot (5 cm). **A**, ligule (1 mm); **c**, three utricles (5 cm)*

2-3 M) mm broad; lower glume paper* long, 2-1 mm wide. 1* or more-nerved, with narrowly winged or hardly margins; upper glume ihin. OWonj lanceolate, :->i2 ran long> i-S mm wide, ' - <«' ^ . lemmas oblong-UnceoUIC, 5-10 n*m long, lainUy oi 7-iH-rvrd: pjilfas elliptical w oblong-lanceolate. WO nun long, 1-2 mm wide. 2-nerved, 2-keeled. Can-opsp s ovoid LO globose, ± Smffl long.

Annual. Found in a wide variety of wetlands, common in and around marshes, along water courses, often standing in shallow water iit !J¹⁰ls - bflctawatera and rice fields. It fryer) variable in habit mnd ... e of the utricl* , several TMriede*S*e colriwted. rbe dw are mod for decoration, medicine and as Jood a* flour or lor beer, h ta good fodder. The leaves some-time* uwd for thatching.

(O Hel). Warm and u-opic.tt Asia, cultivated «r naturalized in Africa ami AntCffctf Ban. Gey, Ind: As, Bh. Gjt Go, Hp. Kl. Mfr Mb. Mp, Np. ()r, Sk. I p.

*Diptachn** [cSdadhsg UptixMwl- 1] «pede* tropical and subtropical region*

Stolimifrcrms or Uifted pert-rtni.Os. Cnlms erect, 30-270 cm lail or Soatlof. L<<<>W mosoy li g iotf hlarles Hncar-sinmiinitK-. flat or rolled, tnflorojeence an open \u.n\y K-<i -inp'^d ol mnnerons, bowb .pike Ufa i.u:cmc» (whbwWf ows m length on one «Hc». Spikrlcu, 3^io «* (> » tmeardbimig, 4-8 mm kHig, mlnercir. above the glunie* and bTwwm the Bprtffc -ilh Flattened. Glumci imeqna] i-> MIU-IH.II. l-ncrved, !...<ji-oiu- u, owtr. kuded, wtb » Mutt or mucrooaw apex, usually daorter dwn the towett tomraa. Lwranaa obiw or acute, somciimts Btoodycd and nauCKKWe or shortened between tlic teeth, J^lftved, tin: nerwa Mmetimea pubescent. ± cowoded on the back. Stamens 2 or 3. ClaryopM's cllipsfjidal o. ohwoul.

liiptarhntis very cfttc io and sometimes united With arc the non-flattt-ncd rallu-r lousch arranged and lenunaa with rauDded backs.

]. U m m i with an up lo 12 mm long awn; sessik-: annual

I- Lemmai vntfa a mucnp « awn ooi more than I > mm long; spiklcicis stalked; perennial

iHpluihnr faxeicuhris (Lamarck) Palisot dc Beauvoi*

Like *Diptchnr fussa* but annual spikelefc sessile; li-iumas with an up M>18

[O Hcl]. Warm I> iropkal America, nauirali/fd m Asia minor and parts of the Indian subctmCJienL

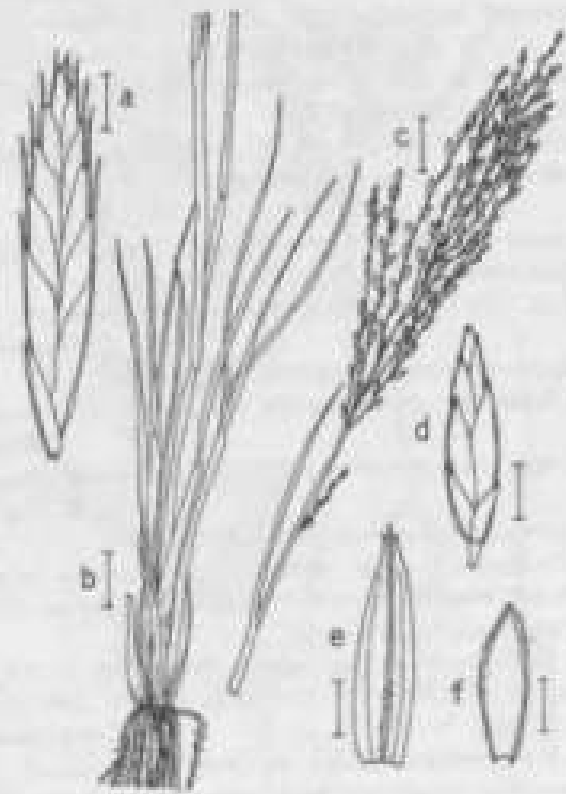
Diplachn /usTM (Unnacus) Pslisot dt faMUVOis ex Roemex ti ScbuUei Vsft mak&mim {Linnaeus t Veldkamp]: Fig/Jy?

Gtdnu tufted, erect, (30-) 60-200 an high, rooting and branching on the lower ftodes. lignlcs membranous, wnguMhaped fr4) mw to>gi leal blades 8-50 cm Song. 2-6mm wide, glaucous. Panicks 1D-40cm long, tooae, grf)ish. Splkdets stalked or sub- l, <4_) 8-y (-15) mm long, 1-2 mm in diameter, 4- to 10r (to S0)-fiowWedi Lower glume 1.5-2 mm long; «pp<T giuim- 2.5>3.5 mm long, miicronaic. Lemmas Sr* mm long. 3-nei^cd. 2-lob<l. with central roqero or awn up td IJ5 mm long. Pttleaa 2-3 mm long.

Perennial. Not confined to werJand* but frequency round in fresh »nd brackish water, silli marshes, irriga- Iton (iicht-s, ritt- fields and along roadsides. The stems are spongy when in water.

[He]. He]. Tropical Old World and Australia; B;m. Biir. Ccy, Ind: Kl. Ki. Mp. Tn. Up. Wb.

Echinochioa [Jfetaeam pro part*]: 30-40 often poorly defined ipede*: costnopuliian. probably introduced into Ami-iaa.



Rt. 297. *thpkuhn** fivrirulatvt: au spUtelci (1 mm). h. b>e ol plant i> «m): c, infioswceBce (2 cm); d, spikekt (5 mmlit, lower lemma (1 nun); f, Itwer palea (1 mm).

Tufted annuals or stoloniferous perennials; variable in size, ligules absent or a fringe of hairs. Inflorescence of 1-sided, spike-like raceme* along a mitral axis; rachis flattened or 3-angled, not ending in a bristle. Spikelets arranged in 2 or 4 rows. Lower glume, terete, sub-terete or in irregular clusters, **disarticulating** from the **pedicel**; lower floret sterile or male; upper floret bisexual. Lengths unequal; lower glume less than half as long as the spikelet. 3- or 5-nerved, **acute**, cuspidate or short-awned, not clearly abaxial or adaxial; upper glume as long as the spikelet. Length of lower glume as long as the **crapa** glume. Mids or flattened on the **back**, cuspidate or awned (awn up to 5 cm long); lemma of upper floret rounded on the **back with** **intra** margins, not enclosing the apex of the palea. **GwifDpSa** fusiform, tightly enclosed by the hardened lemma and perle.

Annual or perennial. The culms of some are enclosed by an awned sheath, probably dispersed by adhesion to animals. **Others** probably by water. Some are **cultivated** for forage but the **nuns** or other species may be very serious weeds in rice (it is and irrigated land). It is a taxonomically difficult genus, many species are variable and several species hybridize resulting in intermediate plants with many intergrading forms and local inbreeding **races**. Yabimo. T. Biomolecular studies of the **genus Echinochloa**. Japanese Journal of Botany 19(2): 277-328 (1966); Gould. F. W., Ah, M. A. and Fernald, D. E. A revision of *Echinochloa* in the United States. American Midland Naturalist 87:36-59 (1974).

Excluded: not found in wetlands; *Echinochloa* glaberrima J. D. Moore.

1. Ligule represented by a fringe of hair, at least in the lower leaves: usually **perennial**

2. Spikelets acute to cuspidate but never awned

E. pyramidalis

2. Spikelets with awns at least 2 mm long

S. Spikelets (excluding the awn) up to 4 mm long

E. picta

3. Spikelets (excluding the awn) 5-7.5 mm long

E. stagnina

1. Ligule absent: annual or rarely perennial

4. Length of upper florets acuminate to awned; spikelets usually **racemes** unilaterally 2- (or several-rowed, the longest **2-10 cm** long

5. Inflorescence usually drooping or at least curved, side branches soft, very densely covered in spikelets

E. virgipavonis

5. Inflorescence axis erect or almost **curved**, side branches rough and hard, not densely covered in spikelets

6. Length of upper floret 2-3 mm long; the longer racemes with secondary branching spikelets very branched **men** bran 4 mm long

E. crispata

6. Length of upper floret 3.5-5 mm long; all racemes simple, unbranched; spikelets usually more than 1 cm long

E. oryzoidei

4. Length of upper florets acute to cuspidate (the cusp not more than 1 mm long); spikelets hispid: **racemes** unilaterally 4- (or several-rowed, the longest rarely **exceeding** 3 cm long

7. Racemes not crowded, usually \pm half their length apart and appressed to the axis or rarely spreading

MI subverticillate, \pm in 4 rows; spikelets rarely **more than 2.5 mm** long

7. **Racemes** crowded with at least some overlapping or appressed to the axis, usually incurved

MI several-rowed; spikelets **more than 2.5 mm** long

E. fistulosa

Echinochloa cotona (Linnaeus) Link [*athnum* orthomur., *idmora* orth. muL, *Panicum colonnatum* Linnaeus*]
Fig. MS

Tufted. **Culm** or **Eutendia**, 10-100 cm long. Leaf sheath glabrous, up to 5 cm long; ligule absent; blades 10-15 (-30) cm long, 2-8 mm wide, occasionally marked with purple bars, **linear** in outline, 1-15 cm long

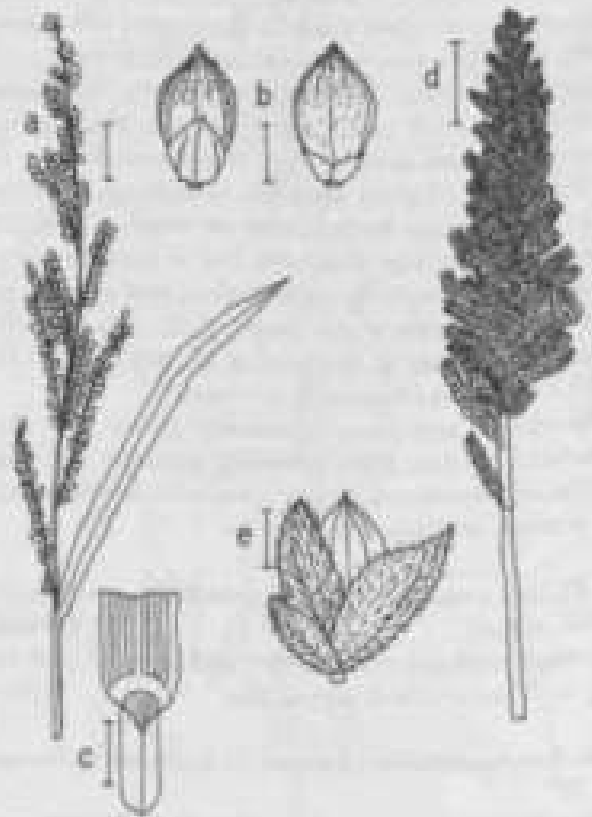


Fig. 498, *Echinochloa tebmai* A, inflorescence (1 cm), spikelet (b), leaf (c), spikelet with secondary branching (d). *E. crispata*: e, inflorescence; f, spikelet (1 mm).

GN 8-10 raceme raceme* **W*&f** * * * * * **Hj**
 <>> on lone, usually ± half their length apart and
 approved to the axis or sometimes spreading and
 wvtrlicillaic. Spikclw **OTOi*E>»p<»*d** 10 ->
 bosr. (I-) 2-2.5 M) " " n l>n K- p l lbr S<: snl Lower
 glume ovaie, 1-2 mm long, half as long as
 spikelet, acuminate nr shortly cuspidate **bUI**
wmea, 9fterfed; oppw S lllltlp 6M a l u r n ff
equalling [be spitelci, acuminate 7- to 11-
hbpld, Ummaof lower floret <***<. **fc-4** mm long,
 acute or shortly cuspidate, &e **cliaP** l to l m o r c
 1 mm long; lemma of upper **Her*** 2-3 mm long.
 AiiTluwiulrL or purple.

Aaituat No, <<>,lim-< to wetlands but of.cn ... <
 and marshy places. En ditches along canals, ait uw
 <%> of <md3, watering a serious pem to ! * * * * >;
It g^des into !; JhtmtOaaa. It < wny good ft
 Int li before- and alitr tlow^ri ng.

10 Hrrl. Tropics of Asm <nd Afric. inl, <>du,^ mo
 -Africa: Bur, Cey, Ind. N.i>. **Pafc** <A>- ^P; ^S" ^n
 % Go, **Hp**, Ik. Kl. K(. Mh. Mp, Ri, 'In. Tp.
 IJ-2000 ni.

Echinochloa crus-galli (Linnaeus) IN*** d- Beauvois
 [E. hispidula (Retzius) Nees ex Royle, E. crus-galli var.
 brevis (Dr>ll) **Ndlrc**,
 (Dr>ll) **a) Nnirdchl: Fig. 299**

Ttfted. Culnu <<< i or waitt ding, (15-
HSOj cm long. L^l lb<tfEJi gtabtW* <<J>
W^ S %ui<< atocnt: bbite
 long. 4-20 mm wUU, **bfa<#X*&** ...ieirr
 nodine, 6-20 (-25) cm long; **the long<t** 2-10 cm
 several-rowed, the long<t 2-10 cm
 short secondary branchlets at the base; rachilla with
 «omc hairs as long a» the spikclt-ts
mpKM, (a^_) 3-4 (-') mn, to
 « awn), hispid, pale green or
 '3 mm long, oi u-diird LO w
d. J. of Uer^ed; <pocr
mm bag, u kmg < the
brivly h.ir., S
 of upper floret ovate, 2-4 am long. m. • hulin the
 short h^o as **dp Seeded**, ^erved. Ambers
 brown on vcllnw.

Annual perhaps sometimes perennating. Not
ccittfined toweflandabol often found in wet or marshy
place*. A common and troublesome weed m rtcc
 Rdda U is mtntl ftidder before nowrring; die gran, is
 eaten m times or **Kstfcfty. It Is amogamow ot even**
 cleistogamous and numerous segregates have betn
 recognized.

f(O) **H<H. Wton** and tropical, Asia, Africa and
 An^rica: Bur. **Gey**, Ind. Pak: As. CB, **Go**, **Hp**.Jk. Kl. Kt.
 R% Mb, Mp, Ng. Or. Pj. Rj, Tn. Up, Wb. 0-2000 m.

Echinochloa crus-galli (L.) Link. (Hwtrrhofc Booptand ct
 (17) Schultes Fig. 299
 "t"ikt B cn>igaffi but **Inflortsoence** 10-30 (-40) cm
 lone toft norldiiiR. murli inorr dense, with more
 numerous na-mt-s ;md **my** * * * * * " p * ^ * ^
 rtoemfs up m 14 cm long; rachitta ^iibcui lung hairs;
 spikeU-is mosdy 3-4 mm long (exduding cusp or awn),
 usurtllv awncd.' inconspicuously haii-y; **lemnfa of upper**
irta naiTowlv cllipticjit-ovalt' to elliptical, **gnybfc**.
 Annual prrluips sometimes **pert^nadttg. U<uaHy**
found in water.
 f(O) Hyp/Hell- Tropical Am. n... ..id Alma, rare m
 Asia: Ind: An.

Echinochloa crus-galli (L.) Link. [E. crus-galli
 var. *frumentacea* (Roxburgh) C. K. (. Fwchr. C. crus-galli
 var. *frumentacea*
 et Yabon. 1: Fig. 298
 Tufted
 "Culms" err. t, «M<0 OB long. Leaf sheaths
 d Mnooth. u> to 12 cm km_K: lig.,l< ahicni:
 li—bnc, obt., 5WW **MBJ** cm Ion., **M 0 < D**
 wide **tnlflorefcence** Luuc-olatv in outline. b-JO cm
long; with BttmcttMia racenwj; rac<m< st-vn, l-rowe.l
 with crowded spikclcU. simple. H,>lmiiKbrd. 1-3 cm



FIG. 299. *ErhhuxMM n^gnlH*: ft, inflorescence (1 cm);
 b. **tigale** (5 mmV. **c, vjWM** < 1 >->• **J r**
 p<1 of inil.,vrs,m< (I da)} c splkclcl (1
 f, spikclct (1 mm). *E. crus-galli*

g w on; Hgnta a line of hairs; btode- *5° 1'' long,
 ft-10 mm 3de! Ittflowceoce namely Ian.*olai« or
 omte m outline, 7-20im long, a«.allv
 5-15 i:,cc,mv. racemes «...«. **d' '' ^ f
 3-4.5 cm lor*. Spikelcu ovoid to broadly
 *Mind<l. 3.5-6 mm long, p«bc*eW t« hfap
 gW ova(o. 2-3 mm long, «ninfwi.e
 glume owtetowwtaw, 5^ 1'' 1'' 1'' 1'' 1'' 1''
 7- ot 9-nem-d. Lemma of U««r no«<<
 awn :>-io nun long; tenans <^ >»PP^r flufct
 man lonR. Anthers yt-llow.

Perennial or <«
 to wcl plures: louml in jjoog -
 ts and canals. Il often forms
 a. Il has raiher distinct purp^
 goixl fodder and ihe grains we eaten
 times of want. This species is <>licn
 Indian Floras.
 11©) Pit- 'Kuh/Hell. Tropical Asia:
 s.kl.K.. Up. Rj.Tn,Wb-0-1500 n.

Elytrophana 2 BpedCK Old World tropics
 Willi A
 '*«HUC. indL, non Palteot de Beaavn]: Fig.
 Culms branched n-on, bwe, creep^ ^
 (-70) cm long. Lear *bead« (BghUv ki-U- U
 membrano^ ^mctimes minuwly hairy; leaf
 often overtopping tfee WtoresrwiM
 npik,lik., D.M5 (% cm long, oi d«s«- £
 tern of spikdeis on a rtum.l Mis. the lower
 e, the upper ctmOuam and spiU-hkr. p
 (0 ..lowercd 2-8 mm long (tacllUSng ^ is), rtn« Kh
 flattened laterally; rachilla
 florea. Glumes 1-4

1-2 mm long, cusp^ie, the opper. 2-H nun tong,
 dat, S I i ^ ^ -
 beaded. * or B-nowd, afttoerw P" * ^ 11'' >
 05-1 mm bngawn. Pafc^dU«ae. 1.5-2.5mm
 to 6-lobed at ^c apei, defieaie.
 elliptical 10 narnwlv efltolkal to
 Annual. Seasonal!? sHlnu.Tg-d bottom-footed or
 floating al edgej of poob. ditches « lakes.
 Baiiuns. «jmrtiliifs l'onnH in ri«r fk
 {O HeH, Old Wortd tropiiw Bur. Gey, to*
 Mil. Mp. NR. Rj. Tn. Up. W>.

£™grw(ir ± 560 Kpedck waian and BropUal regfa«>
 AnnuaJ or pe
 Spik<-l,s U,M-XU.1. «alk<l usually many floweres (up
 10 45). laterally flatten** ru hilla (x-rsient
 us.udiv mu-qual (upper longer fcan lower),
 kmget than the lemma and pal*8S, TM% 1

together with the grain. Meaa membranous, hyaline,
 jhortet than the lenwu* 2-kecl<l.

Excluded: m;m\ spcti^ grow in damp places but
 not wetland plains: *Eragmstit atrtwirtiu* (Deaftmtah
 Trintu* Stucdel; K «7ta»™.m (AlKoni), Vignnlo-
 l.ULiUt 1/ n-agrw(H Linnaeus
 (RoiutgbPsteudel U. srrrkhylla; Hochsietter
 E japonkn fOumbetg) Tiinius [£ <&A«U (Schullfc
 SteuSS; £./>ifo« (Unrtaew) PaBvJtde BeatnoU [Jte
 MJy»(H^ J. G. Koniş ex Ro^ftrll K. =*->-
 fWULdeaW) Nees: *Ind; £. tanrlh (UnruwSB)
 tit- Ik-auvois: £. s?vt>f« Nees el Meyer,

rii IIIW/OW* (Retain) Nee* ex Stcudd: Fig. 301
 n taS«i. 4.&50 cm high, erect or creeping and
 wjoLine below. l-iRuk- 9 narrow rim or thin membrane,
 + 0.2,mn long; leaf blade (M ^-15 t-2B) rm long.
 T-8 mm wide, at the ba« ronttded ew shallowly
 cordate Panicle* up t« HO cm king, Spikelew o w w to
 oviuc-oblong. 4-lfi mm long, 1.3-4 mm wide. &• u,
 KM lowered, usually tinged with purple. LOWKI gluiiie
 oblong-lanceolate, 1-2 mm long, 1-nrrved: upper



h spiUHri (1 mm). *Mytnfh*,™ *tpktW* c, H«wrnnK plant
 (S uni: d. tower glww (1 mm): e, upper slyme (1 mm);
 f,lemma (1 mm);«.!>»*(1 mm).

glume ovate-lanceolate, 1.5-2 mm long, 1-nerved. Lemma broadly ovate to obovate-lanceolate, 1-2.5 mm long, 1-nerved.

Annual or perennial. Very common, not confined to wetlands but often found in shallow water around pools, in and along ditches, in rice fields and in marshes. It is very variable in size. In the Sudan it develops rhizomes or stolons.

[(O) Hel]. Almost cosmopolitan: Gey, bid: An, * . j. Go. Hp. Kl. Kt, Mp, Rj. Tn. Tp, Up.

Eriodontoa ± 30 species

Eriochloa procera (Kit/HIM) < [Hubb;id] *foliolitachya* Am. Ind. non Nutt, Bonpland et Kunth j. Fig. 302

Tufted. Culms sometimes shortly creeping at the base. Culm, 30-80 (-150) cm long; nodes glabrous. Leaf sheaths slightly keeled; ligules membranous, limb-like; blades linear-lanceolate or linear, 10-30 cm long, 2-8 mm wide, rounded at the base, acuminate. Inflorescence paniculate, 5-20 cm long, lax, purplish; racemes simple or branched, 2-10 cm long; spikelets 1-sided, bearing paired spikelets. Spikelets elongate-ellipsoid, 3-4 mm long, with white silky hairs, green or

purplish, supported on a ring-like swelling (lower glume) and the rachilla forms a ring-like callus). Lower glume absent or reduced to a ring! upper glume ovate-lanceolate, 3-4 mm long, 1-2 mm wide, paper-like, 5-nerved, with white silky hairs. Upper glume sterile, without a palea. Upper lemma of lower floret resembling the upper glume, elliptical-lanceolate, 1.5-2 mm long, 1-1.5 mm wide, brittle, faintly 5-nerved. Lower lemma of lower floret resembling the upper glume, elliptical-lanceolate, 1.5-2 mm long, 1-1.5 mm wide, brittle, faintly 5-nerved. Palea ovate-oblong, 2-2.5 mm long, ± 1 mm wide, membranous, faintly 5-nerved. Palea leaf ovate-oblong, 2-2.5 mm long, ± 1 mm wide, brittle, 2-nerved. Sterile anthers ± 1 mm long, violet with yellow connectives.

Annual or perennial. A common grass found in wetlands, ditches, rice fields and along the banks of waters. Common and often abundant. Used as a forage crop. "the ring-like growth below the spikelet" is a characteristic feature of the grass.

[(O) Hel]. Tropical Africa, S and SE Asia: Bur. Gey. Ind: Ap, Kl, Kt, Mh, Mp, Pj. Tn.

Hemarthria [2 sp. - Old World tropics and subtropics, perhaps also native in America]

Excluded: found in damp or moist places but not wetland species: *Hemarthria altissima* (L.) Steud. C. E. Hubbard. *H. kamittoniana* Steudel; *H. longifolia* (L.) D. Don. A. Camus: *H. f. umsa* Steudel.

Hemarthria compressa (Unn.) J. E. Brown. [Rat] *btaxin giabra* Roxburgh, //, *rvnruirumhui* Sieber. *H. longicaulis* Steudel]: Fig. 3(12)

Stolons creeping or floating, up to ± 8 m long. Culms floating, erect or ascending from the base, 40-100 cm tall. Leaf sheaths hairy at the throat; ligules very short, membranous, ciliate. Blades folded in bud, afterward flat, 9-15 cm long to 8 mm wide, base rounded or subcordate, thin, glaucous. Inflorescence of axillary, solitary or in small spike-like racemes; raceme 5-12 cm long, sometimes partly enclosed in leaf sheaths. Spikelets in pairs; each pair with a pedicel and a sessile spikelet (the pedicel joined to the internode of the axis, thus each opposite pair is made up of a sessile spikelet and a pedicelled spikelet of the next lower node); the spikelets disarticulating tardily. Spikelets 4-10 mm long, 2-flowered, awnless, flattened abaxially; the lower glume reduced to a sterile lemma; the upper glume membranous, gradually acuminate or obtuse, 5- or 7-nerved, indistinctly winged above; the upper glume + lemma ± 5 mm long, 2-nerved, Garyopod somewhat lateral. Palea oblong in outline, ± 1 mm long.

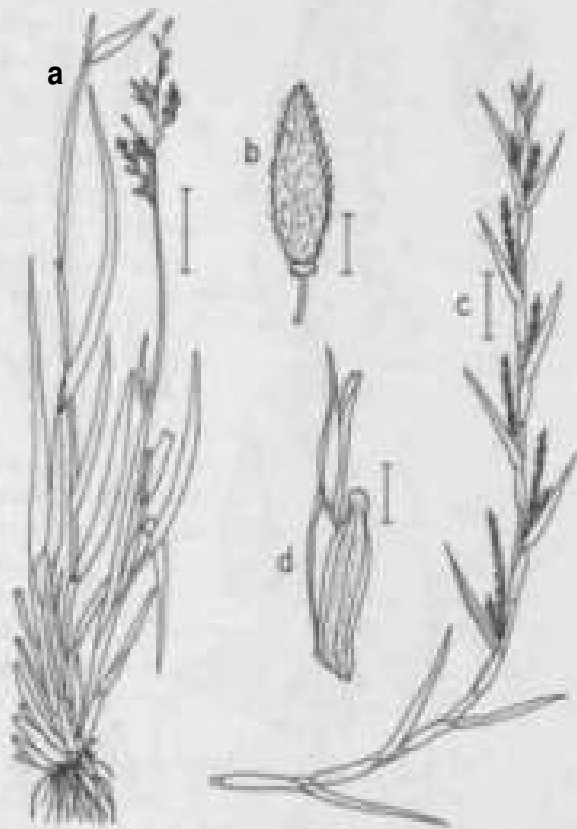


Fig. 302. *Eriochloa pectiniformis* a, flowering culm (2 cm); b, spikelet (1 mm). *Hemarthria wimfuriensis*: c, flowering culm (3 cm); d, spikelet pair (5 mm).

Perennial. Koicom-rooted 01 floating ai edges of pools. iaki; mid riven, also in damp place*, ditches, bunksjujfi abandoned puridv ftelds. li '^» be a uT>ii>lr-9Qmc wt-rl on Irrigated land antl in wcl places.

(Hel/tpH,Tlc|. Wami ui tropw::tl Alfa, Australia and N Africa: Ov. Ind, Nea Pate 111, fij. Up. Mp. Rj, Tn, UpWb

Hemiarthron: 2 Species SE Asia

Excluded: *Hymixtrgrium venuxtutrt* (Thwuites) Clayton
n«i found in wetlands.

Hemiarthron tnekftngetisix (A. Camus) C. & Hubbardt
Fig. 305

Culms v«ry robust, tufted, tall. IJguk* very SIKH i.
H "Hffrte, tictiM:ly shart-ciliacce; leaf ttadei lincw-dance-
Olfte, flat. inflorciw-fih-K A large, topae, ucomprand
Panicle, iis primary brjnehes subdivided, bearing long,
'c«nc racemCB. Spik<rl> paired, 1 st'ssile the other
Pedice 11d; sessile spikolcLs S-flowercd, ihe lower one

sterile, ihe upper one bisexual, »taaxiaUy flattened, awolcscs, (be callus obtuu willi ;i ring o) tuiniit hatn. Glijim-x 2, uju*fu;il; *iomrgiumt* [bin, leathery, flai <'t ihe back. S- 10 ll-nerved, 2-kccled for most <il 'us fengih^ ihr k<rds scaSrid, tdc tnurgins becoming sharply Inflated towards the base; upper giuim-rounded cin tl>- back, -ii^iitv keeled towards the apex. *Letitittx of lower fhxet thghdy* Vhorttr tJuo (fie glumes; lemma of upp^r flurci nrarly as long as dn-lower one. awlless tr bi(U-ninu- and invited- fctttcctted spikclets stt-riic. dther wflklt-vclttffipd mih a 2-keded lower glume or much reduced. Caryopsis ohkmg-obcwofdi at>axiaJfy ffat.tcned, dpped witi siylf basu.

Perennial. Xviy rabusi, locally clnminant on rivtr banks.

P le}}. *Btuntu*, Thailand attd *Laos: Bur.*

Htffbardia I genus

tlubbardia heptaneurtm Bur: Fig. 308

Culms delicate, creeping on and hanging from rocks under waferfalis. I laves arnurgrtf alucig die culms; lent sheath shorter than the internddes; lipuU*s abstmi; leaf blades narrowly ellipiir.il to oblong-elliptical, l't—\ cm Jung, 3-7 mm wdc. vrr>- thin (only 2 foyrs tii'jnr^sop>iy)) (cllsi. mem brail* JUS, translucent, wjhh ^curler nu'cr(i-hairs on the adaxi'af surfact^l. frifioresctmcc a «.aniy .mil-lan' panicle, terminating '«ifv branches. Spikel?u all iilike, ±2.7 mni long, 2-flowtred, withoul awns, terete or iihixuilh fi&tttrntxl, ttKtrtU thuing above, the glumes; rachilla withoui ait extension. Floreta similar bui the lowef rmpy, the other bbexual Glumes perststtm. iijcinbuninis, 5- tir 7-ncJ*vci. It* long us thi spikt'lfj. LfmWOT nirmbnuius. 7- f*r 9-nerved. rounded on the back; patras absent Caryopse* spinulic-shaped, 1.25-1.5 mm long, siiphtlv tUutned.

Probably annual. A remarkable *flute-like plant found L' WBGT and an rucks in sprir at die b*«> oi* (fg (Gei^'Ppa) Falls Kamalaika, probably extinct due to daffiming of tte Sbaravad Riv*>r. jjttr, N, L, A new gentii ofinttonttfrasses. Kcw Bulletin 19r>0, S^~3S8 (1951)

{O? Vli/Hyp?}. Bnderalc to SW India: *Ind: KI [Sharavnfi Kiver, now probabty extinct).

Hygnyza = [Hygwhyzn\ oith. mut.]: J species
Hygnyza aristala {Heiztm) Srv> vx Wright et Arnott

Fig. 304

Culms crwping or trailing, il<;uhuj, hianchtng, ascending. rootinj} ;it internodes; n<id<ls jflabrous. Leaf sheaths open, strongly inflated, fanning Boats, partly cniimf>eut; figuk's tiuncatc, ±0.8 nun (imp; uicmhra-tiotw, unf ringed; leaf bLide* cmci-gmt, ovau-lniu:colate to elliptical, <H 2-5 (-8) cm long, (3-) "J-*20 innt wide. *glaucous* beneath, *awmefasu oewdaie* at base, without a ljiomiueui ttidrilj. ItLflorcsccnce 3 pyramidal panicle^



Fig. - S03. *Hrmiiur^hum w&tngptnAr.* i. (lowering culm H ntt);
"o *w Ip&eleu, one w.vsiC and one stalked (2 mm).
lluM*i'tliu (uptonHmm c. JtaijjitiK d>O1 (2 cm); d, leaf
*h«>h ami bUde (5 inn); r. spifef Jr (0.5 mmj; f. glume
f*'' mm); k. U-mnia ID.) mm-



FIG. 304. *Iygroriza aristata*: a, flowering panicle (2 cm); b, spikelet (5 mm).

2-5 (-8) cm long, Spikelets solitary, 1-flowered. Glumes long, slightly flattened laterally, long-pedicelled. Disarticulating from the pedicel, tiller times and sterile lemmas absent. Lower glume lanceolate, 7-8 mm long, papery, 5-nerved, narrowed into an awn: awn 11.5-1.7 cm long. Palea as long as the lemma, narrower, 5-nerved. Stamens five. Ovary narrowly oblong, ± 3.5 mm long.

Perennial or sometimes annual. Almost the habit of *Eichhornia crassipes* but tiller floats developing from inflated leaf sheaths. A characteristic plant in mats of floating vegetation. It is common, often abundant and so in the water. It is found in water reservoirs, pools, canals, backwaters and flooded rice fields. The culms are sharply awned, probably damaged by animals. The grains are eaten by people; it makes good fodder for cattle.

[O] (Pte). S and SF. Asia: Ban, Cey, Ind, Pak: As, Bh, Kl. Mp, Rj, Up. WI.

Hymenocallis. 8 species; pan-tropics

excluded: wetland species in the eastern Himalayas: *Hymenocallis assamensis* (f. I). Hooker Hitchcock.

Hymenocallis acutiflora (Sleutel) Gilgland [H. pseudo-interrupta C. M. Tieller, B. amplicaulis Nutt. (Rufijiv) Ners, *Ptautis myurtis* (Uct) Lamurk]: Fig. 305

Culms floating, creeping or ascending, sterile swollen stem softly spongy (containing white, aerenchyma), up to 1 in or more long, branched, with (Vaiht-r4ike roots. Uguite? membranous. 1-2.5 mm diam; leaf blades linear to lanceolate 7-35 cm long, (0.5-1.5) cm wide. In the base, a particle of spike-like and dense or long and narrow with a spike-like branch toward the tip. HMO tin long, 5-flowered, lower glume long, sterile; lower floret sterile, reduced to a lemma; upper glume bisecting. Ouncia unequal, acuminate, the lower up to half as long as the spikelet, the upper lemma is 1/2 as long as the spikelet (sterile) lemma as long as the spikelet acute, acuminate or shortly awned; the lower lemma of upper floret sterile; acute. The base of the palea below but towards the tip of the lemma and palea not hardened.



FIG. 305. *Hymenocallis acutiflora*: a, flowering panicle (2 cm); b, spikelet (5 mm); c, spikelet (1 mm); d, stem (2 mm).

globose or globose-obovoid, (0.8-) 1-2 (-3.2) mm long. Upper and lower florets almost alike in shape, size and texture, ellipsoid. Glumes subequal, 0.8-1.3 (-2) mm long. Lemmas broadly elliptical, concave, rather hard, with obscure nerves. Paleas like lemmas but flat with incurved margins, nerveless.

Perennial or perhaps sometimes annual. Not confined to wetlands but often found in wet places beside streams and in moist grassland. Readily eaten by cattle.

{(O) Hel}. SE Asia and Himalayas: Ban, Bhu, Bur, Ind, Nep: Ar, As, Hp, Kt, Mg, Mh, Mn, Ng, Sk, Up, Wb. 0-2000 m.

It is very variable and some variants from the western Ghats have been recognized at the rank of species.

Isachne bicolor V. N. Naik et B. W. Patunkar: in the original publication the description and illustration do not agree.

Like *I. albens* but leaf blades widest in the lower third; spikelets globose, (2-) 2.2-3.2 mm long, purple; panicle branches and pedicels with 1 or more yellowish glandular bands. • Ind; Mh (Aurangabad District).

Isachne elegans Dalzell ex J. D. Hooker.

Like *I. albens* but annual; culms delicate, ± 2.5 mm in diameter; spikelets (L8-) 2-2.5 mm long; leaf blades linear (widest at the middle), not more than 15 cm long; lemmas pubescent and mostly purple on the upper half. • Ind: Kt? Mh.

Isachne meeboldii Fischer.

Like *I. albens* but culms robust, ± 5 mm in diameter; spikelets 2-2.5 mm long; leaf blades linear, (widest at the middle), 15-35 cm long, 2-10 mm wide; inflorescence branches and pedicels with reddish glandular bands. • Ind: Kt, Mh?

Isachne veldkampii Bhatt et Nagendran.

Like *I. albens* but culms delicate, not more than 8.5 cm tall; leaf blades ovate {widest in the lower third}, up to 1.5 cm long and 7 mm wide; inflorescence branches and pedicels with glandular bands; spikelets not more than 1.5 mm long. *Ind: Kt (South Kanara District).

Isachne globosa (Thunberg) O. Kuntze [*I. australis* R. Brown, *I. dispar* pro parte, auct. Ind., non Trinius, *Panicum violaceum* Klein ex Thiele, *P. lepidotum* Steude), *P. nodibarbatum* Hochstetter ex Steudel]: Fig. 306

Culms tufted or spreading, often rooting below, (10-) 20-80 cm tall; nodes glabrous. Ligule hairs (1.5-) 2-3.5 mm long; leaf blades linear-lanceolate to ovate-lanceolate, (L5-) 3-12 cm long, (3-) 6-15 mm wide, glabrous or hirsute, with cartilaginous margins. Inflorescence up to 18 cm long, compact or spreading; branches and pedicels with or without glandular bands. Spikelets globose or globose-obovoid, (1.8-) 2-2.5 (-3) mm long. Upper and lower florets dissimilar; the lower one longer

and flatter. Glumes subequal, ± 2.5 mm long, 7- to 11-nerved. Lemma of the lower floret elliptical, ± 2.5 mm long, usually exceeding the lower glume, thin, paper-like, obscurely 6-nerved, glabrous. Lemma of the upper floret ovate-elliptical, 1.5-2 (-2.4) mm long, not exceeding the upper glume, concave, coriaceous, nerves obscure, glabrous or sparsely hairy. Palea of lower floret like lemma but narrower. Stamens 3; anthers 1-1.3 mm long. Lemma of upper floret and palea up to 2 mm long, glabrous, without nerves.

Annual or sometimes perennial. On mud or emergent in shallow water, often found in floating mats, common and occasionally very abundant. Sometimes becoming troublesome weeds in rice fields and irrigation ditches. Acceptable to grazing animals. Used as green manure. In many Indian Floras it is confused with *I. dispar*, a species endemic to Nepal.

1(O) Hel/Eph/(Hyp)]. S and SE Asia, extending to Japan and Australasia: Cey, Ind: Ap, As, Bh, Gj, Go, KJ, Kt, Mh, Mn, Mp, Or, Rj, Tn, Up, Wb. 0-2000 m.

Isachne miliacea Roth [*I. dispar* pro parte, auct. Ind., non Trinius, *I. geniculata* Griffith, *I. stigmatosa* Griffith] • Fig. 306

Culms erect or ascending, creeping and rooting below, 8-35 (-50) cm long; nodes hairy or glabrous. Ligule hairs 0.8-1.5 (-2) mm long; leaf blades lanceolate to ovate-lanceolate, 1-3 (-6) cm long, 2.5-3 (-10) mm wide, glabrous or sparsely hirsute, without cartilaginous margins. Inflorescence up to 6 (-10) cm long, spreading; branches and pedicels with or without glandular bands. Spikelets (1.2-) 1.5-2 (-2.8) mm long. Upper and lower florets dissimilar; the lower one longer and flatter. Glumes subequal 1.5-2 mm long, 7- to 11-nerved. Lemma of the lower floret elliptical 1.8-2.5 mm long, slightly exceeding the lower glume, hard, glabrous. Lemma of the upper floret ovate-elliptical, 1.2-2 mm long, not exceeding the upper glume, concave, coriaceous.

Perennial or perhaps sometimes annual. Common and often abundant; found in wet places, flushes or hollows in grassland, sometimes lurf-fonning and sometimes forming floating mats. Considered to be good fodder. In many Indian Floras it is confused with *I. globosa* which is widespread and with *I. dispar*, a species endemic to Nepal. I suspect it is best united with *I. globosa*.

[(O) Hel/Eph/(Hyp)). S and SE Asia extending to China: Bur, Cey, Ind: An, Ap, As, Go, Kl, Kt, Mg, Mh, Sk, Tn, Wb. 0-2000 m.

Isachne pulchella Roth ex Roemer et Schultes: Fig 306

Like *I. globosa* and *I. miliacea* but spikelets (1-2') 1.5-1.6 (-1.8) mm long; glumes distinctly unequal, the

lower shorter and narrower than the upper; anthers of the lower floret 0.3-0.6 mm long.

{0 Hel?}. S and SE Asia: Bur, Ind: An, Ap, As, Mh. Mn, Mp, Ng, Or? Tn, Up, Wb. 0-± 1400 m.

hchaemum: ± 70 species: warm and tropical regions, most in Asia

Culms creeping to erect, 10-350 cm tall, simple or branched. Ligule an unfringed membrane. Inflorescence terminal and axillary, of paired (rarely single or digitate) racemes, these generally 1-sided and interlocking back-to-back thus simulating a single spike mostly exerted but sometimes enclosed in a leal sheath. Spikelets 2-flowered, in pairs, 1 always pedicelled, the other usually sessile, disarticulating at the nodes; sessile or subsessile spikelet 5-6 (-8) mm long, abaxially flattened, awned or awnless. Lower floret male or sterile, the upper one bisexual. Pedicelled spikelet like sessile one but showing all stages in reduction, sometimes represented by no more than a small glume especially in the upper part of the raceme. Glumes 2, usually hard and rigid; lower glume awnless often 2-winged near the margins; upper glume awned or awnless, 1-winged or keeled. Lemma of upper floret 2-lobed and awned from between the lobes; awn bent and twisted. Paleas as long as lemmas. Caryopses abaxially flattened.

Perennial with creeping rhizomes or sometimes annual. This genus is taxonomically rather confused with numerous local endemic species; few are found in wetlands, most grow in dry or, at most, damp places.

Excluded: the following may tolerate temporary flooding or waterlogging but are not wetland species: *Ischaemum barbatum* Reuius [*I. goebeli* Hackel]; *I. bombaiense* Bor. •Ind: Mh; *I. commutatum* Hackel; *I. copeanum* P. V. Sreekumar, V. J. Nair et N. C. Nair: •Ind: Kl; *I. duthiei* Stapf ex Bor: •Ind: Bh, Mp, Wb; *I. glumineum* Bor: •Ind: Kt Tn?; *I. mangaluncum* (Hackel) Stapf ex Fischer: •Cey, •Ind; *I. naini* V. J. Nair et P. V. Sreekumar: •Ind: Kl; *I. raizadae* Billore et Hcmadri: •Ind: Mh; *I. santapauui* Bor: •Ind: Mh; *I. thomsonianum* Stapf ex Fischer.

At anthesis the glumes are membranous with green nerves; in fruit they become hardened and the nerves are no longer visible. This key is based on fruiting plants.

1. Racemes 3-10, paniculate *I. nilagiricum*
 !• Racemes 2, rarely solitary or 3, digitate or nearly so
 2. Margins of lower glume of the sessile spikelet expanded below the middle
 3. Spikelets with projecting awns *I. indicum*
 3. Spikelets without awns or awns rudimentary and hidden

4. Racemes usually more than 4 cm long, borne well above the leaves; lower leaves narrowed and tapering towards the base; pedicels of the pedicelled spikelets ± 1 mm long

I. jayachandrann

4. Racemes usually rarely more than 3.5 cm long, the lower part partly enclosed by sheathing leaves; lower leaves rounded or shallowly cordate at the base; pedicels of the pedicelled spikelets 3-5 mm long

2. Margins of lower glume of the sessile spikelet narrowly and evenly interned from base to apex

5. Lower glumes of the sessile spikelets with white silky hairs, ± flat and almost smooth or with obscure nodules and furrows *Lmolle*

5. Lower glumes of the sessile spikelets glabrous, curved with distinct nodules along the lower margins

6. Lower glumes of the sessile spikelets hardened below with sharply denned lateral furrows and ridges, pedicelled spikelets reduced, without flowers, lower leaf blades narrowed and tapered at the base

6. Lower glumes of the sessile spikelets leathery below with obscure lateral furrows and ridges; pedicelled spikelets well-developed and fertile; lower leaf blades rounded or shallowly cordate at the base

7. Racemes 8-15 cm long; sessile spikelets usually without awns; lower glume of the pedicelled spikelet broadly winged on 1 margin

I. travancoretise

7. Racemes 5-8 cm long; sessile spikelets usually with awns; lower glume of the pedicelled spikelet narrowly winged on 1 margin *I. vembnademe*

Ischaemum indicum (Houttuyn) Merrill [*I. n. var. prorepens* Hackel, *I. indicum* var. *walltchn* (Hackel) Bor, *I. m. t. v. a. r. longtpilum* Hackel, *I. aristetewautt* Ind non Linnaeus, *I. dliare* Retzius; *Andropogon malacophyllus* Hochstetter ex Steudel, *Spodiopogon scrobiculatus* Nees ex Steudel, 5. wtonuNees]: Fig. 307

Culms tufted or creeping and rooting below, (10-) 20-80 (-100) cm tall; nodes glabrous or hairy. Leaf blades linear to lanceolate, (0.5-) 5-8 (-25) cm long, 2-8 (-15) mm wide, glabrous or hairy, at the base rounded or narrowed or toward the base of the culm usually developing a pseudopetiole, acute at tip.

Racemes (1) 2 (3), (1) 1 st a rm lfiTcr Sessile spikelets ovate-oblong, 3-6 mm long, distinctly awned; lower glume nowei inmv, upper flower bisexual; lower glume oblong or ovate-oblong, 4-5.5 mm long, notched or acuminate at the tip, somewhat leathery below, paper-like above, faintly 5- to 9-nerved, the upper half broadly winged on both sides, the wings simple or ear-

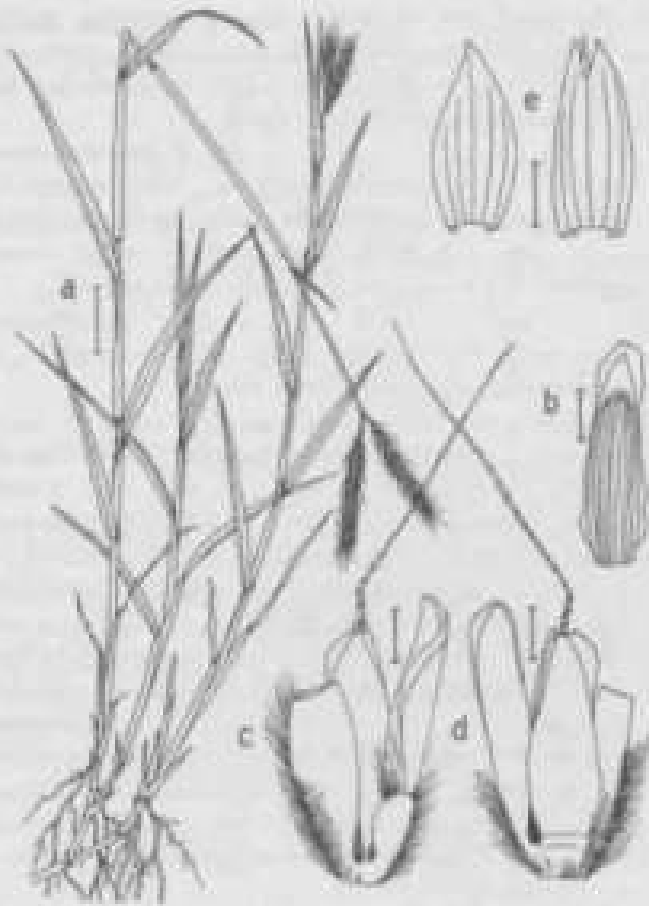


Fig. 307. *Ischaemum huacum*: a. flowering plant (2 cm); b. lower glume of spikelet; c. spikelet viewed from outer side (11 mm); d. spikelet viewed from inner side (11 mm). *I. jayaektindwii*: r, lemmas, **ter** **irithoin** ami, right with rudimentary awn (2 mm).

... margins ribbed below the wings; upper glume boat-shaped, 4-3 mm long, acute at tip or **terminating** in a 1-2 mm long awn, paper-like. 3- or **feathered**, keeled, on the back; lemma of the **lower** **Oerei** ovate-lanceolate, 3.5-4 mm long, paper-like, obscurely 3-**OCTWd**, glabrous; palea diphys, 3-3.5 mm long; lemma of the upper flower **B.f**-4 mm long, notched at tip with awn, the awn 8-15 mm long. Pedicelled spikelet ovoid, 4-5 mm, lower **glume** **ovate-lanceolate**, 2-3 mm long, winged on margin, densely hairy on the upper half; upper glume milky **Moral** **pa**11- **like** **ih**nT in **ICSSUI** **ipikeb** I.

Annual or perennial. **NOL** confined to wetlands but often common in places subjected to seasonal **flooding**, in rice fields and along ditches and canals. It is variable in habit and hairiness, several intraspecific taxa have been described; some of which may be confined to wetlands.

KG) Hell. S and **SE** Asia. **Introduced** **talp** **America**: Ban. Bur, Cey, Ind: An, As, G, Co, Kl, Kt, **Mh**, **Mp**, Tp.

Ischaemum jayachandranii R. Ansari, V. S- **Rama**-**chan**4**ran** el P. V. Sreekumar: Fig. 807

In habit like *I. indiam* spikelets sessile or awnless and concealed within the spikelet; lower glume of the sessile spikelets finely 2- or 3-ribbed with narrow turned margins; pedicels of the pedicelled spikelets 1 mm long.

Perennial. Found in moist places and rice fields. **Helj**. **Rnderak** **10 SE India**; **•** **ud**: **EQ** (Kannur District).

Ischaemum motile, D. I looker: refer to Fig. 309

like *I. rupestris* but usually more minutely; leaves **pseudopetiolate**, the base of the blade shallowly cordate; lower glume of the sessile spikelets densely covered with long white hairs. **DfidsMto** furrows obscure.

Perennial In marshes often forming stands.

[Hcl]- **Endemic** in India and **Pakistan**: *Ind, **•** **Pak**, G, Kl, **Bl**, **Mh**, **Mp**?

Ischaemum muticum L. in **m**iaeus (- **rt** **tem** **Roxnui** **g**11 Fig. 308

In habit like *I. vulgare* but racemes usually **rarely** **more** **th** **8.5** cm long, the lower part finely **ly** **the** **Acathing** [leaves: lower leaves rounded or shallowly cordate at the base; spikelets without awns. **pedicels** of the **pedicelled** **Bpftd** **3** **8** mm long-

Stoloniferous perennial. Not confined to wetlands but often in standing water around pools seasonally flooded and marshy places, occasionally **Rowitiff** **Qoating**. **Collected** **Bar** (odd in Sri Lanka; it has been called *I. muticum* **vac.** **Uavtdse**.

(Hcl (Hyp/Pie) |. Tropical to subtropical Old and Pacific islands; Bur, Cey, Ind: KJ, Ki.

Ischaemum nilagiricum I. in **kel**: Fig. 308

In habit like *I. autium* but racemes paniculate. **Hi** (-16), **each** 2-10 cm long, clothed with **hairs**; leaf blades elliptic, 5-20 cm long, 5-35 mm wide; lower glume of the sessile spikelets narrow winged, **densely** hairy.

Perennial. Semi-aquatic, found in shallow water around lakes and ponds sometimes trailing the **BUT&Cf**; also found in cracks by running water.

[Hcl]/Hyp/(Pie)]. Endemic to S India: **•** **i** **«** **d**: **Kli** **Tn**.



ttc St>8, brhatmtm mutmtm: >, flowering culm (1 cm); >>. mjkd< pair (5 nun). I **•<*><< c< n<<™B cuim l• mi: d. pedkeUed jplkelet (1 mm).

Isthaemtiuj ntgom Salisbury: Kig. 3
 Cutew tufted or asepfog anil rooting below. 20-40 cjn ul| nodesgtabfODS or hairy. l*«i lfctfk*linear * hmceoiat*, 4-15 cm long, Mi mm W*fe at ihf •*** narrowed and tapering, ;«*»' u up. R*cem« (1)2 (3). 3-8 cm long. Sessile spik«fe» frtfeoUoiiy, 4rB mm !oafc dittincOy owned; Iow« Sflwet mai^ til>i>f Bower btoewnalj lower ghmw obkmgJaiimitett, 4.5-5 mm long, becoming hard and »hcD-Hke wiih prommem sitk-nodules connected by wdtt-deflned ridges aAd IUITOWS, l:- or 15^ien'cd; upper ghinir boat-shaped, 4-6 nim hant somewhat leathery, 3- or 5-netved. keeled oa H*-back; lemma of tlir IOWtf Nort'i oWtW|fbneeo>te, *^ mm long, paper-lite, obscurely S^ieni'd. Bl<kn>u< Paiea tlliptital-Janreoh^ 3-3.5 mm long; lemma -H the uppt-r Fknvcf 3-4 nim Irtgn notched at tip. with awn. me awn 8-12 mm Jonp. fedfceDed Bpflsdei obakmg, 4-* 'im- with out an awn; pediceb ± I tam lon^, lower ^luimr oblon^, 4.5-5 mm long, hmdencrt. broadly or narrowly winged on I margin 11- io 15-nci-vrrl; upper ghmw e ajid other floral parts lite daO« in M>ile spflselM.
 Annual or ptrennial. It is flOI ((nifinfd to WCllflJdl bur is common in wet {daces and found as a weed in "« fields, sometimes it grtrtw to itanding water. It » very varttde in form, h is e**en by cattle when young. The grains arc eaten in timers of start iiv.

!{.©) Hel(Hyp)). S and SE Asia: Gey, Ind. Ncp. Pak: An, Gj. Go. Hp. KJ. Ki. Mh, Mp. Pl. Rj, Tn. Tp. Up, Wl).

hduwmum frWWKXJPWwStapfeB Fisrher: Kig. 506
 Like /. r^gDWu) bui racemta 8-15 cm Utt^i leaf blades up to 30 cm iong; sessile spik^ltis usually Whhotll awns; w-'ssilf spikrleLt usually will, awns; lower -lunie of thf sessile spikdet noi or vrr>- narrowly winged OH 1 margin ai the lip, marginal nodules mostly joined by shsliow Rnd irregular ttanwerae ridge*; lower ghupe of lthe pedlerfled spikeleis wnh i broad and I nattwwmg.

IV-rennial. Grows along smi.mis. canals and bac"kwaiers. also >> niiiifshy [lu - [Hrl|. Endemic toS Indin: •Inri: K). Mh.

Pte. 809
 Like /. WavmcarmsA btff radBmo "i-S cm long: leal bbdes up to 12 cm long; sessile spikcleis nsnallv with awns: Idwef ghmw of flir pedircllwl spikclcl narnwlv winged on 1 margin.

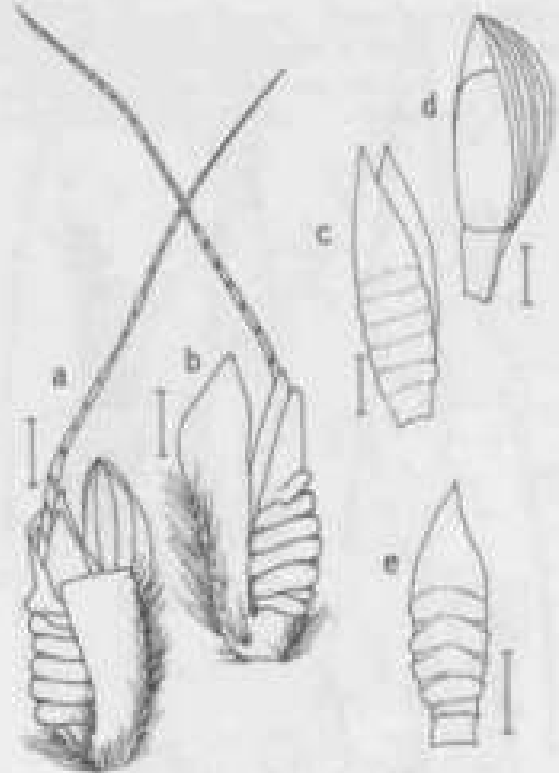


FIG. 309. *Isthaamum rvgwum*: a. spikelet viewed from uiliis side (1 mm); b» *pikclct viewed frnn tin- outer si 0 mm). / MuirtiffonrWM: c4 si.ssilf ^ikrlecl (1 mm); d, pwli celled spjktlet (1 mm). /. vokbinuutow, e, ulumc of iw apiklet {2mm).

Perennial. Grows along backwaters. Perhaps no more than an ecotype of *I. travananrn.se*.

Endemic to SW India »Ind: KJ.

Lectrisia 18 species: tropical and warm regions of the world

Excluded: *Lectrisia hachalii* Keng [*L. oryzoides* (L.) Ind., non (Linnaeus) Swartz]; a wetland species from the NW Himalayas.

Lectrisia hvxandra Sw. n. v. Fig. 510

Siokini'crous. Culms ascending, 25-150 cm long or shorter when floating in water; nodes swollen, stiff-like, hairy. Ligules membranous, 4-9 mm long; leaf blades linear-lanceolate to lanceolate > 1/2 (-30) cm long, 2-6 (-12) mm wide. Inflorescence a lax panicle, 3-12 cm long, with numerous branches. Spikelets 1-flowered, strongly flattened laterally, 3-4.3 mm long, yellowish-green, awnless, sessile or nearly so. Pedicels not jointed, disarticulating below the glumes. Glumes reduced to an entire or 2-lobed and somewhat thickened rim. Lemmas all fertile, oblong, 3-4 mm long, leathery, 5-nerved, pale linear-oblong 2-3 mm long, 3-nerved, the edges clasping the introverted margins.



FIG. 510. *Lectrisia hrvandra*: A, flowering plant (3 cm); B, spikelet; C, lower part (2 cm).

the lemma. Stamens 6 or sometimes less. Gynoecium 10-15 cm long laterally flattened.

Panicle common and widespread. found in floating on water, in pools, streams and ditches. also in marshes and rice fields. It is used as fodder and sometimes considered to be a weed in drainage ditches and rice fields, The distribution is difficult, the most characteristic is the absence of sterile lemmas in *Lectrisia*.

Distribution: Pantropic: Ban, Bur, Gf, M, Mp, Kl, Kt, Mn, Mp, Rj, Tn, Wb.

Uplandia (excluding *Diplazium*): 40 species: tropical and subtropical regions, most in New World

Excluded: sometimes found in damp or periodically flooded places but not wetland species: *Uplandia panicea* (Retz.) Ohwi [*L. javanica* (L.) Ind-fj. G. König] Roemer et al. *Uplandia*; *L. javanica* (L.) Richard.

Uplandia chinensis (Linnaeus) Nees [*L. capillaris* Palisot de Beauvois]: Fig. 511

Culms usually erect, 10-150 cm tall « floating, smooth, hollow, leafy. Ligule a (ringed) membrane, 3-2 mm long; leaf blades linear 5-20 (-50) cm long, 5-7 (-10) mm wide, rounded at the base, acuminate at the tip. Inflorescence a panicle, 10-10 (-60) cm long, composed of numerous slender, spike-like racemes (rachis visible over the whole length « on side). Spikelets 1- to 2-flowered (mostly 5), oblong, (-7) mm long, laterally flattened, purple, disarticulating above the glumes and between the florets. Florets usually flattened. Glumes unequal to subequal, oblong-lanceolate to oblong, (the lower 0.5-1 cm long, the upper 1-2.5 cm long), papery, 1-nerved, acute or 3-nerved apex, usually shorter than the lemma. Lemmas 1.3-2.7 mm long, 5-nerved, the nerves 1-nerved, pubescent, keeled on back. Palea oblong, 1-1.5 mm long. Seeded, 2-nerved. Stamens 2 or 3. Caryopses ellipsoid or obovoid, 1.1-1.2 mm long.

Annual or perhaps also perennial in permanent water. Not confined to wetlands (often found in shallow water around pools, in marshes and in rice fields). In aquatic habitats it is often luxuriant. It makes excellent fodder.

Distribution: (0)1 He/Uyp/Plt: S and SE Asia: Ban, Bur, Cey, Ind, Nep?; Ap. H, KJ, Kt, Mp, Tn, Wb. 0-1000 m.

Uplandia: 1 species

Uplandia meboldii (C. t. C. Fischer) C. F. Hubbard Fig. »12

Culms delicate, erect, submerged or partly floating up to (50 cm or more) long, usually leafless under water. Leaf sheaths 8-20 mm long, longer at the upper part.



FIG 311. *Ispidocarpus cymosus* B. & H. (5 cm);
 a. culm (0.5 mm); c. two panicles (1 mm)

«*cs. the margins free: tigiilc a fringe of hairs, up to 0.5 mm long; leaf blades narrowly triangular. 4-18 mm long up to 2.5 mm wide, reflexed on emergent part of the culm. Inflorescence a unilateral, spike-like raceme, 1-3 cm long, arising from the uppermost leaf sheath. Spikelets paired, the lower sessile and the other pedicellate. Spikelets 3-4 mm long, 2-flowered: Achillae flattened and hollowed on one side. Anthers above the stamens and between the florets. Hairs 2, 2-3.5 mm long. Glumes 2, 2-3.5 mm long. Lower glume 2-lobed; the upper glume obovate to oblong. Ligule of lower glume as long as the pedicel, membranous, unilobed. Lower glume 2-keeled; lemma of the upper floret densely and minutely pubescent, obscurely 5-nerved. Lower glume shorter than the upper one. Palea similar to the lemma. Caryopses ± 1, 1.5 mm long, convex, enclosed between the lemma and palea.

Annual or perhaps sometimes perennial. It grows bottom-rooted and (floating in coastal bays) the leaves are somewhat brackish after the monsoon. Sometimes locally dominant. The leaves are submerged leaving long string-like arms trailing in the water. The culms are very hard and nut-

like: the culms and are probably dispersed by water but it could also be spread by aquatic animals.

(0) Eph/Hyp. Endemic to coastal SW India: * [nd: Kt. Kt. Sea level.

Oryza. 2nd species: tropical to warm regions of the world. Annual or perennial with rhizomes or stolons. Culms emergent and creeping, rarely more than 2 m long or floating and up to 6 m long. Leaf sheaths ± terete, with transverse veins; ligule membranous, 2-keeled; leaf blades linear to narrowly lanceolate. Inflorescence a panicle. Spikelets pedicellate, disarticulating above the glumes (usually reduced to sterile lemmas, the upper one bisexual). Glumes small and blade-like or reduced to a 2-lobed rim. Sterile lemmas usually differing in shape, either scale-like or linear to ovate, mostly shorter than the fertile lemma; fertile lemma 2-keeled, prominently nerved, clasping the lateral nerves of the palea, apices usually prolonged into a long awn. Palea as long as but narrower than the fertile lemma, 2-keeled, prominently nerved. Stamens 6. Caryopses enclosed within lemma and palea.

Humid forests and swamps. Juveniles of some are submerged, the adults emergent, floating or terrestrial. Some are autogamous. Caryopses dispersed by animals and perhaps also water. *Oryza sativa* (rice) is the most

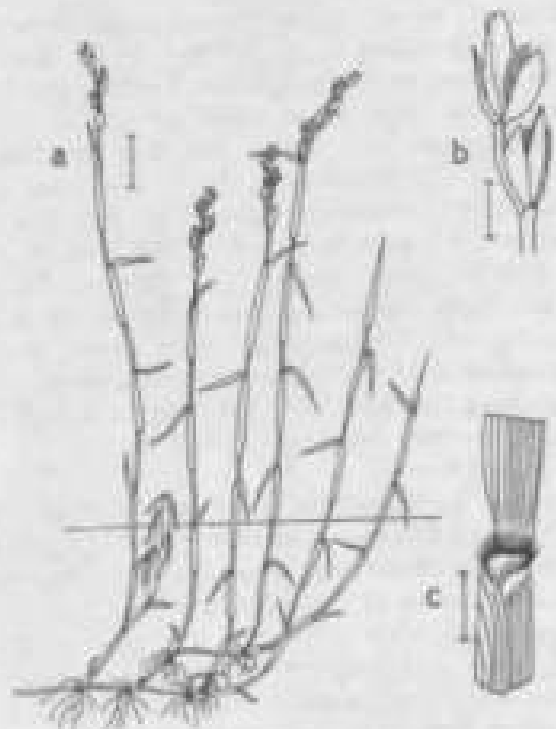


FIG 312. *Lemnopsis subulata* (L.) B. & H. (2 cm);
 a. submerged and stalked spikelets (2 DW); c. ligule (1 mm)

important **crop** plant of the world; it has been in cultivation for at kasi 3WX years, there is evidence that the twi» major races from tropical India and mol-tolerant NE Asia, were domesticated independently. The domesticated *O. glabfrivw* probably amse in Africa. Sonic wild species of rice arc very troublesome weed* especially in rice fields. Duistermaai, H., A revision of (*hszti* in Mak-sia and **Australasia**. BLumea 32: 157-193 (1987); Oka, JL-1. Origin of **cultivated** rice. Developments in Crop Science. 14: 1-25-1 (10S8).

Excluded: not found in wetlands: *Oryza eichingeri* A. Peter [*O. activavar. tallina Tritiwu*]; *O. meyeriana* (Zollinger et MoritfJ) Baillon var. *granutata* (Necs ci Arnolt e* U.iin l)ui<i<-tmaat 10, *gmnuliitu* N'ers ci Arnott ex Wall, *O. fiiiformis* F. Hamilton, rO. j^*parensis* **Govindaswaisy *M Krithnammthyi O. inddndamaniai** Ellis]; O- mi'jjuto |. S. **Pftd ffit C**, B- FtcsI [*O. Ofirirwiis* Wallich ex Watt, *O. matampydiaensis* Krlshri^swarmi et (Ihundrastkharan j; *O. rhizomatis* D. J\ Vaughan: •(-<^, **Bdr** (1960) cites **several introduced** species whii:li I have not bpen able to reconfirm.

- 1. Anihers (3.5-) 4-6."2. IUM long, ycllmv or brown; sjjikflns ficiduoviN **whetl** ript.-. rlisartiLul;iting ahovr the ;^lLimi-v *O. rnfifrogtm*
- 1. Anthers 0.8-2 (-2-5) mm lonp. whitt or yellow; **pef-** sising when X\K *O. ~~indica~~*

Oryza ntfipognn (Griffith [*O. Aiifua*J. G. Konig ex Trinitut. (.), (*Wfiuititri*Rasdirvii/J: Fi^ 31^

lulled or stolon ife rou A. Culms decumbent and fioadng or ascending to **Cpect**, (30-> 70-90 (330) cm lung, branching and rooting below. *Ijcw*i sheaths often **Inflated beiw**, tight above; ligtkk iriangutar to narrowh **tmngular**, ^t-25 (-45) mm long; leaf blades linear. (IO-) 27-6(1 cm long, 7-15 (-25) mm wid<\ Panicles loosely **contracted**, up to 30 cm long. Spikelets oblong lo obovare-oblong, 6-IL5 mm long, deciduous, disarticulating above the glumes. **Glume*** ±0.3 mm long. Sterile **leitmaa** triangubr to linear-lanccobtt.; I2!>-7.5 mm long. Fertile lemma obovate to lanceolate, 7-1 I turn long; awn very variable, up i" HO mm lony. Antliers (3.5-) 4-4i.2 mm long, yellow or brown. Caryopses oblong, cylindrical, "t.2-6.1 mm long, **reddish-brown**.

Perennial or **RbnuaL** In water emergent or sometimes forming floating **BUta 01** tercsirial in **marshes** or jeasonallj immdaicd **places**, alsig along water courses. **Common in rice Beldfi** when it iv a seriom weed, **Hybrids with** cultii-atcd rice ure **sometime!** found, Some **boUpitfs** recognize it as a variety Od *O. sativa*. It Is sonitiimes collected lor fodder.

[{G} Hyp/Eph/Hd/(PU')]. **Wtani** to tropical regions of iht world, ol ~~...~~ **native** to Asia: Ban, Bur,

Cey. Ind. Nep: Ai. Kl, Kl. Mli. Mti. Mp, Rj, Up, Wt. (t * much more widtsprt-ad than my cited di^tribution - I have not been able to confirm more records.

Oryza satitnt Linnaeus [*O. nivam* Shanna et Shany]: Fig. 313

luffed, without stolons, Culms erect lo ascending- (30-) 50-150 (190) cm Jong, rooting **below- ^ sheathj often inflated befcw**, n'uhi iibove; ligulf^{ova(C"} lanceolate to **linear-lanceolate**. (6-> 10-40 mm l^{onK} leal' bla<les linear. 20^60 cm long, 7-22 mm w4<- Panicles loose, up to 30 cm long. Spikelets oblonR^{rt>} nblfjiiK-Litur.>].ik. f>-12 mm long, persisiing- <'li^{llHs} ± QS mm long. Sterile lemmas ovale-oblong lo "wate- lemma- riable. long- mii lanceolate. 1.5-4 (-10) mm long. Fertile-oblong to lanceolate, 6-11 mm long: awn very v **Up tp 150 mm long**. Anthers 0.3-2 (-2.3) **mm** white or yellow. Carjopses oblong, cylindrical. &-8 long, whitish*yeH(jw. **brown** tp reil<li.sh-biown,

Annual or rarely perennial. **Widely** cultivated. <>' * sionally (ls<:aping and found in a wide varied 0 wetland liabkats. There arc numerous races in ^{cultiva}



Frn. 313. (*hya* lofipw: a, (lowering plant (U n<): "• p^{lelet} (1 mm). *O. rufifngoti*: c. liguk (5 mm); U, flower (1 mm)-

lion. Rk-e or paddy is thought SO baa
 in ASILU Independently in (IKU3 IU1d China from
 0. *rufipagm* and in Africa from 0. *ghbemba*
 1© (O) Hd/Ephl. Cultivated in warm u>
 regions of the world: probably ilirntfhoui
 i circlv collected or recorded

Panicum: ± 470 specie*: cosmopolitan except in cold
 regions

Tufted, jtoknrifemw ©* rhizomatous. Leaf blades
 cuneate or parallel, ne*ef amplexicaul at the base;
 ligiik-s mcmbranoi* or eflia*; I«J * I
 S0m«iro« infilled. Inllorcsence AH open or r osco
 pn,,icl. AH spftdcte pecfiedfle* iHgb* Battened aU-v
 iaUy. dUartkulating bi-lcm rbe glumes, ^- <v w
 I-Mowtreu, atmka: ihe lower floret usually reduced
 a tferile le«mw iht upper Horet tee*** L
 glume osualtv mtieh shorter than the upper
 fim« reduced or absent; uppn- glume mostly equal io
 the u-rill- It-mniit and ik<v U. ** rtm usually on -
 plectcty ,nr'c>s, nK tttt Lyrtdic Horrt. LV, Lik
 Caryopses enclosed between the hardened lemma and
 palea, globose to ellipaoidal

Annual or per«ttS Srp
 «cm, often cSwrfag n-buvt-ly large areas; wma
 •Briou*weeds m aquatic sys»«ms.

Excluded: found In mo.SI or damp sUuai.u.is b.i noi
 wetland species: *Panicum aurtum* P.,sl [St aJ* *
 »ito (l',vsl) A. Cam»»l5 ^- <IW*««'''O'''
P. K«fa«'n,unbrjp PjohmiS. M
P. trypharum Schultes
 Steudel].

L Tufted anmu); lower gUuues broadly ovate, apex
 acute; spikdeta purple to rc<l-pmpU- R
 1. Stolonoituous perennial; kofwer filLimr
 apex truncate; spikelcts yellowish or green, ai most
 tin god wuh purple

1. Culms spongy at Lhc base: stolons not fefegttUrty
 thickened, rarely pi-itrU-ating the substrate: lower
 glumes without nc-m's; usually developing gnmis
P. patudaswn

2. Culms not spongy; stolons irregularly thickened,
 deeply penetrating die substrate: fewer glumes J1W
 1 or 3 ('aim mrvt-s; usually HOC developing grams
P. repenx

tomintm paiudaum Rosbillgh [P. fUttans]. G. Konigcx
 Trinius. R *prvtifmim* leftisuj. D. Hooker nun l^marck]:
 Fig. 314

Like R rt/WMA but aquauc or suljaquatic- with lower
 par; or culms creeping, Molort-Hkc. spongy and inflated.

5^100 an long; teaNbfll** s l ^ <>> s or p^1*^ at die
 im ,ntb onW teaf btodes flat, bright green: epikdets nar-
 mwlv taaceotofrdlipoid, MJi mm bog, appread to
 the bntntbes; lower gluroe wilhoui nnv,;s; lemma of
 lower fluid sterile: <3Xyop&* 1-^2 nun long.

IVi rmuU OT annual. A gregai-ious and vigorous grass
 found giMriiR •" «««««. II " « w in lhc " " ^ ^ or
 farms £>ti>g W« on th« mrfea. it is rc<% eaten
 by buffale.

Tropical Asia and
 (©) ^: Su, Bur? Gey, tad, Nep? P* Go. Hp, Kt,
 Kt. Mp, B, R, Sk, To, Up.

Panicum p...m Tnnim | *P. ... Retzius* var.
*g... Rn/ius. ft <*gB«««i* Roxburgh tx Steudel]:
 Fig. 314

Tufted- Culm* leafy, cret and rooting below,
 15-10 cm tall, ligules short, nu-mbratioTts. ± 0J mm
 high- leal' blades lanceolate to Nnr.u-lanceoiaie, flat or



Re. 314. *Ptmitum* /M/ufofu«K a, inflorescence (3
 bj tower glume (1 mm); t, culm base (3 cm). *P. psilttfM*
 d, UmtT Rlrunu (0.8 mm); e. upper ghxme (1 mm). %
 I, spikict viewed from oppoiite sillo (1 mm): %, rhi/ome

folded, 4-15 cm long, 3-5 mm wide. Inflorescence open, 5-15 cm long, 3-10 cm wide, the branches spreading. Spikelets ovate to oblong, 2-3 mm long, usually purple or purple-red. Lower glume ovate to orbicular, ± 1 mm long, obtuse, with 5 faint nerves; upper glume as long as the spikelet, 11-nerved. Lemma of lower floret resembling the upper glume, its palea well-developed or absent; lemma of upper floret broadly ovate, ± 2 mm long, smooth and shining, hardened. Caryopses ovoid to globose, ± 1.5 mm long.

Annual or perennial. Not confined to wetlands but frequently found in marshes, along water courses and in seasonally inundated places.

{(O) Hel}. S and SE Asia: Bur, Cey, Ind, Pak: <Go, Kt, Mp, Pj, Rj, Tn.

Panicum repens Linnaeus: Fig. 314

Rhizomes deeply buried (up to 40 cm), white, here and there forming irregularly thickened parts from which new shoots arise. Culms leafy, erect and rooting below, 30-100 cm tall, with a large central cavity, the wall with many lacunae. Leaf sheaths hairy along the free margins; ligules short, membranous, 0.5 mm high, the upper margin white hairy; leaf blades linear, usually folded or inrolled, 4-30 cm long, 3-15 mm wide, blue-green {white waxy bloom}, long white hairs behind the ligule otherwise almost glabrous, rounded at the base, acute at the tip, the midrib prominent and keeled. Inflorescence ovate to oblong in outline, 5-30 cm long, the branches ascending. Spikelets ovoid to oblong, 2.5-3.25 mm long, pale green to pale yellow, often with a purple tinge, glabrous, acute. Lower glume oblong-ovate, ± 0.8 mm long, with depressed top, with 1 or 3 faint nerves; upper glume as long as the spikelet, 7- or 9-nerved. Lemma of lower floret resembling the upper glume, its palea well-developed or absent; lemma of upper floret smooth and shining, hardened, mucronatulate. Stamens and stigmas not exerted from the spikelet. Caryopses very rarely developing.

Perennial. It is not confined to wetlands but is often found in temporarily inundated places (it cannot withstand permanent flooding). It sometimes forms mats floating on the surface. Even in its native range it rarely develops caryopses. It is a serious weed in plantations and upland rice fields. Because of the deeply buried rhizomes it is difficult to eradicate. It is often called 'ginger grass' (the rhizomes can look a bit like ginger) or in the USA it is called 'torpedo grass' (the rhizomes spread under ground).

{Hel/(Eph/Hyp/Ple)}. Tropical and subtropical regions of both hemispheres, probably originating in Asia: Cey, Ind, <Pak: An, As, Bh, Kl, Kt, Mh, Mn, Mp, Rj, Tn, Wb.

Paspalidium: 40 species: tropics, most in Australia

Rhizomatous or with floating stolons. Ligule a fringe of short hairs; leaf blades linear, up to 30 cm long, up to 10 (-13) mm wide, flat or folded. Inflorescence up to 30 cm long, of short spike-like racemes, these overlapping or distant along a central axis and ending in a 1-2 mm long bristle, bearing the spikelets abaxially in 2 neat rows, each spikelet appressed to a shallow cavity formed by the keel of the rachis and by the disk- or cup-like pedicel. Spikelets sessile, solitary, 2-flowered, up to 3 mm long, awnless, nearly flat abaxially, convex ventrally, disarticulating below the glumes. Lower floret male or sterile, the upper one bisexual. Lower glume abaxial, much shorter than the spikelet, truncate to obtuse; upper glume about as long as the spikelet, 3- to 7-nerved. Lemma of lower floret resembling the upper glume; lemma of upper floret embracing the palea. Caryopses tightly enclosed by hardened lemma and palea, plano-convex.

Few species grow in wetlands. The aquatic and wetland species are perennial; some are found as weeds in rice fields and irrigation channels.

1. Lowest raceme shorter than the internode; leaf blades abruptly obtuse or blunt and sometimes hooded at the tip; spikelets gibbous; inflorescence distinctly exerted over the subtending leaf sheath

P. flavidum Jft

1. Lowest raceme as long or longer than the internode, leaf blades acute, acuminate or setaceous at the tip, spikelets not gibbous; inflorescence scarcely or very shortly exerted over the subtending leaf sheath

2. Upper glume 7-nerved, almost as long as the spikelet; lemma of upper floret with a smooth, dull or shiny, grainy surface; lower floret with stamens

P. geminatum

2. Upper glume 9- or 11-nerved, \pm half as long as the spikelet; lemma of upper floret with a wrinkled surface; lower floret sterile

P. punctatum

Paspalidium flavidum (Retzius) A. Camus: Fig. 3U

Tufted. Culms erect or ascending from a prostrate base, 10-80 (-120) cm long. Ligule hairs up to 1 mm long or sometimes absent; leaf blades 4-18 (-40) cm long, 2-7 (-7) mm wide, abruptly obtuse or blunt and sometimes hooded at the tip. Racemes (3-) 5-8 (-12) cm long, 1-2.5 (-3) cm long, distant by 2-4 times their own length; rachis narrowly winged, the wing 0.5-0.8 mm wide. Spikelets (4-) 15-25, swollen* globose, 2-3 mm long. Lower glume truncate or \pm orbicular, one-third to half the length of the spikelet, upper glume 7-nerved, half to three-quarters as long as the spikelet. Lower floret with a palea, its lemma up to 2.2 mm long, as long as the spikelet, with nerves no

Excluded: found in moist or damp places but not wetland **species:** *Paspalum difatatum* Poiret I'. *aoattem* Nees «K Trinius»; *P. natattm* L'ucgge [P. *uruguayrnse* ArechawileLi]; */*. frikatuJtint Mfchataq P, toviUti* Su-ndcL

I. Inflorescence of 3-15, erect or spreading, spike-like racemes; animal

2.1-eaf bladcs ovate-oblong 10 almost oblong-elliptical; **Spjfcetel** 1-2 mm long *P. amarat*

2. ijeaT blades linr.ir |o lanceolate; spikelets 2-2.3 nun or more long *P. scrobivulatitm*

1. InfloresciMici- of 2, spreading, spikf-lik' racemes, rarely with *n* IV^H below; perennial or sometimes iinnual

S. Spikelets with a fringe of long, tine, white hairs along the margins of llir upper glmiu- *P. amjugatiim*

\$. Spike lets without a Irmgi- of long, line, **white** hairs, glabrous or **pubcftceffl**

4. C>lutries pubescent; {spiketeis 2.5-33 nun long)

P. ttistithim

4, Glutiu-s glabrous

5. Spikctcts 2-2."J nun long *P. sa-obiculatum*

5. Spikelets 2.5—4.5 mm long *P. vaginahtm*

Paspalum canarae Veklkump I'. *comptirJum* aucl. Ind-non Roth, *P. rantiraevaT. fimbriaium* (Bor) Veldkamp;

Fig. 316

g
Cvilsms creeping and rooting below, proa It ate, ascending or rarelj' erect, 10-40 * in lon[^]. **Leafjlieatht** densely or sparsely covered with **taberde-based** hair*; ligules obscure; leaf blades ov;ite*oblonf to oblong* elliptical. lf> cm long: :V-U unit wide, glabrous or with luberde-bascd **hairs**, ibe b;ise slighly **CCffduc** or <lecnricnt. the tipacue **10acuminate**. Riuencies 14-iti. usually spreading, 0.5-2 cm long. Spikclets broadly ovate to ovate-acute. 1-2 mm long. Upper glume ubovaie, 1-1.5 mm long, papery, :Vor 5-nerved, with or without **tuberde-tftied** h^irs. Ixmma of lower flortM hro.ullv ovate, 1—1.75 mm long, papery. **NteEVed; lemma <f upper** floret **broadly** ovate to f>rbkular, 1-t.'2fi ruin long, **hardened**, taitutly 8« or fv-nened, wiih or **Without tubercle-based** hairs. Anthers O.S-O.ii nun long.

Annual or perhaps sometimes perennial. Grows in uplands. It is found lloaiing on **Mate?**, in marshy plates or on *ivct AIKfy* soil. **PtaottS** uiih nt(x>rtltl-h.is,i hiiir* along tin- margins of thr upper **ghnoc** and **lemma** of lower floret have been recognized as var. *fimtiniatum*.

KG) Hel(Eph>|. Endemic to die western Ghais: •LndrMh. Kl. Kt, Mp? Tn.

Paspalum c&njugatum BergiiLs: Fig. 317

Siolons up to 2 m long, flattened, **with internodes** up to 15 an k)Qg,€utatt erect. 20-f>() (-KM)) cm long. **tjfti ibcaths** llartt'ied. glabrous **except** *i the collar and the Frix- **DUfgtBS** which bear some hairs; l;iles

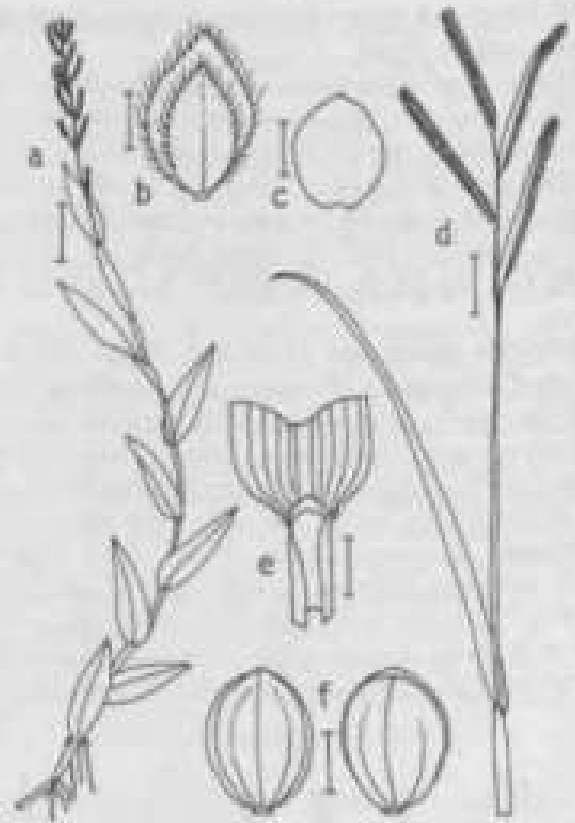


Fig. 316. *Paspalum eaoimn* a. Bowerlng culm, wi* h:i:1S **ondned** fl tmi; b, sjdkcKt sivwing upper j\$one and first lemm.1 id.,; mmi: r, **secoid lemngi** {OS mm), fc **trabula- turn, i**. iiiH.>trs(<mt- [J cm) t'. (igula (fi mm); f. **spikelet** viewed hum **opposdtt tides abaxial** view M Icii < I^m m).

0.4-1.5 mm long; leaf blades linear to lanceolate (4-) S-12 (-25) cm long; 3-15 mm **wide, pubespeDi beW>>>** rhe lignle, glabrous or few **tuberc&baied** h.t>¹⁵. 'the base rounded or narrowed, the rip acute to **acuminate**.

Elacemej g, rarely with i 1^m **bdaw, widely** sP^r **eadng-** each 4-16 cm long, Spikclets broadly ellip- tical to ov^te, (1-) 1.4-1.8 (-2) **nun** long, **couupkuptaty** hairy. **pate** v<lluw-gu-e[i to light brtwn, abruptly •<<»' * Upper **glutue** „^ail- to orbicular, as loti^ **aa tin'** ^P^l*^m let. **wtty** thin, **marginally 2-nerved**, the midrib su ppressed, wSLi itUvrcl-bjiied'hair-i. **Lemma of lower** iloret ovate **to orbicular**, as Ions ;" ilir **ipikclet, paperyi** marginally J-ntTved. tftic fiiirfrifi **luppessed, gJabrou*** lemma of i<PK-r **Roret** ovatt- to orbitular. 1-1.25 mm long, hard- cned, "j-kt't-led. Anthers **0.5-0-6** mm long.

Perennial. **Common and widespread.** H is **confincd** to wetlands but is **frequently found** <<Jl Lltt>> banks of **waW PQWKI** and bark waters.' ill wet^{ld} **small y flooded** depressions, in marries and in llt ^ck psirtii-ulai-ly **IhOM** surrounding rice **Bddfl <H di;ii'>''>>** **plaatatiosu,**

(Hel) Pamropics bin probabiv native to die **New** World: Bur, tley. tnd: Vsh Kl. Kt, Tn.

Paspalum dirticifium Linnaeus [*P. fraxifolodes* (Michaux) Scribn. & Br. aff. mm.]: Fig. :*17

Scolofiferxnu or rhizom:nous, Culms erect, 5-60 cm **tottfr** **Leaf sheaths** keek-d towards the top. **tlit**; collar glabrous; liyulcN **0.6-1.5** mm long; Icill **Edadci** linear (o lanceolate, 3-12 cm long; 2-fi (fiim wide, usually glabrous or **fcometjtici** puheso*nl. ihc **base** lightly lounrltrl arid ciliait\ die up **acute** to acuminate. Racemes 2, rartilv will) a H^h below, appressed or widely **Spreading** and **reflexed**, each 1.5-8 cm long. Spikclcs elliptical HJ ovate. 2.5-3.5 (-4) mm Jong, light **green**, **acute**. **U p r** jrlunu- **broadly ovate** to nlliptcal-lanceolate. ± as luijs ;is die lemma oflowr.r **BofCt**, with slmi I appressed **bain**, **Lemma** **tf** lower Horn t\mo-oblong < <iriUing-t!!lipiit:al, papen¹; lemma of upp<-r liorct **ovate^oblong** <> **dblongrdliptfcail**, *l-2.r> **tarn lw''g**. **hardened**, finimly > i>r 7-nervwl. Amlnis 1.li-1.7 nun long.

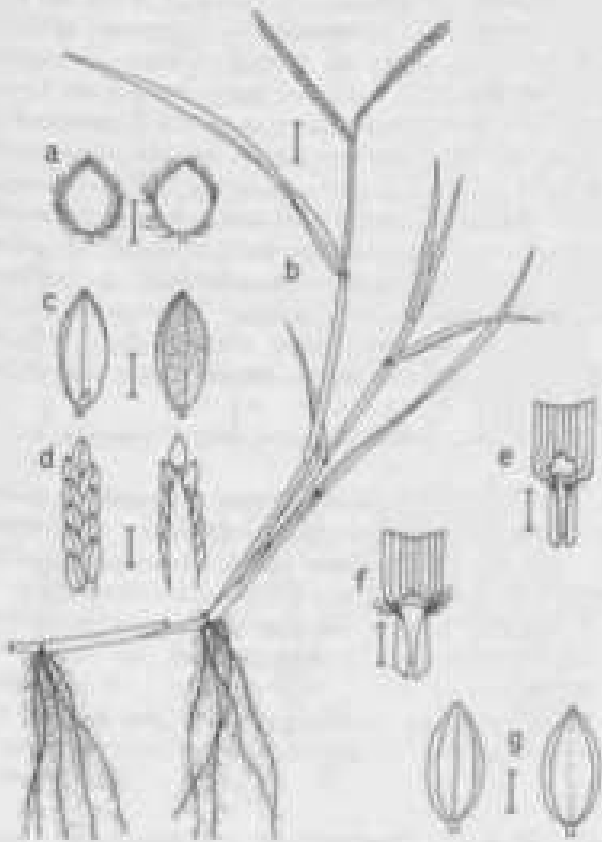


FIG. 317. *Paspalum dirticifium*: J. sfiikrlrt vicVed from Dppo-
 itic sides • jb»xiiiil view rfgtu ddc (I pun). *P. dutukumi*
 • **Hovering CUM** 11 cm); f. spikrlct viewtd from oppmiic
 sl<r* **nbuciaJ** view rijght sidr (I mm); d. raceme viewer
 ^wive and below (5 nun); c. lijjulc {5 mm}. *P. cognatum*
 • **ogwie** (5 mni): g. spikdet viewed (nun **opposite**
 ^oaxial view a> li i (! mm).

Pemwml, Common and **widespread**, **oftaa** forming **large patches**. It is not confined to **wetknd*** ^ur i- usually in vet places, often found in or **Boating on watti**" and in *n* wide **variety** of marshy liibtUits. It is **reported** to be a wt-t-d in **lice BeUb**. In rjhe]>>st it has often bcon run fused with /*. i^'ia/u»i a in ore tropical s]M'dts; mostly in **Coastal region*** iviih nanuwly **ovate-rllypticat** spiki In-, **papery upper glumes** and lemma of **tower** (**latt&** anti gfahrous **Upper** gfurncs.

(Hel). **Tropki** and **njbropfa** otborh h^mispfirt-s; Ban, (lev. Ind. Ni-p, Fak: An. Ap. 01, Up, 1)L. Kl. KI. Mb, Mp, Pj, Rj, Up. Wb.

Paspalum acrobatlattm Linnacis [*P. uniUogniun*], S. F*rsel ct C IJ. Presl, f. *orttirulttir* fi, Foraier, /*. nwn-**mmonf I Lamarck**] * Rg, ^16

t:tilms (lilted, crrci or defiinibrnt at the base, **rooting** nl the Inner txwh's. 10-120 cm long. *ixaX* sluzitlis **slightly** ktlvclfl towards ibr lop, usually jjtahrous bin **sometimes** **pubCKent**; **BguUa** 0.3-1,2 mm long; loaf blades linear to litiu-coliiti:. (i-t &-30 (-40) on **long**; 2-8 (-12) mm widt'. usiulK **glabOOS** or **sometimes** pubescent, the **bane** rounded or shaliowly cordate, the **tip** **acute** io **acuminate**. **Racema** (1) 2-1 (b). ascending to widely **spreading**, rach 1-H (-10) cm long. Sptkdm o^ait- to almost orl.ntul;n. (1.ft-) 2-2-5 (-3) mm long, alive gm'ii lu brown **Of** gluucuii* preen hlenn lied ivitii brrrtvn, Upper glume mate to orbiciitar, ± as long as tin- Inmna of lowrr floret, thin. 3- to 7-n<*rvnl. **Lemma** of Inner **Boret** <t-u<- to tjrbiculate, papery; lemma of upper floret **OVaC**, JJ-2.") mm lori^j. imrticned, **fulitly** S- to 7-nerved. Anibers **1-1.3** mm long.

Perennial or sonic- **mem** annual. Not confined to wetlands but often found in **we**) plates such as in waterlogged **soil** :ilong ihe. margins of tanks and streams, in marshes, Iwkwaiers and rice fields. Some races ar« occasionally **cultivated** for prain.

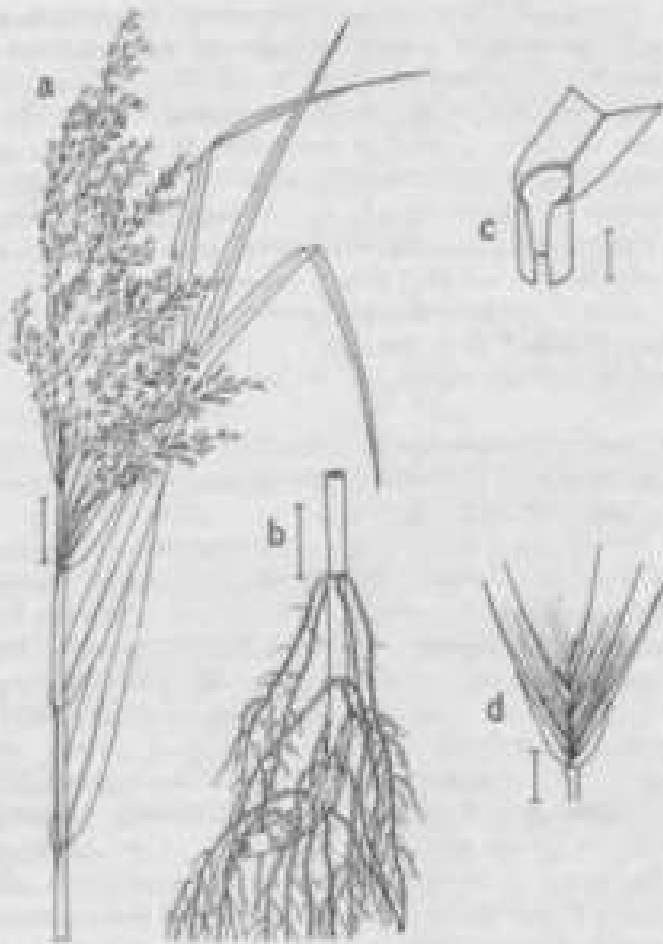
|(O) Hcl]. Old World **tropic***; **Gey**, Ind. Ni-p: *Sc&Mi*, Ap, As, Gj, Go. H]>. Kl, Kt. Mb. Mp. 'ftj, TD, Cp. *Wh*>

Phragmites. 2-4 specie*; cosmopolitan

Excluded: an aquatic and wetland reed^Qfce grass found in iht* Miimihwiis bin not extending into tropical liiiiiin. *Pbrvfpnitn australis* ((;nanilkr) Trinuis ex **Sieudel** [*P. ammunii*Trinuis].

Phragmites vaUatoria (Linnaeus) **VefcOuump** [*P. ktrka* (Retzius) Strudcl, /', *mxima* Bhuter CI **McCana**]: Fig. 318

Perennial rt-ed **With BtaloniferotH** rhizomes. Culms y-"> (-1UJ ni high, [jfiivi-s i.inJim': li^ulc -i vm short membrane fringed with hairs; Ifjaf blades SO-SO rm or more long. 1-4cm **wide**, **glabOUt**, the lower iiffare rough to (he touch, the tips attenuate and stiff.



Fta, S18. *Phragmites* vaUatoria'*. a. inlinrrscenc (20 cm); b. base of culm (20cm); c, JiguJe (1 cm); d, raceme (2 mm).

Inlloiescenre a feathery panicle up to 7i cm long. SpikfleLs solitary, 9-12 mm long, |H-diceUrđ, disarticulating above **the** glumes and between the Horns, awned. subterete. before anihesin becoming laterally **flattened** later. S- to 7f lowered; lowest floret usuall\ sterile or male, upper florets bisexual, Chi rues *J, shorter than the lowest lemma, 3- or fvnen'ed. wıVi acute apex; lower **glumeJUSI** more than half as long as the upper; upper glume narrowly elliptical to very narrowlv elliptical, 4-6 mm long, **Lowennoit** lemmas narrowlv elliptical, 7.!>-12 mm longv awtiless, 3-ncrvcd; upper **^fertile**) lemmas Incoming progressively shorter bin awn tipjx'd, 1- to 3-nrrved, glabrous; rachilla with silky bail's -1-7 mm long. Stamens 2 or 3. Caryopses free, crowned by the stvie base.

Perennial reed. Often very abundant, found in vwauips, in shallow **water** at the margins of lakes, ponds, in and along streams, ditches and irrij'iUion canalv The caryopse* **are** dispersed by wind. Often dontiiiam over large areas. In sianrU it is a good soil binder and ii is n'u-n planted. The young leaves can be used a> ioddci. The old **cubm** art used *tea* [Tiiiu.li-

ing, SCT<n(t, b-AsV.csf paptt and reeds lor musical in»i rumen is, *Phragmilvs* stands art⁴ impariajH retuges for wildlife but in irrigated land it is sometimes & major pcsL Rodewald-Rudf s< uT I, Das Sthillrohr. Ilmi''''!^' **wiwer 27:1^302 (1974)**

It is rather simitar to **Cbe tempera!* spi" *• Pimtgmiiu aufmhl** which diffprs in **baying Ustf** blades smooth on ihe lower surface, with filifuun aitt **Qcxaous** lips: rhachilla hairs 6-10 mm long; u|P*-*# glume 5-9 mm long.

(Hyp/<Eph». Tropical Africa, India. St Asia tBO N Australia: Bur. 0.7, Ind. Pak: An, DK Cio, Hp, &t*J* Kl. Kl. Mn. Mp. Pj, Rj. Tn, Up, Wb.

Pseudoraphis. S spetiex: tropical and E Asia and Australia

Perennial. Ligules nieinbranoiis, short or well-dcveloped. Infloresceiuc ol persistent racemes on a sh^or common axis; die **raceme axis deader**, bearing t-several distant spikcicts, **prolonged at lh<** «Pⁱllio bristle v.w h **extends beyond** the uppermost spikelet. SpikeleLi acunuaie to **awrted**, unn- Of slightly flattened **abaxiaDy**, -1-10 mm long, 24lov, erred. Lower florei sterile or male, Lht- **itpei** Horei bisexual in female. **Lower glume very small, membranous,** nerve-k-ss, with ^|K\ nl it use or appearing bitten oft; u^{pper} glume its long as rhe spikclet, leathcn-. with an^{ac} umir nate or awned apex, usually **icaiu iK** with short brist- like hairs. **Lenuna** of lower **Hotel** slightly **shorter** ^{lian} tlf tipper glume; lemma of upper floret miirh slu'itt*¹ than the lower one, thinly membranous, hyaline* Caryopses linear-oblong m outline, when rip** *I^{nl} *# lltspikelct.

In ditches and shallow pools, usually **gregarious**.

1. U*mma of the lower floret snbacutc; sp 25-4 mm long; inlk>rtr.sccn(T congested **P- mtu** in **I. Lemma** of the lower florei acuminate-*irisia<"" spitelets 4.!)>-10 mm long: inflon-strcur **spreading**
2. Spikelets 7, ^9 (-10) mm long; tip of the axis extending 1-2.5 cm **beyond** iht- uppi' **raceme** sj>ik<llct /¹ b **membranous**
- 2, Splkelcta 4.ft-i.i mm Umgi tiu of (**fee ratftm'** - extending 0-1cm beyond the **Uppermost** spike lei **P. pines**

Psrudaraphis kntnoniatta **Griffith** 1 C-htmanuJilas *('''''*'' <rnx Poirtt var, *bntntmiaita* (**Griffith**) J. D- **Hooker**]- **F5g.S19**

Likt- *P. xphtaans* but lit* tip of the raceme **extending** 1-2.5 cm beyond the uppermost spikelet. •vjiiikdcLs 7.5V-9 (-10) nun long; lower glume oblong- iu<1 -i 7.5-9 (-10) mm long.

Perennial and perhaps also annual. It is usually found floating on water in ditches, ponds and lakes but it may also grow as an emergent in shallow water.

{(©)? Eph/Hyp/Ple}. S and SE Asia: Ban, Bur, Cey? Ind: As, Mn, Mp, Or, Wb.

Pseudomphala mitrata (Mez) Pilger [*Chamaeraphis gracilis* Hackel]: Fig. 319

Like *P. spinescens* but inflorescences congested (dense panicles with small spikelets, reddish-green to deep purple); spikelets 2.5-4 mm long; lemma of the lower floret subacute, without an arista.

Perennial. Plants root at the edge of tanks and lakes and send out culms floating upon the water. It mostly forms large patches. It apparently tolerates brackish water.

{Eph/Hyp/Ple}. SE Asia and the northwestern part of the Indian subcontinent: Ban, Ind: As, Bh, Mg, Wb.

Pseudoraphis spinescens (R. Brown) Vickery [*P. asperaucci* Ind., non (J. G. König) Pilger]: Fig. 319

Stoloniferous. Culms prostrate or floating, ascending to flower, rooting below, 15-30 (-60) cm tall. Leaf sheaths flattened laterally and keeled, tight but becoming loose with age; ligule membranous, ± 1 mm long, collar and orifice glabrous; leaf blades narrowly linear to lanceolate, (1-) 3-6 (-10) cm long, 2-5 mm wide, flat or folded, shortly hispid with tubercle-based hairs on the adaxial surface, rough to the touch. Inflorescences (3-) 6-15 cm long, up to 6 cm wide, with 9-12 lateral racemes, the bristle-like raceme prolongation extending 0-10 mm beyond the uppermost spikelet. Spikelets 4.5-6 mm long, lacking any subtending bristles of any sort. Lower glume broadly oblong, 0.5 mm long and wide, membranous; upper glume long-acuminate and aristate, 4.5-6 (-7) mm long, obscurely nerved. Lemma of lower floret aristate-acuminate, 4-6 mm long; lemma of upper floret 1.5-3 mm long, membranous, nerveless, glabrous, smooth, somewhat folded around its palea. Caryopsis obovate, ± 1 mm long.

Perennial or sometimes annual. A/J abundant and common aquatic grass found in flooded places after the monsoon rains. It roots on the banks of canals and ponds and spreads as a floating mat over the surface. It also grows in marshes and other wet places. It is gregarious and often locally dominant. It can be a troublesome weed in rice fields but is also good fodder. Is very variable; Bor (1960) recognizes 3 varieties.

{(O) Eph/He|}. S and SE Asia and Australia: Bur, Cey, Ind: Go, Kl, Kl, Mh, Mp, Rj, Tn, Wb.

Saccharum [*Erianthus*]: ± 40 poorly defined species: tropics and warm regions

Whalen, M. D. Taxonomy of *Saccharum*. Bailey 23(3): 109-125(1991)

Excluded: *Saccharum ravennae* (Linnaeus) Murray [*Erianthus etyhaulinus*]. D. Hooker]; a wetland species not extending south of the Himalayas.

Saccharum spontaneum Linnaeus: Fig. 320

Rhizomatous, forming clumps. Culms erect, 1-3 m tall, 5-15 mm in diameter, green or white, covered to the* base with persistent leaf sheaths. Leaf sheaths with silky hairs (3-7 mm long) at the auricles and around the ligule; ligules membranous, ovate, 3-8 mm long; leaf blades linear-lanceolate, 30-150 (-200) cm long, 3-15 cm wide, glaucous, serrulate along the margins, with prominent midnerves. Inflorescence a large, feathery panicle, (15-) 40-70 cm long, bearing numerous spreading branches, all invested with silky hairs 2-8 mm long, these very prominent below the inflorescence. Spikelets linear-lanceolate, 3-5 mm long, with



Fig. 319. *Pseudoraphis brunoninna*: a, end of a raceme with 8 spikelets (4 mm). *P. spinescens*: b, flowering culm (2 cm); c, end of a raceme with 3 spikelets (4 mm). *P. minuta*: d, end of a raceme with 2 spikelets (3 mm)-

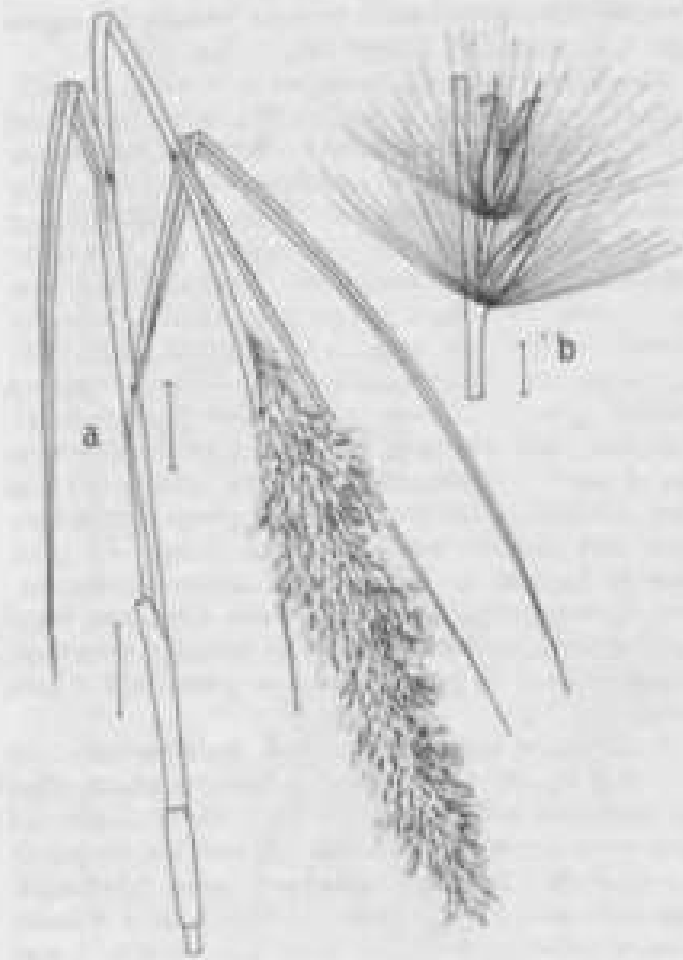


FIG. 320. *Saccharum spontaneum* - a, inflorescence (3 cm); b, spikelet (2 mm).

long silky hairs (8-14 mm long), in pairs, one set on the other part of the pedicel; pedicel of spikelet arises from the pedicel. The pedicel 0.5-3.2 mm long; the sessile spikelet disarticulates with the inferior internode and the pedicel of the pedicel spikelet. with or without awns, 3.5-5.5 mm long, 2-flowered. Lower floret sterile, the upper one bisexual. Lower glumes ovate-lanceolate. 2- or 3-nerved; upper glume 3-5, 1-nerved. Lemma of lower floret up to 4.5 mm long, nerveless or weakly 1-nerved, sometimes almost suppressed; lemma of upper floret strap-shaped, up to 4 mm long, very thin, sometimes almost suppressed. Caryopsis oblong to globose.

Perennial. It is not confined to wetlands but is frequently found in swamps, inundated places, along streams, rivers, banks and ditches. The caryopses are dispersed by wind. It usually forms deeply rooted clumps and is a useful soil binder but can become a serious weed in irrigated systems; it is used for decoration, thatching, making ropes and as fodder. In form it is highly variable. It does not

produce sugar but is used in sugar cane hybrids between it and cultivated sugar cane (*Saccharum officinarum* Linnaeus). It is sometimes found in which might, in part, explain the variability.

It is native to warm regions of the Old World, in the New World, it is cultivated: Burma, Nepal, Pakistan, Afghanistan, Ceylon, Cambodia, Laos, Thailand, India, Java, Sumatra, Philippines, Indonesia, Malaysia, and Australia.

Sacciolepis; 33 species: Tropics and subtropics. most in Africa

It is either submerged or floating and hollow (not spongy), rooting at internodes. Inflorescence 3 spike-like. Spikelets pedicellate 2-flowered, oblong, asymmetric at base, awnless. It readily disarticulates from the base of the glume. Lower glume of male or sterile: upper glume 5-nerved; lower glume 2-nerved. Length of the spikelet, the upper glume as long as the spikelet. Lemma of lower floret similar to the upper glume but almost straight. Lower glume of upper floret shorter, papery slightly at maturity with opaque margins embracing the palea, closed at the apex. Caryopses between hardened lemma and palea but free within.

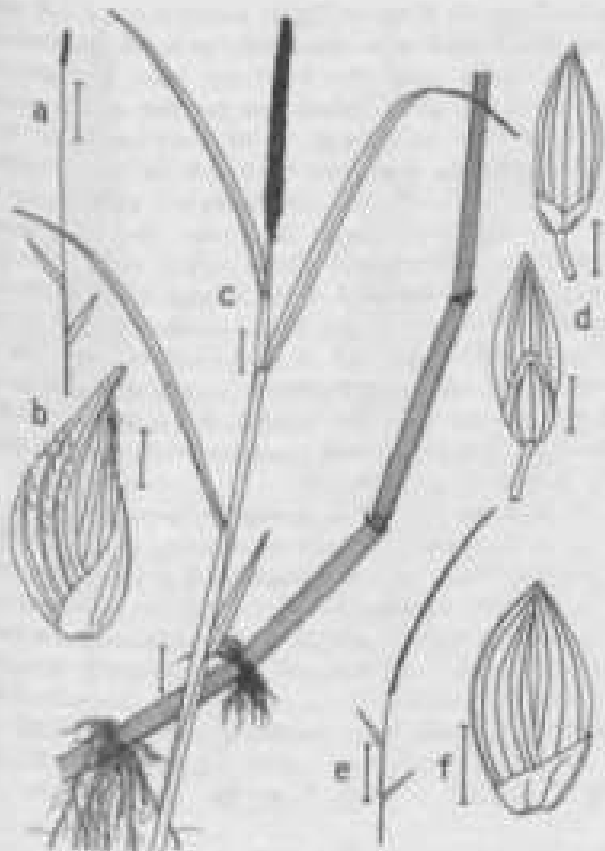
Annual or stoloniferous perennials. The distal parts are hardened and thickened. They are eaten by animals or by water.

Excluded: not wetland species: *Sacciolepis aucta* (Presl) A. Chase [*Panicum autilum* Presl]; *S. interrupta* (L.) Chase.

1. Spike-like panicle continuous, rarely more than 6 cm long; lower glume narrow, never inflated. Spikelet; culms slender, never inflated.
1. Spike-like panicle interrupted, low, mostly less than 1 m long, mostly longer than 1 cm; lower glume shorter than the spikelet; culms slender or inflated.
2. Spikelet (3-) 4-5 mm long; culm inflated, 1 or more times.
2. Spikelets 2-4 mm long; culms slender or inflated.
5.)

Sacciolepis indica (Linnaeus) A. Chase [*S. indicum* var. *intertextum* S. M. Ahneidal: Fig. 321]

Herb. Culms erect or spreading, slender, (5-) 100 cm tall, less than 1 cm thick. Ligules a few millimeters long: lower blades (1-) 1-2 mm long, 1-2 mm wide. Spike-like panicle cylindrical. (8-) cm long, continuous. Spikelets 2.2-4 cm long, glabrous or hairy, green or with a purple line. Lower glume 0.5-2 mm long, more than half as long as spikelet, 7-nerved: upper glume 1.5-3 cm



521. *Saefotipb imtka*: n, flowering culm (10 cm): *lit*:ci (0.5 mm). *S. interrupts*: C, young infltoToncncr booming infmipiod, willi inflated nln>ic in the H>unri PJ <TII: il, spikelet nwd In mi rifip... (1 nun).

*j to 11-nerverL I-emma of lower floret empty. 1-3... R- 5- to 11-nmr.d; icrnna <f upper florei 0,5-1.5, ... as tang as the spikelet, hard and shiny. Andicrs t or deep violei, *tiSt-4*. ~ mm Intifi. (jrynpscs eHip- usually abaxially flattened. ±0.8 mm long,

Annual. Not confined lo wed and <L hut often found in 'naishcs, seasonally Jluodt'd places, banks of rive-rs. often t oinmn in rice tidds but DQ< COO<idered to be *

(O): Mrl|. India, St Asia, Polym^la and Australia. in Africa and America: Gey, Ind, Kepi An. W. Kt, Mp, M/. Tn. L^p, Wb. 0-2100 m.

Sactiolep' intarufHa (Willd<-now) Stapf: Fig- S21 Rhizome .mri Imvrr p.irt ui th*: (llttis Ofcpiug nr g inflated btit hollow, without spang¹ pilh, dually more than 1 cm diick; t uJuu KJ-100 (-150) cm Q^g, t>ft_{en} purpJisiw^ . Ljgulea ortotcatA to atwe, Hun Jong; lifif blades linear to rlliprifal*)jinceo-

lale. 8-20 (-10) cm tong. 3-8 (-20) mm wide, bkiish-grecrn. Sjiikc-liki7 padide 15-30 (-40) cm long, interrupted below. SpUceleti !iiner>K(te-ellipsoid, f5_) +5 mm loTip. pujptiiJi or bluish [rnver (Imtu- titu;idly ovate, ~2 mm long, leu than hall a* lung u the spikcek-i. 3- to 11-nertrd; uppr glumr o*ra4aii(rolirc, 3-5 thin lonp, 9- 6 INicfvrd. IJTITUIU <f town fl, n r empty, lite rbr uppr giumr: Irmnu of uppy-r flurt(- ovate-obkmg. ^-S mm long, hajdcurd. faitiit S-tit-rv il. Anllicrs dark purple. 1-2 nun long. Carvopv* abauu to rlliptiral. abaiuIK iJjttrrd. 2-2 r> nun l<

Inenniril 01 perhap* tomrumtt alw anniw! Partly submcrgt-d Ot Hrunng in fUgnam waicr *Obtm* dominant in recentl) tlr>odrd Und or in bgnofiK uith Miu tusting w&itr Icvafa, *tntnetime* UHIHS* in her n>kb xn< irrigation channel* but not reported tn br .< Ktfooa weed. The inflated *icm* we e*ien In bu!7<ikx-^emer-gent culms uiren giiihirmi lor fodder.

(O)} Hyp., pii i ilr^,, Tropical Asia: *L.cy.* ind, Nep: Go. Kl, Kt.Mfj, Tn.\Vb.

Sactiolep'u trtyosurvittf (R- Rr(iwn) A. QunUK Fij; ;i2I

TudccJ, Culms erect or decumbent, 30-75 (-120) an Cong, less 1ltau i cm thi<-L Ugides tnmaue, 0.5-1 .s nun long, ltilialp; leal blades linear 6 liticur-lantrdlatt. 8-8 (-40) cm long, 2-1 (-ft) nun wide, SpjiLe-likr pi>ii(It (2-) 5-15 i -!!! , ;i long. 5-fi mm thirk. denjefy (lowered, iiaTnm jnii wltip-fitr. iuirrrripieif below. Spikclets olt<d-tibjong to rll}pwv<ufa0obofr. t-j nun lurtg, daricrCOLmwed Loucr gumr ovate, ± hoil/ as long or shorter thiin the sptkelet. S- or Sflerwd; upper ^1 ovate to oratt^<obkmg, [-2 aim tang. 5- to 9-firrvcd. Iemma tif Inwt^t il-irri empty, bkc tbr upper glmni; lemma of *ttflm* il «W rJhptical, ± 1 mm long, harden<l. faintly 5- or 7-nerved, nhining. Anilit-r* purple, ±0.5 mm long. Qirvopscs ovoid, 15-2 mm long.

AjnuKIS. Not ron fined to wrtlands but often found in seasonally inundated places, marches, along water courses and in rke Odds.

[0 Hyp/Hel]_ TropkaJ Asia and Australia: Cw, Ind. Nep: Up. fa, Mp. \Vb.

Sphaerocaryum \Gra\til: I species

Sphaerocarym malaccttur (Triulns) f'ilger [V: *eltgani* (MrudrlJ Necaexj. D. Huuterl: Fig. :?22

Ctiins rufted or spreading, orurn root ing below. creel piirw rarry umre than IS < m high. 1 oil sheath metstly Wmni long, muih "ilmrtei than tbc internodes; ligule a rim of hairs l-l.f> (-2) mm long; leaf blades ovnte-riirdate. 1-2.5 (-5) cm long. (+J 8-13 (20) mm wide, ai hise amplexirau), at apex .Mine, glahrnus or hiiin¹, InUorcscncrc an open panicle, 2-5 (-10) cm long, 1-2,5 tffi wide; ihe *htttgrr* branrtttw with 1-3 glandular bands; pedicels longer than the

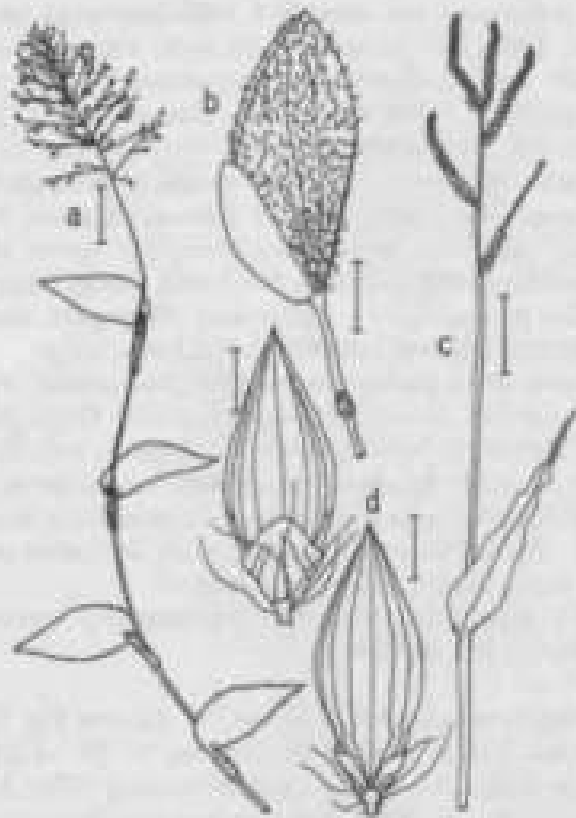


Fig. 322. *Urochloa panicoides* a. Culm (1 cm); b. spikelet (0.25 mm). c. inflorescence (<2 cm); d. spikelet (1 mm).

spikelet*. Spikelets 1-flowered, globose, 0.7-0.9 (1.5) mm long. Glumes subequal, separately deciduous at an early stage, the floret disarticulating at maturity: lower glume thin, less than half as long as the spikelet; upper glume $\frac{1}{2}$ half as long as the spikelet. Lemma and palea alike, 0.7-0.8 mm long, membranous, 1-nerved, pubescent, obtuse. Caryopses \pm 0.6 mm long, with brownish longitudinal stripe*.

Annual. On mud, in swamps or emergent in shallow water around pools and lakes and along streams. In the Flora of British India.]. D. Hooker (1896) mistook it for *Hemipanicum* with the idea that it had probably been under-recorded in India.

(O Hyp/Hel). S and SE Asia: Ban, Bur, Cey, Ind: As, Mg, Mn. 0-1800 m.

Urochloa: 12 species: Old World Tropics, mainly in African savannas

Urochloa panicoides Pott. [*Panicum juvenirum* auct. Ind., non Poiteau, *P. Kotoctaa* Deamack, *U. flummarum* Kuntze, *U. maratti* Hemard, *U. mautthensis* Wimmer Hemard]: Fig. 322

Culms (10-) 20-60 (-75) cm tall, ascending from a creeping base, rooting at lower nodes. Leaf sheaths

hairy along the margin*; ligule a row of hairs 1-2 mm long; leaf blades ovate-lanceolate 60 linear-lanceolate 8-15 cm long, (3-) 8-20 mm wide, glabrous or somewhat hairy, rounded, cordate at tip; inflorescence spreading, 8-10 cm long, of 2-(-12) spike-like racemes, each 1-2 cm long; rachis hardened, narrowly winged. Spikelets solitary or in groups of 2 or 3, borne in 2 rows, 3-5 mm to 1 cm long, glabrous or hairy. Lower glume turned away from the axis and facing the back of the lemma of upper floret; minute (0.3-1 mm long), 3- or 5-nerved; upper glume as long as the spikelet, 5- to 10-nerved. Lemma \approx lower floret \pm like upper glume; keel of upper glume slightly shorter than the spikelet, 2-4 mm long, with a short awn, hardened with transverse ridges. Palea hard like lemma of upper floret.

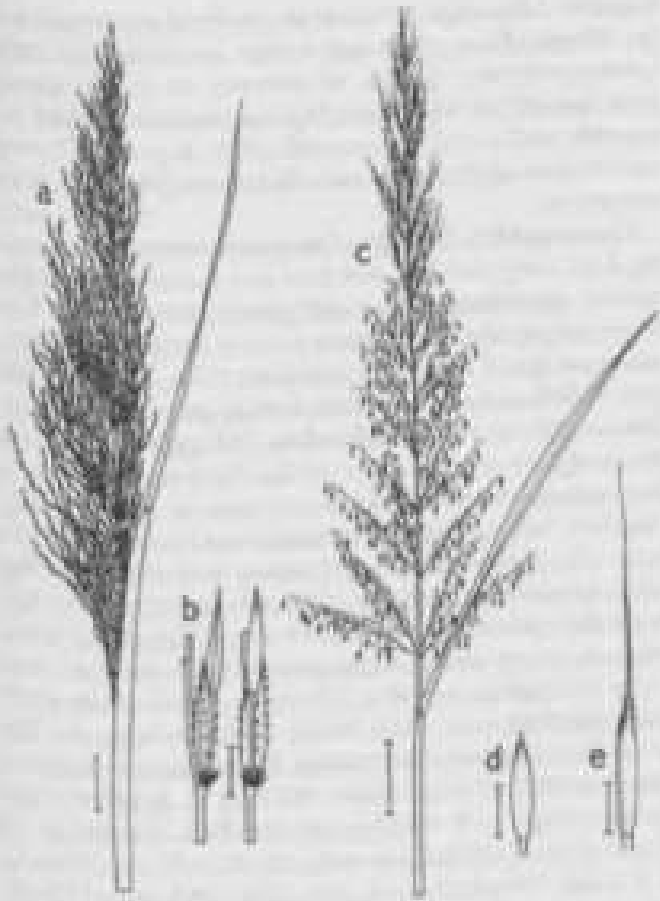
Annual. In rice fields, along ditches and canals in marshy places and on wet sand along the coast. Not confined to wetlands and also found as a weed in cultivated fields. Generally considered to be excellent fodder. It is rather variable and several varieties have been described: see Basaviah T. C. S. Murthy. *Urochloa panicoides* Beauv. (Poaceae in India, Journal of the Bombay Natural History Society 83: (W7-6&) (1986).

[O Hyp/Hel], Tropical Old World: Oy. Intl. Nep: Bh, Oh, Hp, Kl. Mh. Mn, Mp, Pj, Rj, Tn. Up. 0-1500 m.

Urochloa: 10 species: Old World tropics

Urochloa panicoides (Linnaeus) Nash [*Andropogon sylvaticus* Ind., non Linnaeus fil.]: Fig. 323

Rhizomatous hut forming clumps. Culms up to 5 m tall, leaf sheaths glabrous; glumes $\frac{1}{2}$ as long as the lemma, the membrane 0.1-0.4 mm long, 0.2-1.4 mm long; culm sheath 25-30 cm long, 3-15 mm wide, pubescent. Inflorescence a panicle of numerous whorls of simple or rarely branched racemes. Spikelets in pairs; sessile spikelets disarticulating with the pedicel of the lower spikelet and sometimes the inferior internode, 3.6-5 (-7) mm long, flattened laterally, 2-flowered: lower floret upper floret bisexual; lower glume $\frac{1}{2}$ as long as the spikelet, keeled, with numerous upwardly directed awns, 7-nerved, with incurved (not inflexed) upper glume $\frac{1}{2}$ as long as the spikelet, with awns on midnerve only. Lemma of spikelet as long as spikelet, thin membranous, 2- or 5-nerved, lemma of upper floret 2-3 mm long, shorter than the sterile one, 1- or 3-nerved, bearing a 0.4-1.8 mm long awn. Pedicelled spikelet 2.5-1.4 mm long, shorter than the sessile one, 1-flowered, the lower sterile, the upper one usually male: glumes $\frac{1}{2}$ as long as the spikelet; lemma usual unless Caryopses obovate in outline, enclosed in glumes.



*ta. 32S. *Vrihnia* I «*JW»: a, inlloreMenrc (3 cm), b. »pUtt1« pair viewed from opposite sides (I i w n). «"» MIWij e, inflorescence (5 cm); d. malr spikdet (1 mm); c« firmnc spikelet (4 mm).

Perennial. Naturally growing in seasonally inn-
dated places, around Onk* and "points and in di-
Often cultivated u a source of retfver oil, uaw "' I^L-
fiane* The aromatic roois an- woven into **matt, rup,**
&na and **icrteni (kna*klt*** or tatties) which when
wetted cmii meet frapantt. The caryopses arc proba-
 bly **dlipcEKd** h¹ aniin;ils.

[Hell. Tropical Asia and **Africa Bur, Cey. Ind, I «=**
Ap. ni, <to. Kl Kt <Mh. Mp, Rj. I ii. Up, Wb.

Vrihnia: 1 species

Vrihnia cuspidata (Rtjxburgh) Griflith: Fig. 33*

Stolons lubmergd m Boatiog. Culms up io 4.5 m
 ho'is **sp<TM>gy** when in **water.** **Ugules very sh«n** and
 tlcwly hairy; leaf bladrs up to ± 10 cm long, up to
 ± 2.8 cm wide. Inflortscncc terminal, oi diKiUitc
 (rartk single). 15-30 cm lon^, ((ittt-iifd, spikr-likr;
 racemes; the **Inflrnodo**) thickened inwards **the dp**
W hollowed ai lite tip. Sessile **spikdctt** in **enpUke**
Can iUcs afipresacd ID rachi*. disanii UL

togelL«r with **the mfni" T** intrnrixic of [lie rai his a^m
1b» pedicel of ilu- pedicellate spifceiet, 2-flowered;
Umer floret male; upper floret bisexual. Pedicelled
npikleu siiniliir to sttssile ones but usually slightly
 •wallet¹ and with both lloirtts nink-- L^>wcr glume
 ovate, leathery, narrowed into a **Battened awn,** the
 awn grei-rt widi .scabrous marjjins and up to 3 cm long
 and 2 **DUD** wide at **the hast-** upper glume ovaic-
 uhloug, 8 mm long, 5- to y-nem-ft. murron.iH-
Lemmas mem bran ous, of **the lower floret 2-nerved.**
 of the **tipper floret 3-nerved.**

Floating or **emergent perennial.** Grows in swamps
 and **tanks** in up to 1 m deep *wzicv.* **The dtaeminlea**
 are awncd and perhaps animal **dispersed.** It is readily
 eaten by buffaloes. It is highly gregarious **and**
 large and is often regarded as a pest in Africa
 where large populations are known lo **black water"**
ways,

[Hyp/Fle]. Tropit ;*1 Africa and India: Ban? Bur. Ind:



Re. 32A- *Vrihnia* **WpfaUi**: A, part of a «iiton with ihr biis, ^{100x}
 oiim (j em); bi **'aBosmma** PB •"^{100x}: t, iptck-i (2 mm);
 d, **Ktopa]** s«d«- <i «>• rtcbis f2 cm); c. iibanial >idc af thr
radw (2 cm)-

Zizania: 4 rather variable species: Asia and N America
Zizania latifolia Turczaninow [*Z. caduciflora*
 (Turczaninow) Handel-Mazzetti]: Fig. 323

Rhizomes up to 60 cm long, 1-2 cm thick (when infected with smut even thicker) or floating runners up to ± 3 m long or considerably more following flooding, hollow, with partitions at nodes. Culms usually \pm erect, 2-3 m long, glabrous. Ligules membranous and prominent; leaf-blades linear-lanceolate, 15-25 cm wide. Inflorescence a panicle, up to ± 55 cm long; lower branches spreading or ascending, bearing pendulous male spikelets; upper branches ascending at anthesis becoming erect at maturity, bearing appressed female spikelets. Spikelets disarticulating from the pedicel, 1-flowered; glumes and sterile lemmas reduced to a small collar-like ridge at the tip of the pedicel. Male spikelet caducous, ± 1 cm long, not hardened, somewhat flattened laterally; lemma membranous, 5-nerved, acuminate to awn-tipped; palea about as long as the lemma; stamens 6. Female spikelet hardened, subterete but strongly angled, usually 1-1.8 cm long (3-4 cm or more long with awn); lemma 3-nerved, leathery, terminating in a ± 2 cm long awn; palea 2-nerved, closely clasped by the lemma, Caryopses cylindrical, ± 1.5 cm long.

Perennial. Partly emergent and partly floating, found in lakes and marshes, often dominant over large areas. The disseminules are awned and probably dispersed by animals, particularly water fowl. It makes excellent fodder. In China it is widely cultivated; the plants are infected with a smut (gausun) and the diseased rhizomes eaten, the leaves are used to make mats. The culms, grain and roots are widely used in Chinese medicine. There is some confusion concerning the correct name, I have adopted the widest used one.

{Hyp/Pie}. C and E Asia: Bur, Ind: Mn (Logtak Lake).

PODOSTEMACEAE [TRISTICHACEAE]:

47 genera, ± 268 species

Roots capillary, ribbon-shaped, thalloid or foliose, attached to but not penetrating hard objects in flowing water, usually photosynthetic. Shoots reduced and often only present when flowering or well-developed. Photosynthesis takes place under water, floral shoots develop as the water level drops. Leaves well-developed or reduced, extremely variable in size and shape. Anthesis takes place in air or flowers cletstogamous. Flowers solitary, completely enveloped in a membranous spathella or spathella absent. Perianth either present, 3-lobed, free or united at the base or reduced to linear or subulate, scale-like tepals; tepals 2 or 3, usually alternating with stamens. Stamens 1-3 rarely

more, in 1 incomplete whorl or confined to one side of the flower, free or united, borne on a distinct stalk (andropodium); pollen in monads or diads. Ovary superior, 2- or 3-locular. Fruit a capsule, ribbed or smooth, with equal or unequal valves; stigmas 1-3, very variable in shape and size. Seeds axillary, (1) ² ¹⁰ numerous.

Cosmopolitan in tropical and warm regions, extending into temperate NE America and E Asia. Most of the species are endemic to small geographical areas. The liverwort or alga-like plants live on rocks and sometimes on wood in rapids and waterfalls, usually in tw sun. Different taxa are often found growing together. It is sometimes rather difficult to distinguish root from shoot. The term 'root' is used for the part adherent to the substrate, which is sometimes partly floating. 'Shoots' emerge from endogenous buds along the root. The pollination mechanism is unknown. They are essentially annual, dying as the water recedes but some may persist in permanent water. The floral development is very rapid; it may take only two or three days from anthesis to ripe fruit. The disseminules are small and mucilaginous seeds which stick to rocks, the dispersal mechanism is unknown. In India none seem to be of economic importance. Willis, J. C. Studies in the morphology and ecology of the Podostemaceae of Ceylon and India. Annals of the Royal Botanic Gardens Peradeniya 1: 181-250, 267-465 (1902); Cusset, G. and Cusset, C. Structures florales et vegetatives des Tristichaceae. Bulletin du Museum National d'Histoire Naturelle (Paris), 4e serie, 10, section », Adansonia, no. 2: 179-218 (1988); Cusset, Contribution a l'etude des Podostemaceae: 12. Les genres asiatiques. Bulletin du Museum National d'Histoire Naturelle (Paris), 4e serie, 14, section ». Adansonia, no. 1: 13-54 (1992). I would like to thank Ms Ursula M. Kradolfer and Dr R. Rutishauser for help with this family.

1. Perianth segments 3, ovate to oblong-obovate; young flowers enveloped by a few leaves but not enclosed in membranous spathella; ovary 3-locular; stamens rarely 2, free

2. Roots flattened, closely attached to substrate, flowering shoots simple, less than 2 cm long

2. Roots elongate, subterete, creeping and attached by disk-like holdfasts; flowering shoots branched, up to 60 cm long

1. Perianth segments 2 or sometimes a third borne between the filaments, linear to subulate; young flowers totally enclosed in a membranous spathe; ovary 1- or 2-locular; stamens 1 or 2, when 2 the borne on an andropodium

S-flowering shoots with leave* In 6 neat rows
 3. Flowering shoots with leaves in 2 rows or appearing irregular
 4- Capsules indehiscent, containing 1 or 2 seeds

4. Capsules opening by valves, containing many more than y seeds
 5. **Capsule** «Jv» equal, either both persistent or both caducous

6. Root **follow** (lichen-like), closely attached to substrate; flower «&»&*. **renaming** within the leaves; spathe boat-shaped *Hydninum*

6. Roots elongate (ribbon- or threadlike), with the upper part usually free; **scow** pcd. rcllau- held down OK-!>-> /Wy^mm

5. Capst. It **valve unequal**, the "matter" one caducous

7. Capsules smooth W obtusely nblx-d

8. Capsules pedicellate, held above the surrounding leaves; roots irregular in torn., trying from lawfeaped to ribbon-like *Cn^tn*

8. Capsules **subcylindrical**, remaining embedded within surrounding leaves; roots ± regularly pinnetly branched /#yrf<hy^>

7. **Gapsuka** with proniin^ii. longitudinal ribs

8. **Seeds** (1) or 2-8 fr-l& faTM*''o

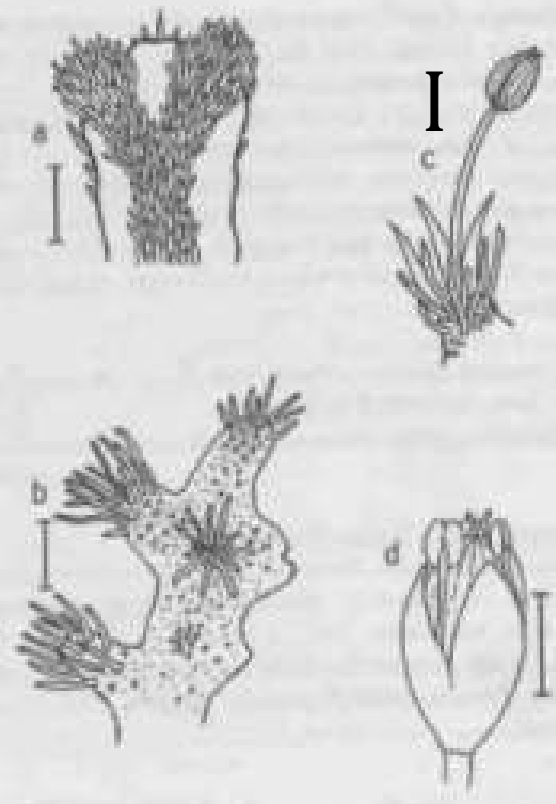
9. **Seeds** *vaort* than 30

10. Spathella-s ftjoneWhftpod, open n_r. rreglilarly at the lip; wgeuif.- shnots wUhou n.li> or linear **Blamenw** feaih teal may Burmtoue In a linear nlameni) *Itafart*.™*
 to. **SpadieUas** bojfc^baped, ofwmna *cmg the upper side hv a longpodtod slit; v^eut. w shoots occasionally **terminatlag** fa tulis o) linear filaments Z

Dactyloctenium [*Levia*, *Mmarttots*, *Tmmila*. *Terniofop*, *Tulacm*]; 4 Bpede« S and SE Asia

Dactyloctenium *Hvbntnr* ((.arclnc-r) *Wight* [W<mv* >rlh. mm.. /^, nif ny&wsM (GtdMT) *Turtle* W « ««fl Willis, van *mtihiUnca* Willis, «n. *jmtkimana* Fig. 825

RCHS **famlose**, flat, cltvely atatched to rock, up W 35 cm in diameter, dually irregularly lobed. M]he tichen-like, bright red or given. Shooia *Wf* short, rinple. Leaves numerous, simpte, occurring either on the upper mi I M • n.ded_{BS} of the il.alloid root oc > closely packed rotette^ on its older parts, those in the centre filiform to linear, those at the edges wider, becoming ovate or obovate; roselle kaves fi-U], ^1S mm long. Howers solitar> or mrelvin pairs. p<i>-cellate, subcinded by a sm;dl *Cttptik** *triKH.rc; **pellia** absent. Pcd'itd 55-3 mm long at antbesu becoming up to 10(-U0) mm lonfi ?
 3 ± ovate lobes, J.3-23 mm long, united



Ho. 355. *Dactyloctenium* A. yS plant 1.5 mm; h > plant just before flowering R (1 cm); c, young fruit (1 mm); d, flower (1 mm).

Stamens 3 or rarely 2, free; filament 2-2.5 mm long; pollen in monads. Capsules ellipsoidal, 1.1 mm long 9-ribbed. 5-locular. opening by 3 equal valves, remaining ± enclosed in the persistent perianth; Stigma. 3? conical. Seeds ovoid. 220-270, ± 0.5 mm long, brown.

Annual or perhaps perennial in deeper water. It is characteristically found on smooth wood in the slower flowing parts of lowland rivers. It is common along the Western Ghats. Flowering from September to February. Rather delicate plants with long leaves (up to 16 mm long) and large capsules (2-2 ft long) have been recognized as *Dateum* by hula var. *hoikanka* (Willis) Jan^rdbaftai [*Uwia x^r lain* fa (Gardner) *Ttilaane* var. *ktmkanica* Willis]; it is doubtfully distinct

[0/(O)? Hapl. Endemic to S India and Sri Lanka: • Oy, • I^d, Bn. (-. KJ, Ki. Mil, Or. Tn.

Fantrtria [*Mafema*]: 2 species: Sri Lanka and S India

Roots ribbon- or thread-like, branched, forming entangled mats, closely attached to rock. Vegetative shoots very short or absent, **heart*** stalked in groups along the edge of the root, linear, up to 1 cm long.

caducous. Floral shoots short, with usually 2-4 scale-like leaves, each leaf with linear and caducous tips. Flowers sessile; spathe boat-shaped, splitting like the lip and on the upper side, tepals 2, linear, on each side of the stamen. Stamen 1; filament slightly flattened laterally, exceeding the ovary and stigmas, capsule smooth or weakly (8)- 10- or 12-ribbed, 2-locular (locules very unequal, one aborting and the other 2- or 4- to 18-seeded). Dehiscence or indehiscence. Stigmas 2, linear.

1. Capsules shortly stalked, with 10 to 12 longitudinal ribs, 4- to 12-seeded, dehiscent *F. india*

2. Capsules sessile, smooth, 2-seeded, indehiscent *F. metzgerioides*

Farmeria indica Willis: Fig. 326

Root prostrate, thread-like and usually 1-2 mm in diameter, attached to the substrate by disk-like holdfasts, leaves linear, sessile, 2-4.5 mm long, ± 0.5 mm wide, filiform tip caducous. Flowers sessile, hardly emerging from spathe. Tepals half as

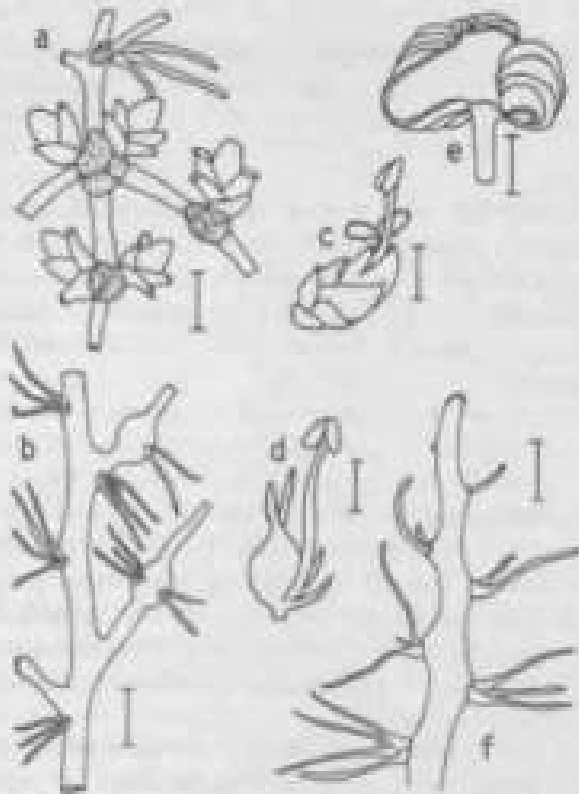


FIG. 326. *Farmeria indica*: a, flowering branch viewed from below (1 mm); b, young plant viewed from above (1 mm); c, flower (0.5 mm); d, capsule (0.3 mm). *F. metzgerioides*: f, whole plant (1 mm).

long as ovary. Siamen ± 1 mm long, exceeding ovary. Pedicel 0.5-1 mm long in fruit. Capsules obliquely ovoid, 1-1.2 mm long, 0.6 mm wide. (8-12)-ribbed. Dehiscence with 2 unequal lobes; stigmas 2 (3) \times 2-nerved. Filament papillose. Sre (4-) 8 (-18), ovoid, ± 0.5 mm long, ± 0.3 mm wide.

Ecology unknown — "in a stream". Arekal, O. and Nagendran. C. R. Additional notes on ferns of the Indian subcontinent (Podostemaceae). Proceedings of the Indian Academy of Science. B. 80: 226-228 (1974). Cuscuta (L.) H. & A. new monotypic genus *Maferria*; this decision does not seem to be justified.

[O Hap]. Endemic to SW India: Kerala (Nellai Kattaittamai District).

Farveria melsneriana (Linden) Willis: Fig. 326

like *F. indica*, but roots flattened, (1-1.5 mm) wide, attached to the substrate by elongate rhizoids. Uspas as long as or slightly shorter than the ovary; capsules smooth, sessile, indehiscent, ± 0.7 mm long, ± 0.4 mm wide; seeds (1)2, often germinant.

It grows on smooth rocks in rather shady places. [O Hap]. Endemic to S India and Sri Lanka: Ceylon *Ind: Kl.

Griffithsia (Linden) Warming: 1 species: S India *Griffithsia hookeriana* (Tulasne) Warming & Griffiths *hookeriana* var. *tumlyensis* (Tulasne) Wilton, *Oedipodium hookerianum* (Tulasne) C. Cussler [sic], in 1992 corrected to *honkmanus*. Fig. 327

Roots star-shaped or ribbon-like, when young then up to 1 cm wide, red when young, usually attached to the rocks, but sometimes like and only attached by the central part. Flowers usually on the margins, with 2-fid disclimous leaves. 3-4 mm long, base ± hooded, lips deciduous. Flower shortly pedicelled; spathe funnel-shaped, 2-3 mm long, toothed at apex and splitting irregularly at tip. Pedicel in anthesis, 4 mm or more in fruit. Tepals 2, minute, one on each side of the andropodium. Stamen, 2; andropodium 1.5-2 mm long, as long or longer than the ovary; filament 0.5-0.7 mm long. Stigmas 2, linear, usually simple, sometimes ± toothed. Capsule smooth, 2.3 mm long, opening by 2, unequal valves, the larger valve pericarp (ent. Seeds 2, ± 0.2 mm long).

Probably perennial. Found in deeper, flowing water in small rivers. Flowering October to February, *Griffithsia hookeriana* var. *willisii* (Warming) Willis [*Cebadifera wittmana* (Warming) C. Cussler] has been described; it is like *G. hookeriana* but the leaves are foliose; the spathe is shorter

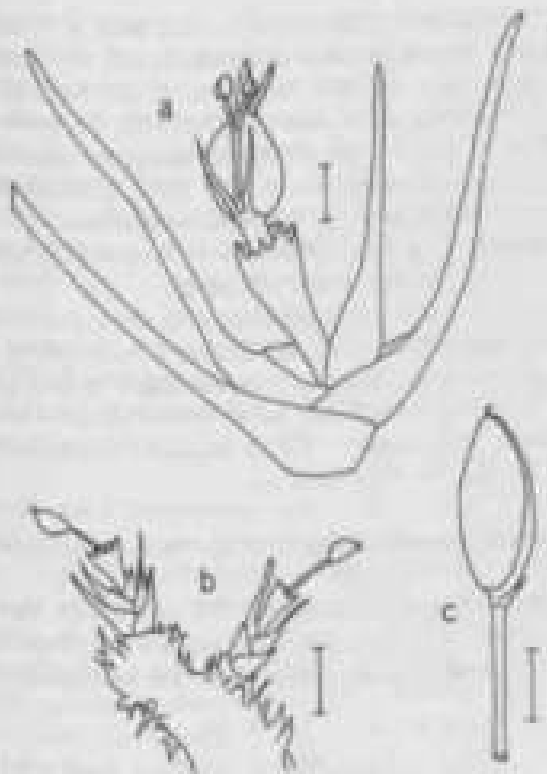


FIG. 327. *GtyUheUa* fcfwfcmaiw: 1, flowering *0W « antibiotic (1 mm); b, plam with 2 yimng (nutt (5 nim) i c. d capsule (

broadly funnel-shaped, splitting inlci many BCCh. This « probably no more than the environmentally tadm ed lf p-tike Tor in uhkfa appears when the plailM grow ertnvded Cnasei G in Flare <ll Ownbogs, du Uw el r<« Vin-Nam 14: 6f>-74 (1973) sunk (he K<-milS Griffith&n into Cfodtflux I d> tux »ee thai this move was justifird. Vidytohankari, B. ;ind Malian Rain. H. Y. ?n Ufa germination and »rigu» <f dte&M ta GriJfitMh xittfnanu. Aquatic Botany 28: 161-169 (1987>.

IO/(O)? Hap}. Endemic to W Ghats of India: # Ind: o K I K M h

Hydrobryopsis: 1 six'cirs: S India
Hydrobryopsis Mfssilis (Willis) Engler [*Hydrobryum* *scutell*
 W K«J:KgiS38

Roots ihalloid. irrregulfir in outline, chltscty attached to rock, S-10 mm wide. ± regularly pinnatcly branched, branches somctimea orasrtapptag and giving *e rrnus a loliosi- appearance. Boral (hooo ^t <^K<- «* r<O) in branch \ViW, t prostrate, eacfe with 6-7 Uk leaves. UMVCS distichous, W mm l''K- «< cr tmei small. H.n and gpjCULATE M *C »p<Ci «< »Pp(i OHO larger and helnu't-sha)i'd. Flowew «H» »le; spatheDa boat-^iapcd, rcnMriniog c»*ed ^ d to surrounding leaves. Tcpls 2. one on each side of

the andronodtum. linear, aa long <jr longer than ihc Ovary. Stamens 2; andropodium ± 1 mm long, as long or longer than the orary: filaments up to 0.5 nun long; pollen in diads. C^psult-s globose. ± 1 mm in diameter, substrssile, rt-maining cnibi-dded within the surrounding leaves, smooth, unribbed or obstureK H-ribbed, 2-lticular. opening by 2 unequal valves (the larger one persistent): stigma* 2. linr;u. St-cds numerous, yellowish. + 0.2 mm long.

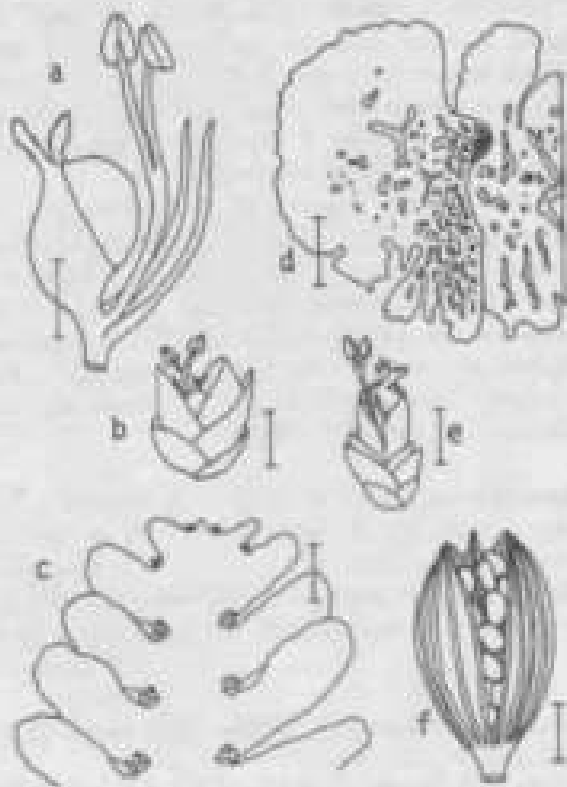
Annual. Common in streams in the Western GhuK Usually found on rounded boulders in very swift water. The t.hall'» ftOTII white when dry. Thi* Spedei ina) perhaps be htllel placed in the genus *Zrylanidittm*,

[O HapK Endemic to S India: »lcd Ap. Go, Kl, Kl, Mh-

Hydrohryum Vtydrnnnua t 10 species: NE India, SE and li Asia

Hydmbruta griffilkii (Wallich ex Griffith) Tulasne: Fig- T28

Roots bard, Ebfiose, irregularly lobed. up io 30 cm in (i;iniieier. Vegeiative shoots very short, simple or absent. *fl leaves linear, up to VI mm long, scattered



Flo. 338. *Hfd**byGjBii msfBp* a. Hnwer removed from HMtfacal (05B JI»«); b, flowL-nng shtwi (0.5 mm): i. pt» view<l from abtrvc (1 cm). *Hyilrtilyniam fpiffthii*: rf.Wigettttffih plunl viewed frOUJ above (1 cm); c. (Iriwering *hoat (0.25 mm); C. capsule <>5 mini-

in groups of 2-5 on the upper surface of the root. Floral shoots spread on the upper surface, simple and prostrate. Leaves of floral shoots scale-like, distichous, imbricate, enlarged at the base, tips caducous. Flowers subsessile, remaining within the leaves; spathe boat-shaped, splitting irregularly on the upper side* and at the tip. Tepals 2 (rarely 1, 3 or 4), linear, 1-1.5 mm long. Stamens 2 (rarely 3), borne on an andropodium. Capsules shortly cylindrical, ellipsoidal, ± 2.2 mm long, ± 1 mm wide. (S*) 12- or 14-ribbed, 2-locular, opening by 2 equal valves: stigmas 2, linear to cuneate, entire, toothed or lobed. Seeds numerous, elliptical-fusiform. The surface granular.

Annual. On rocks, in rapid, but not deep water. {0 Hap}. NE India, Indochina and N Vietnam: Bhutan, India, Nepal; Assam, Meghalaya, Nagaland, Sikkim, Uttaranchal.

Indotristicha: 2 species: S India

Roots long and slender, much branched, creeping. Vegetative shoots arising from the root, submerged, branched, bearing photosynthetic scales and filaments (ramuli). Fertile shoot densely clothed in ramuli and scales. Capsules and ramuli equal or unequal in length, distally overlapping, the uppermost ones unified below and forming a cup-like structure at the base of the pedicel. Flowers terminal, solitary; spathe absent. Perianth segments 3, united below or free. Stamens 3, free; pollen paucicellate, in monads. Capsule 3-locular, 9-ribbed, opening by 3 equal or 2 unequal valves; stigma* 3, linear. Seeds numerous.

Cusset, C. and Cusset, G. Delimitations taxinomiques dans les Tristichaceae. Bulletin du Muséum National d'Histoire Naturelle (Paris), 4^e sér. 10, section B, Adansonia, no. 2: 149-177 (1988). Rutishauser, R. and Liubcher, K. A. The developmental morphology of *Indotristicha ramaxissima* (Podostemaceae, Tristichaceae). Plant Systematics and Evolution 178: 195-225 (1991).

1. Ramuli feather-like; scale-like appendages scattered or spirally arranged, without midrib; perianth segments united in lower half *I. ramosissima*

1. Ramuli millifeather-like; scale-like appendages in 3 or 4 rows, each with midrib; perianth segments free *I. linnirhi-liisii*

Indotristicha ramosissima (Wight) Van Royen & Dahellin & Auai Wight; Fig. 32f

Roots with disk-like and lobed holdfasts and adhesive rhizoids. Vegetative shoots arise from the holdfasts, up to 60 cm long, branched. Warty scales and ramuli; ramuli feather-like, up to 1 cm long, bearing many scales: the scales varying from leaf-like (triangular to lanceolate, 0.5-2.5 mm long) to filaments (0.5-1 mm

long). Floral shoots abundant, each with 1-9 ramuli and scales, the uppermost 1-3 ramuli and scales leaf-like. Uales [in] the cup-like structure. The base of the pedicel: pedicels 7-15 mm long in fruit. Perianth segments ovate to obovate. 2-3 mm long, membranous-reddish, united along the lower half, splitting later. Filaments 5-7 mm long. Capsule ellipsoidal, ± 2 mm long, opening by 2 or 3 slits. Seeds almost 100, bluntly ellipsoidal to oblong, ± 0.5 mm long.

Annual or sometimes perennial in deep permanent water. Usually found in the larger rivers, often very abundant. The seeds germinate during May-June. 10/0 Hap, Knd. mi. to 11 liuii. C? — record b) Ousel and Cusset (L'ISS) in ruins unconfirmed. •hid: Kl. Ki, Tn. I(MJ)-2(H) in.

Indotristicha tinmetwliana B. L. SbartDO, S. Karthikayan et B. V. Shelly; Fig. 2V

Roots unknown. Shoots 5-25 cm long, densely covered with ramuli & vegetative ramuli 0.5-2 cm long. The scales leaf-like, overlapping, ovate to ovate-lanceolate;

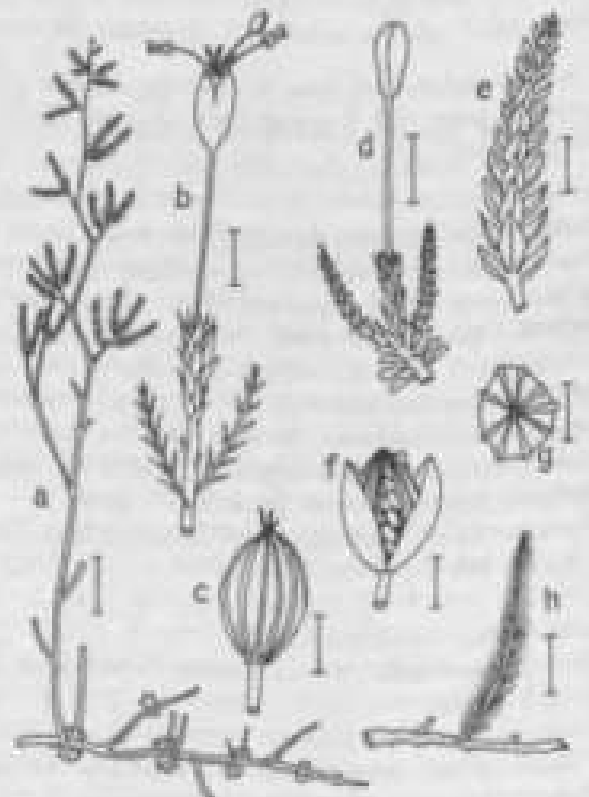


FIG. 339. *Indotristicha tinmetwliana*: a, VCgBO&tt flowering shoot, with ramuli (5 mm); c, capsule (1 mm); r, perianth viewed from the thence attached (1 mm); d, capsule viewed from the (1 mm); b, part of vegetative shoot with ramuli (2 mm); h, fertile shoot (2 mm); e, scale (1 mm).

laic, with a midrib, ± 1.5 mm long and 0.8 mm wick. arranged in 3 or 4 vertical rows, floral shoots borne Minting the ramuli. dothed in leal-tike seafc*, the stilts viih elongate apitrs. ifce upper ones tmitetl ai the base to form ihe aip-Kke structure. Pedicels ± 2 mm long ai an thesis, ± 10 mm long in (nüt. Perianth legmwrtá free, green, oblongs-ohovatc. ± 2-5 mm long. ± 1.5 mm wide. Filaments ± 1 mm long. Gapsute ellipsoidal. 23 mm long. Seeds, bluntly t-Hips«ida1_T ± 0.5 mm

It is known only from the Thuliikkamparai River "earTinikurungudi.

10 Hap). EnddDk to S India: tflMfc Tn (Nellai Kattabonunan Distrkl).

P*rt(0: + 10 Speciefl (generic limits somewhat uncertain): tropical to NE America and Aitia

Roots elongate, branched, creeping. SUOOO arising laterally from the root, leaves in 2 rows, linear and entire (in Allan specie* only). Bowers borne in awls Of leaves; jpLuhella funncShaped, splitting irregularly from the top. Tepals 2 (3), «ne *_^_ n skk> or ** andj-opodUmi (and one on (he back — abaxial side. - of the andropodium or in the fork between ihe two Riamtnts — in American species: abnormal flowers with proliferation of the tepals and stamens are not uncommon). Stamens 1 or 2, borne on an andro-Podltim; pollen in diads. Capsules 8-ribbed. opening ty 2 unequal valvCT. the larger \Tilve persistent; stigmas 2. linear, equal or unequal.

Philbriik, <. T. Aspects of floral biology, breeding and seed and seedling biology in Mnlevm** ^ anophlthm. Systematic Botany 9(2): IG6-174 (19W, Philbriik, C. T. and Bogle, A. L. A suney ol floral variation in five p,upulations of Podostvmm cmttophyllum, Rhodora 90: 115-121 (1988). The Aiiati species are HW different from the New World species and Lhc Vision <rfgU>et (1992) to place ihe India" ^P«ies into the genus Znlaniiltum h probably correct, at least. For P. subuktus.

I? Roots ribbon-like, not obscured by leaves when *kwed from above; lumen I: ovan' wiih pronnurnt a1" iost wtng-likc ribs

•• Hoot., filiform. ± obscured by leaves when viewed from .bove; stamens '2: ovar>' ribbed bill ribs ^1UJ1dTM> not wing-like

Podostemum barberi Willis [Zeylanidium btirbtri (Willis)

C. Cansct^Fig.SSQ

Roots ribbon-like, closely attached to rotks. ± 3 mm wide. Shooou 2^J cnt long. Leaves in 2 rows, linear, b Cm long, not obscuring ihe root. Spaihella flongatc.

splitting irregularly from the top, Tepals 2, minute. Stamen 1: Bfameni a* long or somewl,rn Sorter than the Ovary; pollen in diads. Capsule valve ribs usually promintrnt. almost winged.

(G/t©)? HapJ. Endemic to S India: *Ind; Kl, Kl, Mp. In.

Podottemvtn subulahts tlardner {Podivstrtiwim wbulatus var. mtivat-Ua? Willis. Var- slu/iaii Willis, Zeylanidium subu-UituJi (Gardner) C. Cnsst]: Fig. 330

Like P. btntbri, but foots filifm-m: leaves up to 30 cm long, very dense and obscuring the root: lepals % ± as long as tlie ovary: stamens 2. as long at the ovary; ribs Of Capsule valves rounded, noi wing-like.

[G/<O>? Bfcap]. F-ndemic t« Sri l^inka and S India: •Ccy, •Indzitt, Mb.Tn.

Polypleunim [Duraea\ 7 species: 8 Asia

Roots ribbon- or thread-like, closely attached to rock Of the tower pare closely attached to rock with ihe upper part free; Tree parts up U> 50 crt long, rather towgh. Spciitliicd vegetative shoots absent. Flo nil shoots less than 0-5 mm long, dot- 1c>cd at almost regulai intervals along the margin of the root, bearing 2-S or rarely more imbricate, distichous scsle-likt leaves. Flowers

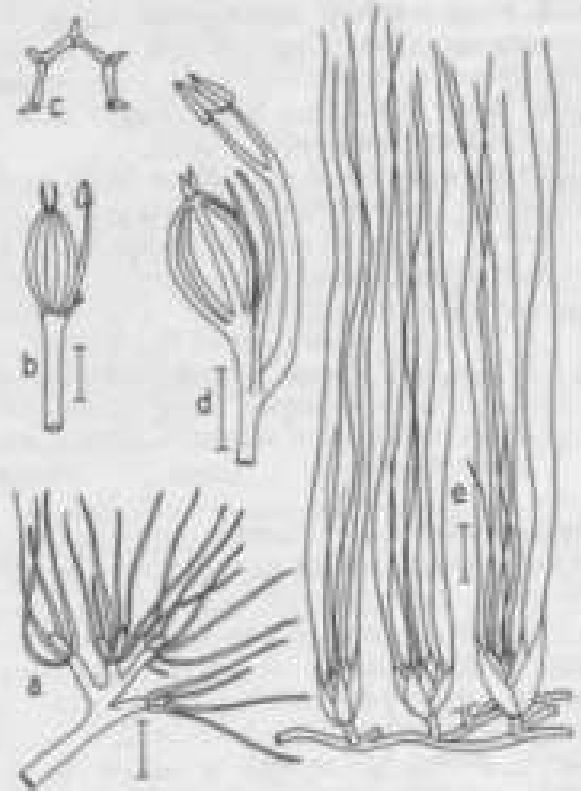


FIG. 330. Podastemum Ixiritifn: a, pl;int (1 cm); b, flower (1 mm); c. tnuisverw wction Of the persistent capsule «1 n F. nibttbtur. A, Mower (1 mm); e, plant {1 cm).

pedicellate; spathe opening irregularly at the apex. Tepals 2, 1 each side of the andropodium. Stamens usually 7 borne on an andropodium. Capsules (6)- 8- or (10)-ribbed, opening by 2 equal and persistent valves; stigmas 1. ovate or linear.

Klitosla. Charu and Mohan Ram, H. V. MoqjhoJogy of flower fruit ami st'cd in *Polyplntmm xylatum* \quatic Botany 46<5-4): 255-262 (1993); Schgal Anita Mohan Ram. H. Y. anrl Bbatl. J. R. *In vitro* germination, morphogenesis and flowering of an aquatic ajigio^ sperm *Polyptntmm \ytosum* (Podosteinaceae) Aqualk Sotnny 45(4): 26&-2S3 (1993).

1. Root completely attached to substratum, **fbffoae**; shoots spread on upper surface of the root; upper pair of leaves of flowering shoot with 2. long, **persisteni** apical filaments *R/Uifolium*

1. Roots attached to substrate at hast¹ only, ihe real free; upper pair of leaves of each (**lowering** shoot apic-Mhue or with 1 caducous or persistent apical **Bbroem**

2. Free part of roots subiereu.; filiform (Sri l-inka)

P. ttongatum

2. Free part of root* distinctly flattened

3. Leaves of fertile shoots with persistein **apical** Hlamenu *P. munnomw*

3. Leaves of fertile shoots acuminate or dps caducous
4. Roots + fblios\ usually small, up to If) mm wide, up to If) cm long (NE India and Myanmar)

P. lvalifhii

4. Roots ribbon-like, much longer than wide (Peninsular India and Sri Ijinka)

5. Free part of roots ± 6 nun wide, up to 30 cm long, not fleshy, sparingly branched above, often **zigzagged** towards **the tip**; floral shoots **along** the margins of the whole root; pedicel of fruit about 6 min long *p. dickototatum*

5. Free part of roots up to If) mm wide, up to 50 cm long, fleshy, usually richly branched above, not xigragged. floral shoots on **the margins** of the basal part of the root; pedicel of It uil 6-H) mm long *p. *tyto:um*

Polypleunim dichotomum (Gardner) J. B. Hall: Fig. 981

Roots sparingly branched, ribbon-like, up to 6 mm wide, partly attached to **rOdt** and partly free; (ret- pans 10-30 cm long. FJoraJ shoots **developed along** ihe margin of the whole root at almost regular interval* **often on** -small projections making the **root** appear zigzagged, each **bearing** 2-5. imbricate, disiichuus scale-like leaves. Leaves with elongated tips, which **sometimes persta** or may fall **off early**. Pedicel 3-f) mm long in flower, **elongating in fruit** up to G-fi mm-spatheltha opening irregularly at the apex. Stigmas 2. ovate to **subulate**.

t^,/^> -. *"><.nn> ana rivers, [0/(0,? Hapf. **Endemic to India: Had; Kl, Mh, Tn.**

Polypleunim dtmgaium (Gardner) J. B. Hall: Fig. 331

Roots **cylindrical**, up to **IS** mm in **diameter**, at base frequently **branched** and attached to rock by disk-like holdfasts, upper pan fret; free park 50-60 cm long, sparingly branched: vegetative parts of I he roots and iht **marginal pun*** of **the fertile roots caducous**. Floi*¹ shoots **developed** at almost regular intervals along *e lower part of the free pan af the mot. each bearing (2-) 4 (5) **imbricate**, distichous scale-like k.ivrs with caducous elongate (**ip-t**. Pedicel 4-5 mm in So**¹, elongating in fnjit up 10 5-J) mm, Stigmas 2, subulate.

Annual or perhaps sometimes perennial in deeper water. On stones and *rotiks* in rivers.

1©/(0? Hap}. Endemic to .Sri Idnka *Cev.

Polypleunim fitifolium (K. Ranutmurihy trl J. Joseph) Nagendran, AiekaJ ct Sub ram an yam: Fig. 331

Like *P. dichotomum* but roots attached throughout ilieir tangih without any free parts; shoots alt on thf upper surface of the root (never along the margins):

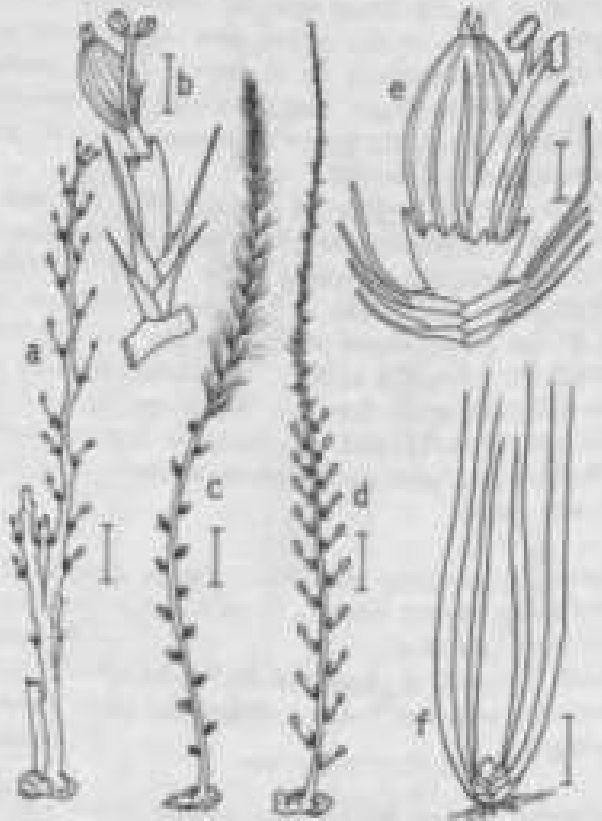


Fig. 331, *Polypleunim did&emtm* a, ilamrinfi plant (1 cm): b, **flowering ihww t>nun**). /> *Amgsttm*; r. plant at an *thess* : IL !,Lui1 ta frail .1 cm) /> *jugutaM* <. ilowering about /03 cm): r. shooi JUSL before anihwis (2 mm).

leaf tips filiform, persistent, up to 20 mm long; the upper pair of leaves apparently each with two subfossil appendages,

This species would, perhaps, be better placed in the genus *Fannaria*.

!©/(©)? Hap]. Endemic to S India: *Ind; Kl (Palakkad and Thiruvananthapuram District). Gopal (1999) pvc^s Or (Koraput). I have not been able to confirm it.

Polyptarum miiwiarmanafendran el Arkal: Fig 332

Kike *P. dirlwontum* but **fifofl** leaf tips persisting (faring aithe&is. up to 1 cm long; stigmas linear

his **doubtful** this is a **gf** I*¹ • « - ItllulT mu,slu - Ration will perhaps show that it belongs to *P. ditantum*.

10? Hapj. Endemic to India: •Ind: Kl (Munnar in Idukki district). 1820 m-

Polyptarum tftm (Wight) J. B. Hall & Stylo. ^{TM*TM}

nmu Nsiii, /JivTM n4pn>rwim **Wanning**, w. sJrfcw var. *tmurfitnii* Willis, w.r/wft><fci Willis, var. / Willis, var. *ludniata* Willis]; Fig. 332

Roots frequently branched, ribbon-like, up to 10 mm wide, fleshy, often crisped at the base, attached to rock by a stout foot and at other points by smaller (list-like **bokt&tt*** p^{r11v lrtu(!; Brofl} **pw^HW** cm long, •regularly **branched** but not /ig^gged. Floral shoots developed at the **base** of the foliage part, at almost "CKilar intervals of 2-4 mm along the margin, each bearing (2-) 4-5 transverse and distichous, salt-like, liclmt-shaped leaves. Flower buds usually as long as **bpwti**; pedicel 2-5 mm in **flow**, elongating in **fiw** up to 40 mm. Stamens usually 2, borne on an andropodium- Stigma* 2. linear.

Annual or perhaps **perennial** in deeper water. In rivers and streams. Scum-trees in partial shade. The leaves are **brown** and leathery and reddish **rewaomc** the brown alga **Ate&**

|O/(O)? Hapf- Endemic to India and Sri Lanka: •Cey, •Ind: Go. *HI*, Kt. Mh. Tn,

Polyptarum wallicii (R. Brown ex **Griffith**) **Wanning** *Uhrrea minor* (L. N. S. Widdell) Widdell. /J. ^ « J *Phylla* Weddell. *Polyptarum ughnarii* (Nandit Nagendran, Arkal el Subramanyan nom. illeg.) Fig. 333

Roots ribbon-like, up to 10 mm wide, up to 10 cm long, branched and lobed, often rounded, with rather woody vascular tissue at base attached to rock by a thick holdfast, at other points by disk-like or elongate holdfast*; vegetative parts caducous. Floral shoots develop at almost regular intervals of 2-3 mm along the upper edge* of the margin, bearing (2-) 4 (-7) wale-like, helmet-shaped and keeled leaves. Flower buds* usually as long as broad; pedicel 4-5 mm m



FIG. 352, *Polyptarum muurtatri*. *: a, flowering shoot (5 mm). /'. t^ojrii>: b, flowering shoot (1 mm); c, plant in fruit (2 mm). *P. wallicii*: d, flower bud (2.5 mm); e, flower bud (5 mm); f, root showing marginal holdfasts (1 cm).

flower, elongating to 8-20 mm in fruit: spathe opening irregularly at the apex. Capsule 8- or 10-ribbed. Stigmas 2, subulate.

Annual or perhaps **perennial** in deeper water. It is very **cfw** to *R. i-cvc9i* the 1x-st diagnostic thinutci is the distribution.

|G/(O)? Hap). Endemic to NU India and Myanmar: •Bur, •Ind: As, Mg,

Willisia **Ipedt*5W** India *Willisia seiaginoides* (Hfdtlome) Warming ex Willis: Fig. 333

Roots **Eotioae**, closely attached to rock by an irregularly lobed, 2-3 cm in diameter holdfast. Vegetative shoots caducous as the water level falls, linear, simple or rarely branched, up to 50 cm long, almost leafless below, above with numerous, up to 5 cm long, filamentous **Ump** leaves. Fertile shoots densely crowded, simple, upright, 2-10 cm long, closely covered with leaves. Leaves of fertile shoots in 6 distinct rows, scale-like, triangular, rigid. 2 out of 6 rows terminating in a caducous, hair-like tip. Flowers sessile; spathe forked at the top. Tepals 2. Stamens 2, borne on an andropodium.



FIG. 333. *Witkia stfagnailry*, a. plant before anthesis (2 cm); b. fertile shoot (1 mm); c. persistent capsule valve (1 mm); d. plant before anthesis (5 mm); e. young fruiting shoot (2 mm); f. plant before anthesis (5 mm); g. plant in fruit (5 mm); h. young fruiting shoot (2 mm).

Carpels smooth or slightly ribbed, opening by 2 valves, the larger one persistent; stigmas 2, linear.

Annual or perhaps perennial in deeper water. On smooth rocks in torrents and waterfalls. Most accounts write that the leaves are in 1 row; the main one we have seen has them in 6 rows,

(©)? Hap). Endemic to SW India: Kerala, Tamil Nadu.

Zeylandium [*Hydmbryum* pro parte, *Podostemma* pro parte]: 2 or 3 species: Sri Lanka, W, S and NE India and Maldives.

Roots rhizomatous, ribbon-like or foliose, resembling lichens, up to 25 cm or more in diameter, densely attached to rock. Shoots short, and simple, vegetative shoots terminating in tufts of linear filaments, floral shoots rather prostrate, with distichous, bract-like leaves, each terminating in a caduceous thread-like lip. Flowers pedicellate; spathe boat-shaped, opening at the upper side with a longitudinal slit. Tepals 2. Stamens 2 or rarely 1. Carpels ribbed, opening by

2 unequal valves, the larger one persistent; stigmas 2, unequal, linear or slightly flattened.

As suggested by Cusset (1992) it may be better to place the Asian species of *Podostemma* in this genus.

1. Roots frondose, crustaceous, lichen-like, sometimes bearing stalked tufts of filamentous leaves; floral shoots scattered over the surface of the root

Z. oivaceum

1. Roots ribbon-like, pinnately branched, with stalked tufts of filamentous leaves; floral shoots arising along the margin of the root

Z. bichanoides

*Zeylandium lieheiioides** (S. Kury) [?]-*U. henrici* var. *bhomsii* (Willis) Suniapa, *Z. bichanoides* var. *khmimoides* (Willis) Santapa, Willis recognized an additional 10 varieties. *Podostemma animum* Weddell, *P. micropodum* Weddell, *P. krivovis* WUB; Fig. 333

Roots ribbon-like (at least partly parallel-sided) closely attached to rock, at the periphery often pinnately branched. Vegetative shoots short, simple with linear leaves 3-6 mm long. Floral shoots ± prostrate with distichous, wale-like leaves, each terminal in a caduceous thread-like tip. Flowers shortly pedicellate. Tepals 2, shorter than ovary. Stamens 2 or rarely 1. Filaments as long or slightly longer than ovary. Stigmas 2, unequal, ovate to subulate. ± lobed or toothed.

Annual. It occurs on smooth rocks, in rapid currents. The vegetative form is very variable; Willis recognized 12 varieties. *Zeylandium jokmatum* (Wight) F. ngkt u liko *Z. khmimoides* but it is reported to have stamen filaments (presumably including the andropodium) two and a half as long as ovary.

[O Hap]. Endemic to Sri Lanka, India and Maldives: Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, Orissa, West Bengal, 1000-1500 m.

Zeylandium alivaceum (Gardner) Engler [*Zeylandium tohmsii* (Wight) Engler. *Hydmbryum otmatum* (Willis) Willis, var. *flavum* WUB, var. *Zitadum* WUB]; Fig. 333

Roots frondose, closely attached to rock, ± circular or oval, lobed, red when young. Shoots prostrate on the surface, sometimes bearing stalked tufts of filamentous leaves, which are up to 10 cm long. Floral shoots rather prostrate with distichous, wale-like leaves with caduceous lips. Spathe ± papillose. Flower pedicellate; pedicel 2-5 mm long. Tepals 2, one on each side of the andropodium. Stamens 2 or rarely 1, as long as ovary. Capsule 2-3 mm long, 8-ribbed, opening by 2 unequal valves, the larger one persistent; stigma 2, unequal, subulate. ± lobed or toothed.

Annual. In rivers and small streams, usually in rapids with a strong current, mostly in shallow water. Towards

the end of season the root decays and loses its shape. Willis (1902) describes *in situ* germination.

(O Hap]. Endemic to Sri Lanka and India: •Cey, •Ind: Ap, Kl, Kt, Tn. 500-2000 m.

POLYGONACEAE: 51 genera

Leaves mostly alternate; stipules united into a membranous sheath (ochrea). Flowers bisexual or unisexual. Perianth 3- to 6-merous. Stamens 6-9. Ovary superior, 1-locular; ovule solitary, attached basally; styles 2-4. Fruit a nut.

Excluded: the following is recorded from wetland habitats in the Himalayas but does not extend further south in India: *Rumex aquaticus* Linnaeus.

Found in moist or damp habitats but not wetland species: *R. dentatus* Linnaeus; *R. maritimus* Linnaeus; *R. nepalensis* Sprengel.

Polygonum [including *Persicaria*): 150 species: cosmopolitan

Ochreas inconspicuous and hyaline or conspicuous and membranous or paper-like, tubular or cleft, margins glabrous or variously ciliate or lacerate. Flowers aggregated in simple or branched spike-like racemes, in heads or in axillary clusters. Perianth segments (4) 5, subequal, free or united at the base, at least in part petaloid, not enlarging greatly in fruit. Stamens 4-8, alternating with glandular disk lobes. Ovary Wangled or globose or obovoid; style arms 2 or 3, stigmas capitate; nut biconvex or 3-sided or rarely flattened and concave.

Annual or perennial. Found in a wide variety of habitats: submerged, floating, emergent, seasonally submerged or as helophytes. Pollination entomophiiious, some species are distylic or functionally dioecious. The disseminules are nuts usually shed with the perianth attached; dispersed by animals or by water. There are good botanical grounds for placing nearly all the wetland species into the genus *Persicaria*. Nomenclatural stability is of utmost importance. I have, therefore, retained them in *Polygonum* but have included the full citation for the name in the genus *Persicaria* in the synonymy.

Excluded: the following are recorded from aquatic or wetland habitats in the Himalayas but do not extend further south in India: *Polygonum amphibium* Linnaeus [*Persicaria amphibia* (Linnaeus) S. F. Gray]; *P. dolycopodum* Ohki [*Persicaria dolycopoda* (Ohki) Sasaki]; ***P. perforatum* Linnaeus** [*Persicaria perfoliata* (Linnaeus) H. Gross]; *P. posumbu* F. Hamilton ex D. Don [*Persicaria posumbu* (F. Hamilton ex D. Don) H. Gross]; ***P. punctatum* Elliot** [*Persicaria punctata* (Elliot) Small]; *P. strigosum* R. Brown [*Persicaria strigosa* (R. Brown) Nakai]; ***P. tenellum* Blume** [*Persicaria tmella* (Blume) H. Hara, *Persicaria kawagoneana* (Makino) Nakai].

Found in moist or damp habitats but not wetland species: ***P. limbatum* Metšner** [*Persicaria Umbata* (Meisner) H. Hara]; *P. minus* Hudson [*Persicaria minor* (Hudson) Opiz]; *P. mite* Schrank [*Persicaria mitis* (Schrank) Dorstäl]; *P. orientale* Linnaeus [*Persicaria orientalis* (Linnaeus) Assenov], Indeterminate: *P. praetermissumj.* D. Hooker; *P. stridum* Allioni.

1. Leaf blades less than 4 mm wide, less than 1 cm long; flowers in axillary clusters; ochreas hyaline; ovary 3-angled
P. phbeium

1. Leaf blades more than 10 mm wide, more than 2 cm long; flowers in racemes or head-like clusters; ochreas membranous or paper-like; ovary globose or obovoid, not 3-angled

2. Flowers in remote, terminal and axillary head-like racemes; nodes with retrorse prickly-like hairs

P. pedunculare

2. Flowers in elongate, simple or paniced racemes; nodes glabrous or softly hairy

3. Ochrea not ciliate at the mouth (nuts flattened-biconvex; styles 2 or very rarely 3)

4. Perianth segments ± smooth, equal to or slightly longer than the fruit; bracts glabrous

P. giabrum

4. Perianth segments with raised anchor-shaped veins, clearly longer than the fruit; bracts hairy

P. lapathifolium

3. Ochrea ciliate at the mouth (nuts biconvex or 3-angled; styles 2 or 3)

5. Cilia at the top of the ochrea 5-20 mm long, nearly as long as the tube; perianth white (nuts 3-angled)
P- barbatum

5. Cilia at the top of the ochrea not more than 3 mm long, much shorter than the tube; perianth pink to red or very rarely white (nuts biconvex or 3-angled)

6. Racemes slender, lax, often hanging; bracts ± distant
P- hydropiper

6. Racemes dense and tight, usually erect; bracts overlapping
P- pttlchrum

***Polygonum barbatum* Linnaeus sensu lato** [*P. flaccidum* Roxburgh non Meisner, *P. rivulare* Roxburgh, *Persicaria barbata* (Linnaeus) H. Hara]: Fig. 334

Stems erect, sometimes creeping below, 40-80 (-150) cm tall. Ochreas membranous, tubular, truncate, 1.5-2.5 cm long, the numerous nerves extended into cilia, the cilia 0.5-2 cm long; leaf blades shortly petiolate (the petioles up to 1 cm long), lanceolate, (4-) 7-12 (-20) cm long, (0.5-) 1-3 cm wide, glabrous or hairy on the nerves and margins, lateral nerves 13-20 pairs, base cuneate to attenuate, tips attenuate, acute. Flowers in terminal and axillary, up to 7 cm long spike-like



Fig. 334. *Polygona barbatum*: a. flowering shoot (2 cm); b. stem (1 cm); c. nut with transverse section (inset) (1 mm). *P. glaberrima*: d. stem (1 cm) with enlarged portion of the underside of the leaf (inset); e. nut with transverse section (inset) (1 mm).

racemes; bracts closely overlapping, oblong. 2.5-5 mm long, narrowed below, sparsely hairy; bracteoles up to 2 mm long. Perianth white. ± 2.5 mm in diameter; segment* 5. subequal, **ovate**, ± 2 mm long, **obtusely**. **Stamens** 5-7; filaments subequal, ± 1.5 mm long; anthers ± 0.25 mm long. Styles (2) $\times \pm 0.5$ mm long. Nut rhomboid in outline. Sides or some on the surface of the plant occasionally on the surface. J.S. 2 mm long. ± 1.5 mm wide.

Perennial but sometimes perhaps also annual. Gregarious and often forming **clumps**. It is found by streams and rivers, in marshes or in shallow water in pools and ditches or in **swampy** areas of vegetation. The **roots** are used in medicine as an astringent and cooling agent; the seeds are used in **relieving** colic. It is very variable; the following varieties are usually recognized in India but intermediate plants are relatively common.

Polygona barbatum var. *gradifolia* (Danser) Steward [*P. serotinum* W. & A. Hooker, non Lagasca. *Persimna barbatum* subsp. *gracilis* (Danser) H. Ilant].

like *P. barbatum* var. *barbatum* but bristles on the ochrea shorter; leaf blades narrower (7-12 mm

broad), glabrous or scarcely scabrous, the bases rounded; inflorescences narrower, 1-3 spikelets borne at the ends of branches.

Polygona barbatum var. *statpinum* (F. Hamilton ex Martens) Steward [*P. stagninum* V. Hamilton ex Meisner. *Persicaria bairdiana* W. & A. Meisner] (Gardner)

Like *P. barbatum* var. *truncatum* but ochreae longer (± 2.5 cm long); leaf blades hispid, with greyish hairs*.

[? Hel/Hyp/1'lr). Tropical Old World *MH* Australia. The following distribution refers to all three varieties; Ban, Rhu, Bur. Cey, Inti. Nt p, Pak: <An, As, Bh. Hp. Hr. Jk, Kl. Kt. **Mg, Mb**> Mp, Or, Pj, Rj, **Sk**, Tn, Tp. Up, Wb.

Polygona glaberrima Wilsdenow, [*P. dmsiflorum* Meisner, *Vtomarin glaberrima* (Wilsdenow) Gomes do la Ma/a, *Persicaria drontiflora* (Meisner) Moldenke]. Fig. 335

Stems erect, shrubby, up to ± 2.5 m tall. Ochreae membranous, glabrous, tubular, truncate at the mouth, 2-4 cm long, the nerves not prolonged into cilia; leaf blades shortly petiolate (petioles up to 2 cm long); blades narrowly lanceolate, 1(1-25 cm long. 1.5-4 cm wide, **glabrous**, **glabrous** except for the midrib and some lateral nerves, lateral nerves **2M0** in



Fig. 335. *Polygona glaberrima*: a. flowering shoot (2 cm); b. fragment of inflorescence (5 mm). *P. glaberrima* c. petal (3 mm). *P. glaberrima* d. stem (1 mm).

closely pinnate pairs, base cuneate to decurrent, tips gradually attenuate. Flowers in terminal and axillary, 7-10 cm long spike-like racemes, together forming a panicle; bracts oblong, ± 3 mm long, broadly triangular, margins scarious; bracteoles up to 2 mm long. Perianth rose or red, ± 3.5 mm in diameter; segments 5, subequal, oblong, ± 3 mm long, obtuse. Stamens 5; filaments ± 2 mm long; anthers ± 0.7 mm long. Styles 2, ± 0.8 mm long. Nut \pm orbicular in outline, flattened, 2-3 mm long, dark brown and shiny.

Perennial or annual. Gregarious along water courses and tanks but is also found in marshes. It is often dominant along large rivers where it withstands considerable flooding and swift currents. Tender branches used as a vegetable in Rajasthan. It is also used for dispelling fever and colic.

{(G) Hel}. Old World tropics: Ban, Cey, Ind, Nep, Pak: Ap, As, Bh, Gj, Go, Kl, Kt, Mh, Mp, Or, Pj, Rj, Sk, Tn, Up, Wb. 0-2900 m.

Polygonum hydropiper Linnaeus [*P. hydropiper* subsp. *microcarpum* Danser, *Persicaria hydropiper* {Linnaeus} Spach]: Fig. 335

Stems erect, prostrate or creeping and rooting, 30-60 (-100) cm tall, glabrous. Ochreas membranous, glabrous or hairy, tubular, truncate, ± 2 cm long, nerves prolonged into cilia at the tips; leaf blades shortly petiolate (petioles up to ± 1 cm long), narrowly lanceolate, 3-6 (-15) cm long, 0.7-1.5 cm wide, glabrous, cuneate to decurrent, tips gradually attenuate. Flowers in terminal and axillary, lax spike-like racemes, 4-6 cm long, often hanging; bracts mostly distant and not overlapping. Perianth rose to white, with yellowish transparent glands; segments 4 (rarely 3 or 5), subequal, oblong, 3-4 mm long, obtuse. Stamens 6 (-8). Styles 2, ± 0.8 mm long. Nut biconvex or weakly 3-sided, 2.5-3.5 mm long, ± 2.8 mm wide.

Annual. On moist, rich soils which are regularly flooded, also found along the margins of ponds and in irrigation ditches. Frequently found as a weed in Reids and along paths. It has a hot peppery taste; it is used as a fish poison and in medicine as a diuretic. It is very variable, several infraspecific classifications have been proposed. Tall, large-leaved plants with sharp pointed bristle-like hairs on the ochrea and undersurface of the leaf blades are often called *Polygonum hydropiper* var. *flaccidum* (Meisner) Steward [*P. pubescens* Blume: *P. flaccidum* sensu Meisner non Roxburgh, *P. donii* Wight]; these plants intergrade with *P. hydropiper*.

iO Hel]. N Africa, temperate and tropical Eurasia, introduced in N America: Bhu, Ind: An, As, Kt, Mh, Mp, Or, Rj, Sk, Tn, Up, Wb. 0-2000 m.

Polygonum lapathifolium Linnaeus [*P. tomentosum* Schrank, *P. nodosum* Persoon, *Persicaria lapathifolia* (Linnaeus) S. F. Gray]: Fig. 335

Like *P. glabram* but ochreas hairy; undersurface of leaf blades clothed in short white hairs; bracts hairy; perianth segments with raised anchor-shaped veins, pink to white or greenish, clearly longer than the fruit; nuts remaining enclosed in perianth.

Annual. It is not confined to wetlands but is sometimes found in water or in mats of floating vegetation. The aquatic plants usually have swollen internodes (up to 3 cm thick) which become purple. It is autogamous and has many local 'true breeding' races; the Indian ones tend to be hairy and are sometimes recognized as *P. lapathifolium* var. *lanatum* (Roxburgh) Steward. In India it seems to be often overlooked or incorrectly identified and is probably more widespread than some local Floras let us believe.

{0 Hel/Hyp/Ple}. Almost cosmopolitan, probably introduced in N America: Ban, Cey, Ind, Pak: Ap, As, Gj, Jk, Kt, Mg, Mh, Tn, Up.

Polygonum pedunculare WaWich ex Meisner [*P. pedunculare* var. *angustisittum*]. D. Hooker, *P. pedunculare* var. *robustum* j. D. Hooker, *Persicaria peduncularis* (Wallich ex Meisner) Nemoto]: Fig. 335

Stems erect, up to ± 50 cm tall, nodes with stout, retrorse, almost prickly hairs. Ochreas membranous, glabrous, tubular, obliquely cleft, up to 1.5 cm long, tips gradually acute; leaf blades not distinctly petiolate, linear-lanceolate, 5-9 cm long, 3-6 mm wide, glabrous except for the midrib, lateral nerves obscure, base attenuate, tips gradually acuminate. Flowers in remote, dense, terminal and axillary, up to 2 cm long, almost head-like racemes; peduncles glandular hairy; bracts ovate, 1-1.5 mm long, margins ciliate towards the tips; bracteoles up to 1.5 mm long. Perianth purplish, ± 3 mm in diameter; segments 5, subequal, oblong-concave, ± 2 mm long, obtuse. Stamens 5; filaments ± 1.5 mm long; anthers ± 0.5 mm long, Styles 2, ± 0.5 mm long. Nut biconvex, almost circular, ± 2 mm in diameter.

Perennial. Prickly subshrubs not confined to wetlands but often found along rivers, in marshes and in seasonally inundated places. It is very variable and several varieties have been described. Should *Polygonum dichotomum* Blume [*Persicaria dichotoma* (Blume) Masamune] be shown to be conspecific then it is the earlier name.

jHel}, Tropical Asia and Australia: Ban, Cey, Ind: As, Kt, Mg, Mp, Tn.

Polygonum plebeium R. Brown ['*plebejum*' orth. mut., *P. indicum* Heyne]: Fig. 336

Stems prostrate. Ochreas hyaline, obliquely tubular, ± 3 mm long, the upper part lacerate; leaf blades sessile

L Perianth distinctly tubular at the base, distinctly zygomorphic; anthers subequal in length, dorsifixed

2. Mature plants floating with inflated petioles; **Fruit** a 3-locular, many-seeded capsule; not enclosed by the base of a modified perianth tube *Eichhornia*

2. Mature plant is erect and root-tolerant with narrow petioles; fruit a 1-seeded nut, enclosed by the **burdened** base of the perianth tube (antliocarp) *Potitederia*

Eichhornia: 7 species: tropical America and Africa, through introductions now in most tropical and warm regions of the world

Eichhornia crassipes (Martens) Solms-Laubach: Fig. 337

Stems floating, stoloniferous or creeping. Leaves of juveniles **submerged**, euline, linear; leaves of adults emergent, **differentiated** into petiole and blade; petiole up to ± 30 cm long, usually with a bulbous swelling below; blade broadly ovate to orbicular. 5-15 cm in **diameter**, at base subcordate, truncate or

rounded. Inflorescence a spike, up to 50 cm long; spathes dissimilar, the lower leaf-like, the upper **scale-like**. Perianth blue, tubular below, 5-lobed. The lobes unequal, the upper one large. blue with a yellow fleck on the adaxial lobe, up to 4 cm long. Stamens 6, borne at 2 levels: lateral with glandular hairs; anthers subequal, dorsifixed. Fruit a 3-valved capsule. Seeds numerous, oblong. ± 5 mm long, with 8-10 longitudinal ribs.

Perennial or occasionally annual. The juveniles are submerged, the adults are floating. It is found in a large variety of aquatic habitats and is often dominant over large areas. Known as water hyacinth, it has become a very serious pest in many regions. It is utilised locally as fodder, manure, a source of methane and alcohol, for purifying water and also **cultivated** for decoration. It is effectively pollinated by insects. In India the long and middle style morphs are found. The seeds are usually dispersed in mud. *Biological Plant Studies 1: Ebcvterj* Amsterdam, t-xii, 1-471 f 1987).

1(0) PIC/(Hyd)/(Ten)J. In [reduced to the Indian subcontinent in about 1890 from tropical S America probably via Malaysia or Indonesia: <Ban, <Bhu 1992, <Bur ± 1904, <iky 1904, <Ind, <Nep, <Pak: <Ap, <Ar, <As, <Bh, <Dl, <Gj, <Hp, <Hr, <Kl, <Kt 192ft, Lk, <Mg, <Mh, <Mn, <Mp, <Mz, Ng, <Or, <Pj 1917, <Rj, <Sk, <Tn, <Tp, <Up, <Wb 1896.

Monochoria: 8 species: tropical & warm Africa, Asia and Australia, naturalized in Europe and the New World

Stems floating, creeping, cunulike or rhizomatous. Leaves radical. **submerged**, **Boating** or emergent, extremely variable as to size and shape, scale-like to linear or differentiated into petiole and blade; blade linear to ovate, **sagittate** or hastate; stipules sheathing and closed, usually with a ligule. Inflorescences paniculate or umbel-like, sometimes reduced to 2 (lowers; spathes either similar and leaf-like or dissimilar, the lower leaf-like with a sheath enclosing the upper spathe: the upper sheathing and lacking a blade but sometimes hidden from view, so the inflorescence appears to arise directly from the petiole of a leaf (the lower spathe). Perianth very short, tubular. 6-lobed; lobes almost reaching the base, subequal. blue, pink or white, somewhat accrescent, persistent and enveloping the ripe fruit. Stamens 6, one larger than the others; filaments often with 1 or 2 obliquely erect teeth; anthers basifixed, unequal, the small and yellow, 1 large and blue. Fruit a 3-valved capsule, normally released as a **urtil** and **Opening** later; seeds numerous, with 8-14 longitudinal ribs or wings.

Annual or perennial. Usually found in shallow water but most are capable of accommodating to great changes in water level. The juveniles are submerged,

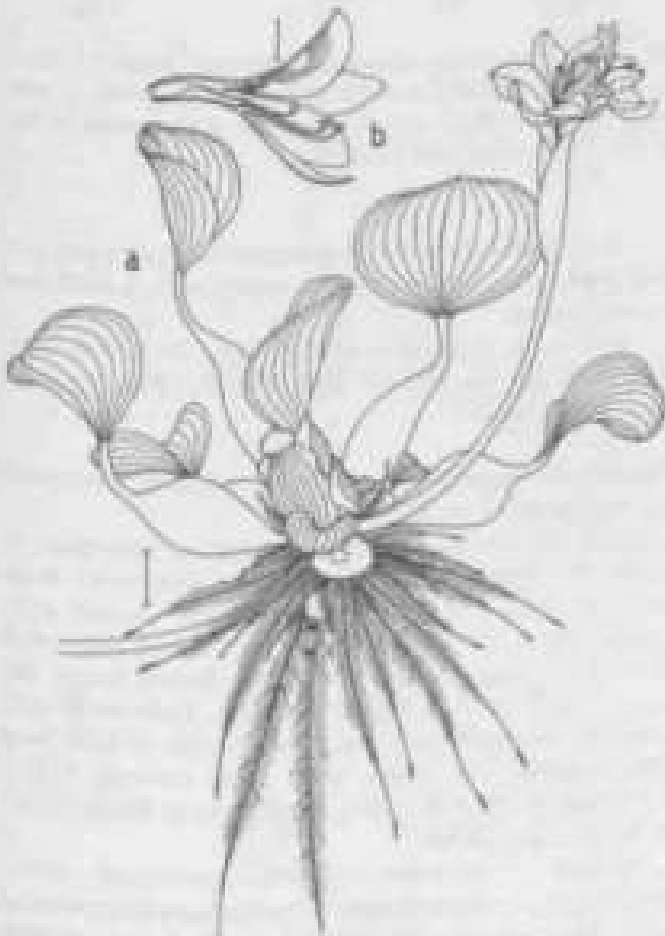


FIG. 337. *Eichhornia crassipes* a. flowering plant (3 cm); b. longitudinal section of inflated petiole (11 cm).

serious pest. It is highly plastic and has stems from 3 cm to over 50 cm tall. The leaves and flowers are used as pot herbs and medicine; the roots are used for toothache.

1(0)? Hyp/Ten). S, SE and E Asia, Australia and W Pacific, introduced in Hawaii, N America and Europe: Ban, Bhu, Bur, Cey, Ind, Nep, Pak: <An, Ap, As, Bh, Dl, Go, Hr, Jk, Kl, Kl, Mn, Mp, Or, Pj, Rj, Tn, Up, Wb. 0-1800 m.

Pontederia: 4 species: tropical to warm America, naturalized in the Old World

Pontederia cordata Linnaeus: Fig. 339

Stems stolouiferous or rhizomatous, floating, creeping or ascending, 30-80 (-100) cm tall. Leaves submerged, floating or emergent, linear or differentiated into petiole and blade; blade elliptical to ovate or sagittate with rounded lobes, up to 25 cm long, up to 6 cm wide (2-3 times as long as wide). Inflorescence a spike; spathes dissimilar, the lower leaf-like, the upper scale-

like; spikes up to 15 cm long. Perianth hairy, \pm 12 cm long, lower half tubular, 2-lipped above, 6-lobed, the 3 abaxial lobes partly united, the 2 adaxial ones subequal and free, blue to purple or whitish, often with a yellow fleck on the adaxial lobe. Stamens 6 at 2 levels; filaments with glandular hairs; anthers subequal, dorsifixed. Fruit a 1-seeded amhocarp (nut surrounded by a hardened perianth tube), with wing-like ridges.

Perennial. Mostly found in shallow water, often gregarious, sometimes in brackish conditions. The juveniles are submerged; the adults are emergent. The flowers tristylic; pollinated by insects. The disseminules are winged nuts; dispersed by water and probably also by adhesion to animals. Cultivated for ornament. Lowden, R. M. A revision of the genus *Pontederia*. *Rhodora* 75: 426-487 (1973); Price, S. D. and Barrett, S. C. H. The function and adaptive significance of tristyly in *Pontederia cordata*. *Biological Journal of the Linnean Society* 21: 315-329 (1984).

[Ten/Hyp}. Atlantic N America to northern S America, naturalized in Europe, Australia and India: <Ind: <Mh 1986.



fig. 339. *Pontederia cordata*: a, sterile plant (1 cm); b, inflorescence (1 cm); c, fruit (2 mm); d, longitudinal section of a mid-styled flower (5 mm).

POTAMOGETONACEAE [excl. RUPPIACEAE]:

2 genera

Potamogeton: 80-90 species and \pm 40 hybrids: cosmopolitan

Stems usually elongate, flexible, submerged or floating or stoloniferous and creeping, often developing specialized tuber-like buds (turions). Leaves distichous, alternate or occasionally some opposite on part of the shoot, stipulate, often heteromorphic; petioles present or absent; squamulae intravaginales present; stipules free or united with the leaf base, sometimes sheathing the stem or united at the margins to form a ligule; submerged leaves thin, translucent, capillary or linear or with broadened, sessile or petiolate blades; floating leaves often lacking, the blades leathery, opaque, narrowly to broadly elliptical-oblong. Flowers 4-merous, in terminal spikes. Perianth of 4, bract-like, clawed scales inserted opposite each stamen (the perianth is often considered to be an outgrowth of the stamen). Stamens 4, united with the perianth at the base; anthers sessile. Ovary superior, of 4, free or partly united carpels; style 1, short. Fruit a drupelet with fleshy exocarp and bony endocarp.

Perennial or sometimes annual. Found in a wide variety of aquatic habitats, totally submerged or with floating leaves, some temporarily emergent. Occasionally it grows in brackish water. Pollination by wind, epiphyphilous or some hypo hydrophilous (submerged autogamy). The disseminules are drupelets with fleshy exocarp and woody endocarp, dispersed by waterfowl

and also by water. Some species develop mrioiw in conditions poor for growth. Most species are very important for wildlife both as food and as refuge. Some species are reported to be a nuisance in ditches and canals; some are cultivated for decoration. *Potamogeton* species are frequently wrongly named in some Floras; this account must be considered to be provisional as I h;ivc not seen sufficient herbarium material from India.

Y xrlndttl: the following aquatic species are found in the Himalayas but do not extend southwards iiuo India: *Potamogeton alpinus* Balbis; *P. berchtoldii* Kieber; I*, *distinctus* A. Bennett; *P. Jiliformis* Persoon; *P. gmmineus* Linnaeus; *P. lucern* Linnaeus; *P. natam* Linnaeus *P. pusillus* Linnaeus.

I. Ijeas'es tUifartn; the leaf sheaths when young wrapped around the stem; peduncles long and flexible, usually Moaring; flowering spikes interrupted. wiih up to f> pairs or whorls of flowers *P. pectinaha*

1. leaves Jlai; leaf sheaths absent or if **present** in en not wrapped around the stem; peduncles rigid, usually held **above** the water surface; the flowering spikes continuous densely **covered** in Howcrs

2. Blades of submerged leaves clasping the stem (ampk'xiraul) at the base, sessile; floating kaves lacking

3. Leaf margins clearly serrate (teeth visible with the naked eye) and wavy; leaves parallel-sided for **most** of their len^ih; beat of the frail ± 2 mm long; flowering spikes not more than 2 cm long

P. Crispin

3. Leaf margins entire or minutely serrate (teeth not visible wilh the naked eye) and flat; leaves lanceolate to ovate, not parallel-sided for most of their length; beak of the (ruit not **mote** than 1 mm long; flowering spikes usually more than 2 cm long

I', perfoiiaim

2- Blades of submerged leaves gradually narrowed ti (he bar*, uru-i i husping die su-ni. peiioiktic or sessile; Iliiating leaves present or alm-nr

4- Subniei'ged leave* terminating in a shaip-pointed mucro or elongate apjK-ndage; floating leaves lacking

P. malaianus

4. Submenjed leaves rounded or acute ai the apex, not terminating in n mucro or appendage; floating leaves nually **preset**] i at time of flowering

5. **Blades** of submerged leaves lanceolate (not partlleE-sided); hlade* of floating leaves 3—10 (-20) cm long, with the petiole longer than the blade

P. nodosus

5. Blades of submerged leaves linear (**parallel*** **Bided** for most of their length); hlades of floating leaves 1—1 cm long, with the petiole shorter than the blade

f*. *octandrus*

Potamogeton crispus L. Linnaeus; Fig. 340

Stolons nol more iliati '2 mm thick, much branched, reddish, lying Hat just below the surface of the substrate, often developing turions (tubers) ai the ^UP^S. Stems 10-70 (-200) cm long, somewhat flatiened and angular, usually branched, reddish. Stipules very **iWO** deciduous, -1-15 mm long; submerged leaves translucent, linear with almost parallel sides **f5-10** lime⁵ a* long a» wide). (1-) 4-6 (-10) cm long. &*) ^ 1 0 (-15) mm wide, the margins serrate (leelh j«si visib«- **E0 the naked eye**) and **ocuaSy** wavy, rounded or some-Lime* acute at the tips, rounded at the base, 3* or 5*veined, midrib prominent; floating leaves ab Peel unties rigid, erect, emergent, up to 10 cm long. Spikes with 2-10 [lowers, dense, rarely more than 2 tin t<mg- Drupelets globose, usually united below. 5-6 n^m long iiu-hiding the ± 2 mm long **Carved beak**

Submerged perennial. It is found in still and ^{flowing} water and shows a preference for eutrophic <otiditionS- Often gregarious, largo populations may constitute a serious hazard. It is someiimes fVnind in ieinporai> pools where it survives the dry period as ^{dormant} tubers.



FIG. MO, *Potamogeton crispus* L. Linnaeus; a. flower viewed from above (1 mm); b, 1 flowering spike (2 cm); c, flowering spike (2 cm); d, leaf (1 cm) with enlarged view of margin (inset); e, fruit (1 mm).

S lanceolate tobes above. Inflorescence cymose but (lowers appearing solitary and opfKMMd to leaf-like bracts. Flowers hisesual, radially symmetrical; pedicels l'tangaiing fa fruit Sepals 5. yefltMV&fe-glfcen, <><<<<, 0-) 4-6 mm long, underside hiiiry, at amthesis reflexed, deciduous in frviit. Petals (morphologii ully nectar-leaves, often called honey-leaves) 5, broadly elliptical to narrowly ovate, 2-4 (-5) mm long, usually shorter than the sepuh. **pate** jWlow. *Stamens* tnunerous. Receptadc aL anthesis)-2mm long, becoming 2.5-9 mm long in Bruit Qttpel* numerous, superior, free. Fruit a head of (40-) 70-100 (-300) 1-seeded nutlets. Nmlcts oral, 0.8-1 mm in diameter, the i&ea smooth or JaieralJy wriiMcd, glabroiis; style persistent and somewhat beak-1 ike, 0.1-0.2 mm long.

Annual <R sometimes biennial. In seasonally inundated places, marshes and along [lit edges of ponds, streams and rivers. It *tolcOfi&t* brackish water. Pollinated by insects or autogamous. The diss<<*mmules iire timletx, difiperscd by water, in mud nr *petbpt* ;il>u by animals. It comairis protanemonin which may poison livt'snj<k.

IG or biennial Ten/Ephf.. Almost cosmopolitan. probably native in Etnusin; Bun. tnd, Nep, Pak: As, Dl, Jt. Mp, Pj. Rj, Up. Wb.



fit. 54S. /(<<iii#eulm ueitnatwi: a, (lowering jllaiM (2 cm); b- fruitriiR head (2 mm); t, nutlet (0.5 mm). /JmiWiu c. d. (towering aho.,i (1 cm); c. (l<™cr (2 mm).

RUBIACEAE 8; 6>7 genera

Trees, shmbs, lianas or herbs. Leaves opposite or Whorled; sdpntea bites¹* or intrapetirjlar; blades simple. usua(y entire, rnfJorcscences ustiatfv cyniosc, panitin laic or in heads or (lowers solitary. Flowers bfccxua), radially sjinmetrical. Sepals 3- to 5-1 obed. Petals united he low, %• io 5-lolwrđ. Stamens as many as and alteiiuu- ing with ihe petal lohes. Ch'ary inferior, fused to and **imbedded** within the bamtl pi of the sepals; carpels (1) 2 (—); ovules I—*. Fruits berries, drupes, dehiscent or iideiisct-rtl capsules or of 2 tncrirarps.

There is considerable generiL- <imin*ion in *thti* family. On a worldwide basis the genera *Htdyods* and *rt/Jtno//?jw/j//* run into *each* other, *hi* India, however, they seem to be well separated. The wetland species of India, small berlw tviih ihiti-wallrd capsules, ai'e placed in cbf genus *OidmInndia**

Excluded: ivc-dntid species not extending south of Lhc Himalayas: *GaliumpatuxtreI* Innatus.

The following gr(»w in wel <R rJanip places but do not really cjialify as wetland plants; others are weedy annuals t)iu may grow in places where wntcr stood during the monsoon bui has dried out (in the dry *easori they replace the wetland'species in this kind of habitat): *KuhauHa aspcra* {lleynv ex Rolh) Brmcakaxiip [*OMrttiavrfia* (tifrra (Heyne ex Roth) A. P. det^ n<lo!lc]; *K. gracilis* (WalBcb) A. P, de Candolle [*Hedyotis gradlu* Wallich, *hi. %tridn* Wallich non Smith]; *K. retrona* Boise; *Hetty-nth hirsuta* Linnaeus fil. \H, *japonic/I* Miquel, *H. thutleyina*, D. Fiookcr ex Wight el Amott, *H. itipu-Inta* R. Brown ex J. I). Hooker); // . *pinifolia* Wallich; *Nemodia iadica* (A. P. de Candolle) W. H. Lewh [*Hedyotis affini** Wight e(Ainutt. *If. Usckcnrtultitina* Walikh ex Wight tt ArnotlJ; *N. numnularia* (Amott) J. D. Efdofctf *'?O>\N. *wyphyita* (G. Don} W. H. [A*wis: •?Inrt; *Spermacoce hispida* Unnaeus (*Bamma artiatlam* (Unnaeus fil.) K. H. Williams]; 5. *pusiUa* (Wallich) A. P. de CancKtlle [*Bigrlimtia lasiofarpa* Wight et Aniou, B. TVxtMf%J>iana Wight el Aniot; B. *kianii* Wight ct Arnolt, *Barrria itrielaawci- hid., turn liim;tcus*

- 1. Stipules entire; flowering nodes alternating with [] <iwe r Iris o n e s *Dentria*
- 1. Stipules lobed or fnnbriate; llowering mn\vs nut alternating wiU] flowerless ones, niost &od£9 bearing flowers *Oldenlandia*

Dentelia ± 10 species: Indinnalaysia and Australia
Dentella rtp&w (linoacits) J. R- et J. G. A. Forster [*D. serpyllifolia* Wallich ex Oraib. *Oidtntandia refum* Uniaeus]:Fig. M^

SteflOi creeping, rooting, inut li blanched, cushion-forming. I.eaves distichous in <pp<jsiie pairs, ^thorily petiolatc at base of ihoot, sessile above; stipules inter-

petiolar, united below, transparent, entire, with few hairs; petiole 2-4 mm long; blades elliptical-oblong to oblong-obovate to rhomboid, 4-10 mm long, 2-5 mm wide, 1-nerved, base cuneate, apex acute to attenuate. Flowering nodes alternating with flowerless ones. Flowers solitary in the axils of leaf-like bracts or in branch axils, subsessile; pedicel 0.3-2 mm long. Sepal tube 5-ribbed, 2-3 mm long, glabrous or hairy; lobes 5, equal, valvate, narrowly triangular, ± 2 mm long, acute-acuminate. Petals funnel-shaped, 5-15 mm long, with club-shaped hairs inside; lobes 5, usually somewhat unequal, white with a purplish spot at the base, ± 4.5 mm long, membranous, subacute. Stamens 5, included within the petals, attached near to the base of the tube; filaments up to 0.5 mm long; anthers ± 1 mm long. Capsule 2-locular, indehiscent, subglobose, 3-4 mm in diameter, densely hairy with white somewhat swollen hairs or glabrous, crowned by the persistent sepals. Seeds ± 0.5 mm long, angular, dark brown, with a reticulate surface pattern.

Annual or perhaps sometimes perennial. Delicate herb forming dense mats. Creeping on drying out mud around pools and in rice fields, river banks and in marshy places. It flowers the whole year with a peak in winter. The disseminules are probably capsules that break up later. Plants with glabrous capsules are sometimes recognized as a distinct species called *Dentella serpyllifolia*.

{O (©)? Hel}. S and SE Asia, Australia and Polynesia: Ban, Bur, Cey, Ind: <An, Ap, Bh, Gj, Go, Kl, Kt, Lk, Mh, Mp, Or, Rj, Tn, Tp, Up, Wb.

Oldenlandia [excluded from *Hedyotis*] ± 150 species (including *Hedyotis* 300-480 species): pan tropics

Annual or perennial herbs. Leaves decussate; stipules develop between the leaf pairs, united below into a sheath, with triangular lobes above, margins usually imbricate; leaf blades entire, sessile or shortly petiolate. Bracts leaf-like, scale-like or united below into a sheath. Flowers in cymes, pairs or solitary in axils. Sepals 4-lobed, usually persisting in fruit. Petals 4-lobed. Stamens 4, attached to the petal tube. Disk ring-like. Ovary globose or nearly so, 2-locular; style filiform; stigmas 2, linear. Fruit a capsule, thin-walled, opening above the sepal lobes by 2 valves. Seeds 2 to numerous.

Except for changing the generic name, I have accepted the treatment of Sivarajan, V. V. and Biju, S. D. Taxonomic and nomenclatural notes on the *Hedyotis corymbosa-diffusa* complex (Rubiaceae) in India. Taxon 39(4): 665-674 (1990) but am not convinced the treatment is correct; see also Halford, D. A. Review of the genus *Oldenlandia* L., and related genera in Australia. *Austrobaileya* 3(4): 683-722 (1992).

Excluded: species sometimes found moist or damp places but not wetland plants: *Oldenlandia ajfinis* (Roemer et Schultes) A. P. de Candolle [*Hedyotis ajfinis* Roemer et Schultes, *H. dichotoma* auct. Ind., non Heyne ex Roth]: *Ind; *O. auriculata* (Linnaeus) Schumacher [*Hedyotis auricularia* Linnaeus]; *O. biflora* Linnaeus [*O. paniculata* auct. Ind., non Linnaeus, *Oldenlandia biflora* sensu Roxburgh, non Linnaeus; *Hedyotis biflora* (Linnaeus) Lamarck, *H. racemosa* Lamarck]; *O. erecta* (K. S. Manilal et V. V. Sivarajan) ined. [*Hedyotis erecta* K. S. Manilal et V. V. Sivarajan, *H. corymbosa* var. *Unearis* sensu Duatta, non *O. lineans* A. P. de Candolle]; *O. herbacea* (Linnaeus) Roxburgh [*O. heynei* G. Don, *Hedyotis herbacea* Linnaeus]; *O. nitida* (Wight et Arnott) Gamble [*Hedyotis nitida* Wight et Arnott, *H. glabella* R. Brown ex Beddome]: •Cey. •Ind; *O. pumila* (Linnaeus fil.) A. P. de Candolle [*O. crystallina* Roxburgh, *Hedyotis pumila* Linnaeus fil.]; *O. trinervia* Retzius [*Hedyotis trinervia* (Retzius) Roemer et Schultes]: *?Ind.

1. Stems 4-angled or 4-winged; petals with a ring of hairs at the throat; capsules spreading or erect

O. corymbosa

1. Stems terete or longitudinally ribbed but never 4-angled or 4-winged; petals glabrous, without a ring of hairs; at least some capsules nodding

2. Stems, peduncles and pedicels glabrous, without short bristle-like hairs; flowers not more than 2 in a cyme

O. brachypoda

2. Stems, peduncles and pedicels with short bristle-like hairs; at least some flowers in 3- or more-flowered cymes

O. [unclear]

Oldenlandia brachypoda A. P. de Candolle [*O. diffuse* auct. Ind., pro parte, non Willdenow, *H. brachypoda* (A. P. de Candolle) V. V. Sivarajan et S. D. Bijul Fig. 344

Stems floating, prostrate or erect, often rooting at nodes, branched, glabrous, terete, smooth or longitudinally ribbed but never 4-angled or 4-ribbed, 10-⁴⁵ (-200) cm long. Leaf blades sessile, linear or linear-lanceolate, 1-3 (-5) cm long, 1-5 mm wide, base narrowed, margin usually inrolled, apex acute to apiculate. Flowers solitary, 2 at a node or in 2-flowered cymes; peduncles up to ± 5 mm long; pedicels 0-1 (-3) ^{mlTI} long at anthesis sometimes elongating later. Sepal tube 1-1.3 mm long, usually glabrous; lobes 4, equal, narrowly triangular, much shorter than the petal tube, often spreading in bud, 1-1.3 mm long in fruit, ciliate, acute or acuminate. Petal tube 1.25-2.5 mm long, glabrous; lobes 4, triangular, white or purplish, glabrous at the throat. Stamens 4, attached towards the top of the w^{De>} anthers ± 0.25 mm long. Capsule mostly nodding-

globose to ovoid, somewhat compressed. 2-3 mm long. 2-5 mm wide, crown of capsule hardly raised, opening by slits which enlarge into a pore. Seeds numerous, irregularly angular, ±0.3 mm long, brown, surface reticulate.

Annual. Weed in fringing wetlands. It sometimes grows in water 1 m or more deep. The submerged stems are usually leafless, it is used locally in medicine.

«©)? Heif. Warm and tropical Asia, naturalized in America: Ban, Bh, Cey, Ind, Nep: An, Ap, Ar, As, Bh, Kl, Ki, U? M_K. Mn. Or, Sk. Tn, Tp. L>. Wb.

Oldenlandia cerymbia UnnaoUS [O a<i>»/(j)rt C. Don, O. ctyi/fori, A. P. de DmdoBc, /JWytfu aaytahasa iUnnwns) J.tmutrck. H. dp*** Boemer ci SchUltW, W. inh>rmnl,a Wight el ArnortJ: Fig- 344

Stems prostrate with ascending branches. 4-ribbed or winged, usually branched from the base. 0.5-1 m long. Leaf blades sessile, linear to narrowly elliptical, (0.6-1) 1-8 (-5) cm long. (°-*->

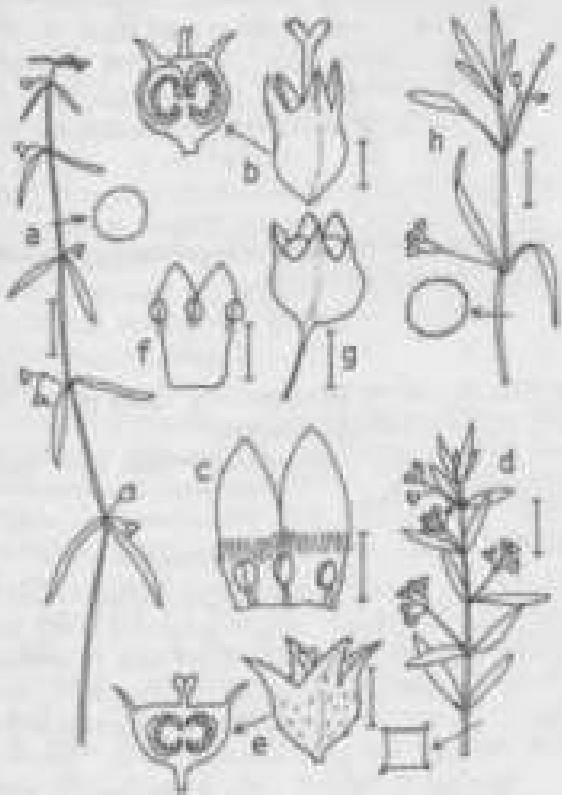


Fig. 14*. (*MtnkniiM btarht*)>d<t • *, flwtrrtng OIOOI 0 ""> with tranwerac »C«KUI of stem fiiwct): b, fruinvitli longhadi-
 tal section (inset) (IJ mm), d emymbatti C BIO fl
 viewed from ir, i,ir <1 mm): d. Bmwatag *h.x.L (I <-^
 transverse tecton *jf ttem (hwd); ft fruit wiil lunpi
 section (m»el) (1.S mtii^ ft rf^w<: f. «™ petal* viewed
 inside (fl.fi tnm); ^ fniii fIJ mm); b, nuwcring <h<>t (1 cm)
 i Lransvenc iwctioit ofsrtrm (in-set h

1.5-3 (-7) mm »vid<\ glabrous, base narrowed, margin usually inrolled, apex acute to apiculate. Howers homostylous, mostly in pedunculate, umbel-like, drymbs. of 5-8 flowers at a node, rarely in pedunculate pairs or solitary-, peduncles (0-) 4-8 (-20) mm long; pedicels 1-7 (-20) mm long, very slender. Sepal tube gibbous, ± 1 mm in diameter lobes 4 (>), equal, triangular, shorter than the petal tube 0.5-2 mm long in fruit. margin broadly, acute or acuminate Petal tube cylindrical, 0.5-1 (-3.5) mm long; lobes 4 (5), elliptical or ovate, 0.5-2 mm long, white, pale purple or pale pink, with a line of rather long silky hairs at the throat. Stamens 4 (5), inserted at the base of the petal tube; anthers 0.2-0.5 mm long; anthers dark blue, ± 0.4 mm long, included in the petal tube, Style and stigma shorter than the style. Capsule exserted subglobose to obovoid, roundish in transverse section, somewhat flattened, 1.2-1.5 mm long, 1-3.5 mm wide, crown at capsule slightly raised, opening by slits which enlarge into a pore. Seeds numerous, obconic, rarely compressed, irregularly angular, ± 0.3 mm long, brown. surface reticulate.

AntUJal. A common and widespread weedy plant, not confined to wetlands but frequently found in rice fields, flooded lake shores, pools on laterite and other seasonally inundated places, sometimes even in flowing water. It is very variable in form and some varieties have been described.

[O Heif. Tropical Africa, S and SE Asia, probably naturalized in tropical America and Australia: Ban/ Cey. Ind, Nep. Pnk: Ap, As, Bh, Go, Kl, Kl. 1-k. Mh, Mp, Or, Pj. Rj, Tn. Tp, Up. 0-2400 m.

Oldenlandia diffusa (WaldenOW) Roxburgh [*O. pseudocofimbria* (R. C. Bakhuizen van den Brink) C R- Babu, *Hedyotis diffusa* Wilk'now, *H. ramouissima* S. Kin/j: Ftg.344

Stems prostrate or erect, often rooting at nodes, branched, with small bristle-like hairs, terete. smooth or longitudinally ribbed but never 4-angled or 4-ribbed. 8-10 (-4) m long or in water 1 m or more long. Leaf blades sessile, linear-lanceolate. 1-3 (-5) cm long, 2-5 mm wide, base narrowed, margin usually inrolled, apex acute to apiculate. Flowers very rarely solitary, sometimes 2 at a node, usually in axillary 3- to 7-flowered cymes; peduncles tip to ±1.5 cm long; pedicels 0.5-2 (-5) mm long at anthesis sometimes elongating in fruit. Sepal margin ± 2 mm long. Sepal tube glabrous; lobes 4 (5), equal, narrowly triangular, shorter than the petal tube, 0.5-1 mm long in fruit. ciliae, acute or acuminate. Petal tube 0.9-1.3 mm long, gibbous; lobes 4 (5). triangular, white or purple, glabrous at the throat. Stamens 4, attached towards the top of the style; anthers ±0.25 mm long.

The following grow in wet or damp places but do not really qualify as wetland plants; others are weedy annuals that may grow in places where water stood during the monsoon but has dried out (in the dry season they replace the wetland species in this kind of habitat): *Adenosma camphoratum* (Vahl) J. D. Hooker: •Cey; *A. indiana* (Louretro) Merrill; *A. javamica* {Blume} Koorders; *A. subrepens* (Thwaites) Bentham ex J. D. Hooker: »Cey, • Ind; *Angdonia goyazensis* Bentham [*A. salicariifolia* auct. Ind., non Humboldt et Bonpland]; *Artanema longifolium* (Linnaeus) Vatke; *Legzpia polygonoides* {Bentham} Yamazaki [*Torema mucronulata* Bentham]; *Craterostigma plantagmaeum* Hochstetter; *Maztts deUtvayi* Bonati; *M. pumilus* (N. L. Burman) van Steenis; *Mecardonia procumbent* (Miller) Small [*Bacopaprowmbens* (Miller) Greenman, *Lindernia dianthem* Swartz]; *Scoparia dulcis* Linnaeus [*Gratiola micrantha* Nuttall]; *Sopubia delphimfolia* (Linnaeus) G. Don; *Stemodia viscosa* Roxburgh; *Sutera dissecta* (Delpino) Walpers; *Torenia bicolor* Dalzell; *T. cyanea* Alston: *Cey; *T. fcVitfermOTftesSaldanha*: *Ind: KI.

Indeterminate: *Bonnaya quinqueloba* Blatter et Hallberg and *Bonnayodes Umnophiloides* Blatter et Hallberg — their status and ecology are unknown; the original descriptions are inadequate. I have not been able to see any material of these two plants.

I. Petal tube very short, the lobes appearing free, flat and spreading; abaxial (lower) petal lobe smaller than the rest; stamens 2, spreading laterally *Veronica*

*• Petal tube short or long, the lobes not appearing free; abaxial (lower) petal lobe or lobes not smaller than the rest; stamens 2, 4 or rarely 5, not spreading laterally

2. Abaxial filaments (of fertile or sterile stamens) appendaged {spur-like or elongate), swollen or knee-like at point of attachment to the petals *lindernia*

2. Abaxial filaments not appendaged at the point of attachment to the petals

3. Sepal lobes 3 or 4

4. Sepal lobes 4, subulate-lanceolate, much longer than the sepal tube; stigma subcapitate, ± straight; stamens 2; stems erect or floating *Bythophyton*

4. Sepal lobes 3, broadly triangular, equal to or shorter than the sepal tube; stigma broadly spatulate, entire, curving over the stamens; stamens 2 or 4; minute; stems creeping *Glossostigma*

3. Sepal lobes 5

5. Sepal and petal lobes ciliate {minute herbs)

Microcarpaea

5. Sepal and petal lobes without cilia

6. Sepal tube 5-angled; abaxial petal lip with 2, hairy patches at the base *Mimulus*

6. Sepal tube not 5-angled, abaxial petal lip without 2, hairy patches

7. Sepals enlarged and globose in fruit; stamens 2 (small, creeping herbs) *Peplidium*

7. Sepals not enlarged in fruit, not globose; stamens usually more than 2

8. Petal tube not strongly 2-lipped; petal lobes equal or subequal

9. Anther locules spurred; 1 loculus of each anther small and empty or aborted; roots orange (hemiparasitic herbs with entire leaves) *Centranthera*

9. Anther locules not spurred; both locules of each anther fertile or both aborted; roots not orange (hemiparasitic herbs with entire leaves)

10. Stigmas simple; stamens each with a tuft of hairs at the base; petal tube long and slender, 5-10 times longer than the petal lobes (hemiparasitic annual herbs with leaves or their segments filiform) *Rhampkicarpa*

10. Stamens without tufts of hairs at the base; petal tube not long and slender, rarely more than 5 times longer than the petal lobes *Bacopa*

8. Petal tube 2-lipped; petal lobes unequal

11. Basal leaves in a rosette with stem leaves much reduced and scale-like *Dopatrium*

11. Basal leaves not in a rosette

12. Flowers in terminal or axillary spikes or racemes *Limnophila*

12- Flowers solitary or in pairs in leaf axils

13. Anther locules united, parallel *Bacopa*

13. Anther locules free from each other, usually divergent *Limnophila*

Bacopa [*Bramia*, *Herpestis*, *Mella*, *Monniera*, *Moniera* orth. mut. and perhaps *Sinobacopa*]: ± 70 species: warm regions of the world, most in America

Herbs sometimes aromatic when bruised. Stems creeping or erect. Leaves opposite or whorled; blades sessile. Flowers solitary or in pairs or clusters in the leaf axils; bracteoles if present just beneath the calyx tube. Sepal lobes 5, usually unequal. Petal lobes 5, subequal or 2-lipped, blue, purple or white. Stamens 2-5, all fertile; anther locules united and parallel. Stigmas 2, free or united below; capsules loculicidally or septically dehiscent.

Annual or perennial. Submerged, seasonally submerged or terrestrial. The disseminules are seeds, some dispersed in mud, some by water, others unknown. Several species are cultivated for decoration. *Bacopa rotundifolia* (Michaux) Wettstein, an American species, is spreading in Asia but not recorded from India; it differs from the Indian species in lacking bracteoles and having obovate to orbicular leaf blades.

1. Stems (**seeping** with ascendent or erect branches, solid with narrow lacunae; pedicels 5-20 nun long; sepals glabrous *B. mottmieri*

1. Stems erect, **hollow**, with a ring of large lacunae.; pedicels (W5 mm long; sepals hairy

2. **Flower*** pedicellate. 1-3 in **teafaxOfi** *B. floribunda*
2. Flowers sessile, solitary tn loaf axils g, *hamilianiana*

Bacopafloribunda (K. Brown) Wettstein: Fig. 346

Stems glabrous, 4-sided, erect, simple or branched from below. **10-80** (-65) cm tall, hollow **with** a ring of large lacunae. **Leaves decussate**, sessile or nearly so, linear-fanccolate. 1-3.5 (-7) cm long, 2-5 (-10) mm wide, margin slightly **notched**, apex *acute*. Flowers **pedicellate**, 1 or 2 (3) in leaf axils; **bracteoles 2**, tilted, 1.5-2 nun long; pedicels (0.5-) 1-3 (-5) mm long, hairy. Sepal lobes divided to the base. **Imbricate**, membranous, **unequal**; the outer 2 larger, broadly oval, obtuse, ± 4 mm long increasing to ± 6 mm in fruit, 2-4 mm wide; the inner 2 and the median

3-4 mm long. Petals white usually with purple veins; petal lobe ± 1.5 mm **fang**; **petal** lobes weakly 2-lipped; the adaxial lip ± 2.5 mm **hog**, ± 1.2 mm wide, glabrous; abaxial lip oblong to spatulate, **Staswtli** 4, all fertile; **filament** 2 ± 1 mm long, the other 2 ± 2.5 mm long; **anther locules** united and **parallel**, ± 1.3 mm long. Capsule ellipsoid-ovoid to **oblong-globose**, **8-5** mm long, ± 2.5 mm in **diameter**, 2- or 4-valved, **dehiscent** the **placenta**; the nutlet parietal and not winged. Seeds prismatic 0.6-1 mm long, reticulate.

Annual. In wet **places**, in **edge** fields and **near** on **wet** sand around drying ponds. Usually frequent and **often** abundant.

[O Hcl). Old World tropics: Cey (not *U* **un** **rtscenty**), **Indo** <An, Ck>. KJ. Kt, Rj. Tn.

Bacopa kamiuniantt (Beuhnm) Wettstein: Fig. 346

Like *H. flaribunda* but stems ± *iv. r. ie*: flowers solitary and sessile in leaf axils; petals pink or bluish-pink, **with purple** wings; placentas winged and sepals **dividing** in fruit.

Annual; in wet places.

1 (C Hei). Old World tropics: Ban. Ind, Nep: M **G**-Go. Kl. Kt, Mfj. Mh, Mp. Pj, Rj. **Wh**.

Bacopa mormieri (Linnaeus) Pennell *vtmmin mottnuta* (Linnaeus) Weustein, *Monirra atrifolia* Mithaux]: Fig. 346

Stems creeping with **wooldeat** or **erect** branches. 5-50 cm long, **indistinctly** 1-sided, solid with narrow lacunae. Leaves decussate, sessile or nearly so. **«s»** **sori** **whai** **suctuleni**. oblong-ovate. **1** **«b»** **6-20** mm long, 3-10 mm wide, with **sunken** **stipules** dots, margin entire, apex **obtuse**. **Flowers** pedicellate, solitary in leaf axils; pedicels 5-15 (-20) cm **1** **g**; **bracteole** 2. linear. ***-8** (-H) **nan** long. **S**-**pal** lobes divided (**O** the **bate**, imbricate, **gmnwhal** soft **glabrous**, **pinnate**, **unequal**; the **outer** 2 larger, **6-8** **mm** long. **0.7-1.5** mm wide; the **median** 1 **cm** long, ± 5.5 mm long, ± 2 mm wide. Petals white to pink or pale violet. **inner** **green** bands inside **il** **llo**at, ± **S** **torn** in diameter; **p** **u**) **IMH** **ciimpan** **5-9** mm long; petal lobes **unequal** or weakly 2-lipped 3-5 mm long. Stamens 4, all **lenit**: anther one **p** **u** **± 1** mm long, the **other** pair ± 2.5 mm long; **•** **&** **«** **locules** united and **parallel**. **5** mm long. Capsule oblong-ovoid, 3-5 mm long, ± 2.5 mm in **diameter**. 2- or 4-valved. **septate** or **loculicidally** **ind** **leptoc** **dally** **dchisciii**. **Seeds** **ovoid** **long**, **QJML6** nun **I** **reiculae** **bt** **also** **longitudinally** **striate**.

Perennial or perhaps sometimes annual. **Grass** **id** **often** **growing** **den** **in** **marshy** **places**. **&** **ka** **pf** **and** **along** **streams** **and** **ditches**. It **is**



Re. 346. *Bacopa flaribunda* (K. Brown) Wettstein: a, flowering branch (1 cm); b, flowering branch (2 cm). *B. kamiuniantt* (Beuhnm) Wettstein: c, portion of flowering branch (1 cm); d, flowering branch (1 cm); e, detail of flower (2 mm).

aur hrackisli conditions. Frequently found in rice fields
bin tjo] *conwUrtii harmlui*. It contains *hrriapon'm*
which *h* used in medicine as a potent diuretic, caj di<
Ionic and tranquillizer. Plants bailed in N&cr arc used
as purgative or akin lotion; also said to lx.¹ a nerve tonic.

J(G>? }M/iWc)/(Hy(i)! Tropics and sitbirapics of
The world: Cey, Ind, Nep. Pak: An, Ap, As, Bh, Dl, Gj,
Oo. KJ, KI. Lfc, Mil, Mp. Or. Pj, Rj, To, Wb.

Bytlopyt: I species

Bytlophytwi indicuntj. D. Hooker: Fig. 547

Stems submerged or emergent, flaccid, up to ± 8 cm
long. **LdVcJ** opposite, subulate-lanceolate, **entire**.
RtartBrj solitary, short **Jy pedkelied**, i> feaf axrfs, sW*
merged flower* **deistogamous**. Sepal lobes -I. unircil
<^mly M Lhe base, equal, subulate-lanceolate, much
longer than tin: sepal tube. **Petal** lobes 4, subequat.
•bortei than the tube. Stamens 2, the fijaints very
short, noi appendaged. Style shun, turvtrd; sti^ttia sul-
rift; Capsule* **Aatttoed laterally**; broadly oblong,
much shoner than the sepals.

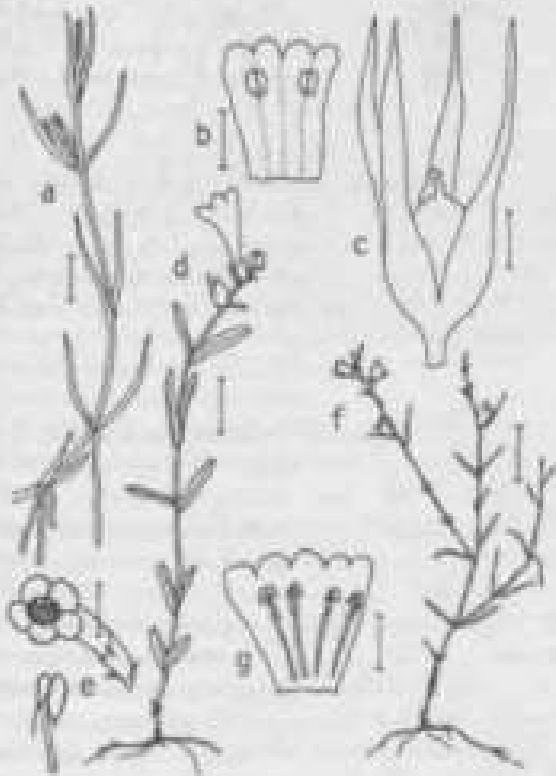


FIG. 347. *Centranthera nutiflora*; a. flowering nhdtH (5 mm);
b. peiai iubu oJK-hed 11 BUB); c. immature capiule and ,<p.iK
Onvtn). *Ontmrnhfta ifuffo*: d. Rowchfir plant niih hairs
omim-d <t cm); e, Qoaei (1 cm) wih stamen (inset).
'• *tntnqutteriat*: t. fiowcriog p3ad (3 <n^; g. P'8<d n*
opened (2.5 tuitu)

Probably annual. A poorly known plant; the juvt-nik-
;rt- sulwuergrd; *the* adtdl.t are <(bmef^ed. pardy emer-
gent and perhaps also temporarily terrestrial. Perhaps
ptillin;icid by insect but most likely to be autogamous.
The rfiss*minules an- <?M:S; the dispersal is unknown.

10? V</Hyp/J>n?j. NE JndJa and Philippines
(Lamoth Ban." Ind: M_K (Khasi Hills).

Centranthera: 5 or 6 sptcies

Anniink ^iit <m;tge roots. Stems prtstntie or erect
Flowers soliiian' or in lax spites IM racemrs; hracicoU-s 2.
oblong. Scpak irregular, shortly 3- to 5-litbed. Petals pink
to puq)le, the uibe. funnekshaped and curved, the lobes
 \pm equal of weakly 2-lipperl, w<> adaxiai (upper) lobes
inside in bud, Stamfens 4, included; anthers combinc-el in
pake* i he locules sprnct-d or [jointed at the base, one
lot tit us of each arthri MIL;III, cmpiy or aboned. *Stigma*
conque-shaped. Capsules longitudinally 2-valved.

Reported to be rool pai'asiles on grasses.

L. Blad rh nf sieni leave* ohloug to ov<lic-i>blurig: pvials
moie than (5 mm long, *the* lobes unite or pint

C. mdifri

I_k Blades of stein loaves lin^ur to ti near-filiform; priak
less than 15 mm long, the lobes yelkm

Centranthera indicu (Linnaeus) Gamble [*C. kbtipida*
R. Brown, (*I. ntffnlrn^it* D. Don, *C. frrvcu.yrjbtm*§
(k-ntfumj: Fig. 847

Stems prostrate and branched from below or erect,
up to 90 cm high, hispid. Leaf blades Missile, oblong to
ovate-oblong, 0;9-3^ cm long. + 3 mm wide, hispid, sd
base truncate, at tip suhacun*. BlOCS linear to linen-
lanceolate, 4-7 mm long, 15-4 mm wide; pedicels
1-2 mm long; bracteoles oblong to ovaie-oblong,
3-3.5 mm long. ± 1 min wide. Sepate ^-IfI mm tang.
the lobe* lanceolate. Peiais 18-.S] mm long, *the* lobes
white t<< pink. C^apitiiles ovoid, 5-8inm long, 4-5 mm
wide, shorter than the sepal*, Seeds obloiiig-cuitcate,
 ± 1 mm long, striped.

Annual. Not confined to wetland* but often found
in grass-dominated marshes and swamps.

jO Hcl/Tcn>)S iitid SF -Vsa and Australia: Ban. Bur,
Ccy. Ind, Nep: KJ, Kt. Mh. Pj, Lp.

CrtttranthfTV trvnqtmbarica (Sprengcl) Mrrrill | (*. *hum's-*
juui Wallich ex Brntham. *Tortnia Irpidata* Roth):
Fi^ 347

Steins erert, 6-15 (-20) cm high, often branched from
below, glabrous to sparsely hispid. U-af blades *ternU*: at
hase of stem oblong to watt'Kjblong. ^long the stem
HttOU¹ to Ijytear-filiform. S-5S (-80) mm long, 0.5-1.5
(-20) mm wide, glabrous to aparw-lv *tibtfd*, ai base nar-

rowed, at lip subobovate. Bract linear-lanceolate to ovate-lanceolate. 1-7 mm or more long; flowers subsessile; bract 2. linear. 1-1.5 mm long. Sepals 3 (-5) narrow long, inflated, the lobes linear. Petals 10-11 mm long, the tube maroon, the lobes yellow. Capsules globose. ± 4 mm long and width slightly shorter than the sepals. Seeds oblong 0.5-1 mm long, reticulate.

Anthers. Usually found in rather wet places often near rice-sea, in mountainous, upland, and lowland courses in riot fields.

(0 Hel/Ten? J. S and SE Asia: Ban. Cey, Ind: Bh, GJ, Go, Kl. Tn.

Dopatrium: 12 species: Old World tropics and sub tropics, naturalized in N America

Stems erect, simple or sometimes branched below; usually somewhat succulent. Leaves opposite; the basal leaves often forming a loose rosette; upper leaves usually flattened and scale-like. Flowers solitary, in axils of bracts; submerged flowers distogamous. Sepal lobes < 5 , equal on abaxial side, longer than the tube. Petal tube 2-lipped: lobes 5. white, blue, purple or yellow. Stamens 4, the 2 adaxial ones fertile with loosely joined and parallel filaments, the 2 abaxial ones sterile. Stigma almost pale with 2 flattened lobes. Capsules frequently dehiscent

Annual. The juveniles are submerged; the adults are submerged, emergent or temporarily terrestrial. Pollinated by insects or autogamous (staminate dehiscent), The disseminules are seeds which are dispersed in mud, perhaps also by wind and water.

1. Capsules obovoid-oblong, apex acute; pedicel defined in fruit *D. nudicaule*

1. Capsules globose, apex obtuse; pedicel terete or horizontal in fruit

2. Lower leaves sessile or nearly so; pedicel erect in fruit; anthers unequal; petals pink to blue or purple

D. jattceum

2- Lower flowers pedicellate; pedicel horizontal in fruit; anthers equal; petals violet to deep blue

D. lobtlioides

Dopatrium junctum (Koxburgh.) F. & M. U. S. ex Benth. *junmmvt* & *muUihba* Blatter ei MaH-bcrgf: Rjf. 348

Stems 10-35 (-40) cm (all. Blades of lower leaves oblong to linear-lanceolate, 4-8 mm long, 1-7 mm wide, middle and upper sessile or short petioled. Flatten in decussate pairs, the lower ones more or less in the upper ones petioled; pedicel very slender. Lvs (-12) mm long, 0.5-1 mm wide. Sepal tubes campanulate. 1-1.5 mm long; lobes marginal, 1-1.3 mm long, obtuse. Petals 10-11 mm long, pink to blue

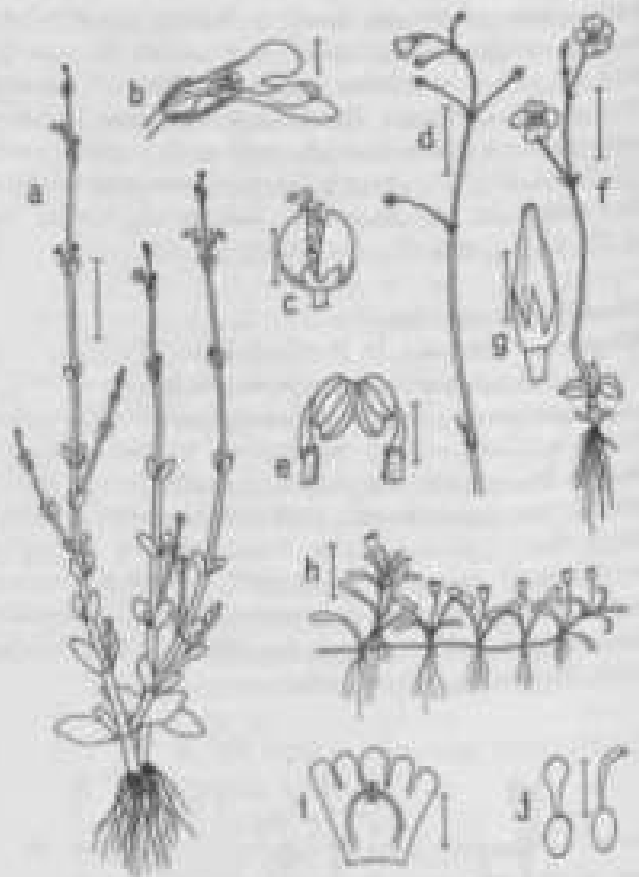


Fig. 348. *Dopatrium junctum*: a. Whole plant (2 cm); b. Longitudinal section of stem (1 mm); c. Flower (1 mm); d. Longitudinal section of capsule (1 mm); e. Capsule with lid removed (1 mm); f. Flowering branch (2 cm); g. Leaves (2 cm); h. Stamens (1 mm); i. Anthers (1 mm).

or purple; petal tube 3.5-4 mm long; adaxial lip ± 8 mm long; abaxial lip ± 8 mm long, with a white patch on the middle lobe. Siamensis filaments ± 0.5 mm long; anthers equal, 0.5 mm long. Tube flattened. Gap broadly ellipsoid to globose, 1 mm long. Seeds broadly ellipsoid to globose, 1 mm long. Longitudinally ribbed, unimbricate between the ribs.

Annual. Coccinea under water. Fls white to blue. W. U. S. recedes to is often gregarious and locally abundant in post-monsoon rice fields mid perennially. W. U. S. lower leaves are usually clewtrigamous. Tropical Asia. Australia and (V. U. S. in N America; Ban. Cey, Ind, Ncp: An. As. Co. Jk. hi, Ki. Mp. Rj. Tn. Wb.

Dopatrium tabelioides (Rexius) Bentham: Fig. 348. Stems upright or weakly branched. Leaves crowded, arid thickened below. Lower leaves crowded, oblong

lanceolate to oblong, 2.5-5.5 cm long, 1-1.7 cm wide, subacute at apex; stem leaves distant, 0.7-2 cm long, 0.5-0.9 cm wide, those subtending flowers scale-like. Flowers pedicellate, in decussate pairs; pedicel 7-17 mm long, horizontal in fruit. Sepal tube \pm 1.5 mm long; lobes oblong, 1.5-2.5 mm long, obtuse. Petals violet to deep blue; petal tube 4-5 mm long; adaxial lip \pm 10 mm long; abaxial lip \pm 6 mm long. Stamen filaments \pm 1 mm long; anthers equal, \pm 0.7 mm long, bearded along the margin. Capsules globose, 1.5-4.5 mm in diameter. Seeds oblong-uneiform, \pm 0.6 mm long, longitudinally ribbed, transversely rugose between the ribs.

Annual. In shallow water in tanks and flooded rice fields. Sometimes gregarious. A common but rarely harmful weed in paddy fields.

[O Ten]. Endemic to southern India and Sri Lanka: Cey, •Ind:Kl,Tn.

Dofiatrum nudicaule (Rottler) Bentham [*Oratiola cuneifolia* Roxburgh]: Fig. 348

Stems 9-12 (-25) cm tall. Lower leaves obovate-oblong, 2-7 mm long, 1-3.5 (-5) mm wide, apex obtuse. Flowers pedicellate, solitary or in ^d«^us^sa^l pairs; pedicels 7-15 mm long, elongating and denixed in fruit; bracts linear-lanceolate, \pm 1 mm long. Sepal tube \pm 1 mm long; lobes up to 0.75 mm long acute. Petals bluish; petal tube 3-4 mm long, dull blue, adaxial lip \pm 3 mm long, 2-lobed, brilliant dark purple-blue; abaxial lip \pm 3 mm long, pale bluish-purple, the middle lobe with a whitish blotch at the base. Stamen filaments \pm 0.7 mm long; anthers unequal, \pm 0.7 mm long, minutely bearded at the base. Capsules obovoid-oblong, 3-3.5 mm long, bluntly pointed at the apex. Seeds irregularly cuneiform, 0.3 mm long, rugulose.

Annual. Locally abundant, in post-monsoon pools on clayey soil and in rice fields.

{O Ten}. S India, Sri Lanka and Philippines. Cey, /nd: Tn.

Glossostigma [excluded from *Mierocarpha*]: 5 species: Africa, India, Australia and New Zealand; 1 species in India

Glossostigma diandrum (Linnaeus) O. Kuntze [*Mierocarphaespathulata*]. D. Hooker]: Fig. 348

Stems capillary, creeping, rooting at most nodes, mat- or turf forming. Leaves opposite or occasionally whorled, spatulate, sometimes somewhat succulent, entire, 0.5-1 cm long, up to 1.5 mm wide, nerves obscure, apex obtuse. Flowers minute, pedicellate, solitary, in leaf axils; submerged flowers cleistogamous; pedicel up to 1 cm long. Sepal tube campanulate lobes 3, broadly triangular, \pm 2 mm long, equal to or shorter than the sepal tube. Petal \pm 1 mm long; lobes (4) 5, pinkish-white, adaxial lobes up to 0.4 mm long.

abaxial lobes up to 0.7 mm long. Stamens 2; filaments filiform, 0.8 mm long; anther locules diverging at the base, confluent at the apex, 0.2 mm long. Style \pm 1 mm long, elongate, flattened above into a broad spatulate stigma usually covering the stamens. Capsules globose; seeds ellipsoid.

Annual or when in permanent water perhaps perennial. It is seasonally submerged and flowers as the water recedes. It is gregarious and forms mats. Probably mostly autogamous and sometimes cleistogamous, but perhaps occasionally pollinated by insects. The disseminules are seeds, dispersed in mud. It is frequent in rice fields but not considered troublesome. It is cultivated in aquaria for decoration.

{(0) Ten/HeI}. Old World tropics: Ban? Ind: Ap, Bh, Dl, Kl, Kt, Mh, Mn, Mp, Rj, Tn, Up.

Limnophila [*Ambulia*]: 36 species: warm Old World, naturalized in N America

Frequently aromatic when bruised. Stems floating or emergent, erect, ascending or creeping. Leaves uniform or polymorphic: submerged leaves usually whorled, laciniate, pinnatifid to compound-pinnate with capillary lobes or decussate and entire; emergent leaves opposite or whorled, sessile or petiolate, entire to serrate, laciniate or pinnately divided. Flowers solitary in leaf axils or in loose or compact, terminal or axillary, spikes or racemes. Sepal lobes 5, subequal or the adaxial lobe enlarged. Petals tubular or funnel-shaped, blue, pink, yellow or white, the tube 2-lipped; the adaxial lip outside in bud, entire or 2-lobed; the abaxial lip 3-lobed and erect or spreading. Stamens (2) 4, all fertile, the adaxial pair shorter or sometimes absent; anther locules free, divergent. Styles capillary, deflexed at the tip; stigma 2-lipped. Capsules ellipsoidal to globose, septicidally 4-valved, the valves bifid. Seeds numerous.

Annual or perennial. Found in a variety of aquatic habitats, submerged, emergent or terrestrial. Often found in rice fields and irrigation ditches but rarely considered to be noxious. Pollinated by insects or autogamous and occasionally cleistogamous. The disseminules are seeds; dispersed in mud, by water and perhaps also by wind. Several species are cultivated for decoration; some are used locally in medicine and for flavouring. Philcox, D. A. A taxonomic revision of the genus *Limnophila*. Kew Bulletin 24: 101-170 (1970); Dutta Narendra Mohan. A revision of the genus *Limnophila* R. Br. of Eastern India. Bulletin of the Botanical Society Bengal 29(1): 1-7 (1975) both these works do not inspire confidence; Wannan, B. S. and Waterhouse, J. T. A taxonomic revision of the species of *Limnophila*. Australian Journal of Botany 33:367-380(1985).

Australian Journal of Botany

1. Leaves divided into linear segments present
2. Flowers distinctly pedicellate *L. indica*
2. Flowers sessile or very nearly so
3. Upper aerial leaves and bracts finely divided or deeply lobed almost to the base *L. sessiliflora*
3. Upper aerial leaves and bracts entire or shallowly toothed, never finely divided
4. Petals 10-14 mm long, violet (Bangladesh) *L. cana*
4. Petals 5-6 mm long, white or pink
5. Inflorescence simple; flowers opposite and solitary in the axils of bracts; petals pale pink *L. keterophylla*
5. Inflorescence much branched; flowers alternate in long, slender spikes; petals white or very pale pink *L. polystachya*
1. Leaves all with flattened blades, none divided into linear segments
6. Mature calyx smooth or with not more than 5, prominent longitudinal veins
7. Upper leaves on flowering shoots divided to the base
8. Flowers distinctly pedicellate *L. indica*
8. Flowers sessile or very nearly so *L. sessiliflora*
7. Upper leaves on flowering shoots with flat, laminate blades not divided to the base
9. Leaf blades 1-nerved, pinnately nerved or pinnately lobed
10. Leaf blades sessile, linear-lanceolate to oval-oblong, 5-10 (-20) mm long, 2-4 (-7) mm wide; adaxial sepal lobe enlarged *L. heterophylla*
10. Leaf blades petiolate (the petiole 5-30 mm long), ovate-lanceolate to oval-elliptical, 15-90 mm long, 7-50 mm wide; adaxial sepal lobe not enlarged *L. rugosa*
9. Leaf blades with 3-7 parallel nerves
11. Flowers pedicellate *L. indica*
11. Flowers sessile or nearly so
12. Bracteoles present *L. con.na.ia*
12. Bracteoles absent
13. Inflorescence branched with terminal and axillary spikes; flowers alternate *L. polystachya*
13. Inflorescence simple; flowers in decussate pairs, solitary in axils of leaf-like bracts
14. Petals 5-6 mm (-10) long, pink to pinkish-violet *L. heterophylla*
14. Petals 12-13 long, blue to purple (Bangladesh) *L. cana*
6. Mature calyx with more than 5, prominent longitudinal veins (veins sometimes obscured by indumentum)
15. Sepals 2.5-3 mm long in fruit; petals 2.5-4 (-5) mm long, glabrous inside (NW part of Indian subcontinent)
16. Flowers pedicellate and in axillary cymes *L. helferi*
16. Flowers sessile or nearly so, solitary in the axils of leaf-like bracts
17. Stems glabrous; leaf blades linear-oblong to ovate, 3-14 mm long, 1-5 mm wide *L. micrantha*
17. Stems with sessile or shortly stalked glands and glandular hairs; leaf blades linear to linear-lanceolate, 3-12 mm long, 0.5-1.5 mm wide *L. polyantha*
15. Sepals more than 3 mm long in fruit; petals more than 5 mm long, hairy inside
18. Petals 6-10 mm long
19. Stems rarely more than 5 cm long (Myanmar and NW India) *L. pulcherrima*
19. Stems much more than 5 cm long
20. Bracteoles 3-5 mm long; stems, leaves and sepals densely covered in minute glands (Kerala) *L. glandulifera*
20. Bracteoles 0.5-2 (-3.5) mm long; stems, leaves and sepals without or with few minute glands
21. Pedicels reflexed in fruit; stems glabrous or with short, appressed hairs *Z* erecta*
21. Pedicels erect in fruit; stems with spreading or upcurved hairs
22. Stems with moderately long, straight and spreading hairs particularly towards the apex, flowers usually solitary in axils of leaf-like bracts; pedicels (0.5) 3-5 (-7) mm long *L. laxa*
22. Stems glabrous or with upcurved hairs; flowers usually in dense racemes; pedicels (0.5-) 1-2 (4) mm long *L. repens*
18. Petals 10-18 mm long
23. Stems erect up to 1 m high; without simple hairs; bracteoles appressed *t. aromatica*
23. Stems prostrate or decumbent below, erect parts rarely more than 20 cm high; with soft an flexuose simple hairs; bracteoles spreading *L. chinensis*

Limnophila aromatica (Lamarck) Merrill [*L. gratissima* Blume, *L. punctata* Blume]: Fig. 349

Stems erect, simple or branched from the base, up to 1 m tall, glabrous to minutely glandular. Leaves decussate or in whorls of 3, simple; blades sessile, ovate-lanceolate to lanceolate-elliptical, 1-6 (-9) cm long, 0.3-2.2 cm wide, glabrous to densely and minutely glandular, punctate, pinnately nerved, base cuneate to subamplexicaul, margin rarely entire usually crenate-serrate or serrate, apex acute to occasionally obtuse. Flowers solitary and axillary or many-flowered, terminal or axillary racemes, up to 15 cm long; pedicels slender, 0.3-2 (-3) cm long-remaining divergent-erect in fruit, glabrous to glandular; bracteoles 1.5-3 mm long, linear to linear-lanceolate, subciliate. Sepals 4-7 (-8) mm long, glabrous to



fig. 49. *Linum catharticum*: a. leaf (1 cm); b. flower (5 mm); c. stem (0.2 mm). *L. catharticum* d. flowering shoot (2 cm); e. flower (5 mm); f. sepals (5 mm); g. capsule (0.2 mm); h. flowering shoot with hairs (2 cm).

minutely glandular, densely punctate, straw at maturity; **pal** lobes subequal. a. 5-4.5 (-6.5) mm long, more than half as long as the tube. narrowly lanceolate-acuminate. Petals 11-12 **BW** long, pink to mauve or purple. **Yellow** throat, glabrous or finely and sparsely glandular outside, villous inside; tube 9-12 (-19) mm long; lobes oblong-obovate. Capsules broadly ellipsoid, 4-6 mm long; style up to 7 mm long with 2 lateral processes at the apex below the stigma. **Seed!** cylindrical to oblong, 0.25-0.5 mm long, ±0.2 mm in diameter, muriculate.

Annual or perennial. In swamps, drains and **moist** Habitats. Sometimes in flooded rice fields but not **enormously** harmful. The whole plant smells of turpentine.

KO) Hyp/Vit/Tcnl, Tropical Asia and N Africa: Ban. Bur, Cey. Ind: A* Bb, Go, Kl, Kt, Mp. Tn. Wb.

Linum catharticum Griffith: refer to Fig. 8

Like *L. catharticum* but **tada** #* and bracteoles and **P0** **es** pinnatisetate to lacerate submerged leaves in whorls of up to 12.

Annual. "Siagnant water".

© Vii/Hyp/Ten?. Endemic to Bangladesh, known in only 3 collections:

Linum catharticum (Osbeck) Merrill [*Uvularia cathartica* (Meyne ex Bentham) Bentham, *L. chinensis* var. *retrofractum* (Lamour.) Muni el Punigraht, *L. rhinense* var. *uobatrimum* (S. Kara) Thothatbri]; Hg. 54

Stems simple or branched from the base, spongy, creeping and rooting below, 5-20 (-40) cm tall, the branchlets usually somewhat succulent and reddish* subglabrous to densely hairy, the hairs soft and flexuose. Leaves decussate or in whorls of 3-8, entire; blades sessile, ovate-lanceolate to elliptical-lanceolate, when submerged up to 7 cm long, up to 1 cm wide, when aerial (0.5-) 2-4 (-5) cm long. (0.7-1.5 cm wide. subglabrous [or sparsely lanate, particularly on major nerves, obscurely punctate, pinnately nerved; margin serrate to serrate; apex acute; base **guneate-drcurrni** to subantplexicaul. Flowers pedicellate, solitary and axillary or in many-flowered, terminal or axillary racemes; pedicels 2.5-15 mm long, remaining divergent in fruit, hirsute; **bracteoles** 1-3 mm long. Sepals 4-7 mm long, hairy, striate at maturity; sepal lobes subequal, more than half as long as the tube, the adaxial one larger, (2.5-) 4-5 mm long, lanceolate, long acuminate. Petals (5-) 10-15 (-17) mm long, pink to blue or pinkish, occasionally white, finely pubescent outside, densely villous inside. Capsules ovoid to ellipsoid, 2.5-5 mm long, pale brown; style up to 5 mm long, with 2 lateral processes at the apex; below the stigma. Seeds cylindrical to oblong, 0.5-0.7 mm long, with a caruncle.

Annual. Moist shady habitats, sometimes in water up to ±20 cm deep. Old **plant*** usually **have more** **Infra** than young ones. The aerial leaves are very aromatic.

© TenVHelf. Tropical Asia and Africa: Ban. Bur, Lev **BOI** **recently**, Ind, Nep: An, As, Kl, Kt, **in**. Mp, Qr, Sk, Ttt, Wb.

Linum catharticum (F. Hamilton ex D. Don) Handel-Mazzetti [*L. hypericifolium* (Bentham) Bentham]; Fig. 54

Stems **creeping** and **branching** below, with erect **flowering shoot***, 20-50 cm tall, minutely **glandular-puberulent**. Leaves decussate; blades simple, sessile, oblong to ovate-oblong, (10-) 15-30 (-30) **turn** **UHE** 5-8 (-22) mm wide, sparsely glandular-puberulent to almost glabrous, densely punctate, with 3-7 **pantile** nem-s arising from **the base**, the base semi-amplexicaul. **the** **3** **ix** acute or **obtuse**. **Flowers** sessile or nearly so, solitary, axillary, rarely in pedunculate spikes; bracteoles 3-5 mm long, linear, glandular-puberulent. **Apex** obtuse. **Sepal*** (5-7) **nun** **IOJU**; glandular-puberulent, not striate at maturity; sepal lobes subequal. **5-845** (-5) mm long, **tanccolaU-Nicuminau-**. Petals 12-13 mm long, blue **IP purple** shortly and sparsely hairy outside, villous inside. Capsules 3-4 mm long, broadly ellipsoid, **blackish-brown**; **style** up to 1.5 mm long with 2 **lawral** processes at the apex below the stigma.

Annual or perhaps also perennial. Robust herb in swampy grassland. The leaf blades with 3-7 parallel nerves and clasping bases are distinctive for this species.

[0]F Hd/Tcn?!. Tropical and **warm** Asia: Bur, Ind, Nep: **As**, **Kl**, **Kt**, **Mn**, **Tn**. (up to 3000 m in Yunnan).

Limnophita emrfa Bent ham: Fig. 350

Like *L. rrp/r/n* **bt** stems with short, appressed hairs or sometime glabrous; **pedicels retted** in fruit, 2-4 mm long, with sparse, short hairs: bractcoles linear, smaller {0.5-0.8 (-1.5) mm long}.

[0 Hel/Ten?]. SE Asia: Bur, ind?: Wb?

Limnophila glandulifera Phi (cox: Fig. 350)

Like *L. armnaticn* hut phints **covered** in a dense covering of **minute glands**; **pedicels shorter** (1-1.5 mm long); bricleoles larger (3-5 mm long); petals smaller (8.5-9.5 mm long) and glabrous outside.

Annual Known only from a single collection "Travancore ... in locis humidis argillosis".

{© Hyp/Ten?/He?}. Endemic to S India; •**Lnd: Kl**



Fig. 350. *Lhmupkila etrtto*: a, flowering shoot (J cm); b, fhiit (2 mm). *L. glftwiutifrm*. r. Fruit (2.n mm); d. *HIAW upvtd* (fi mm). *L. Ssi-ifKffMiUr*. c. Howe-ring **ihool** (k cm); [flower it **mra**]; «., petal* opened {A mm}.

Untnophila hdfm, D. Hooker: refer to Fig. 351

I-like *L. mirrnnthn* bin flowers pedicellate and in axillary cymes {pedicels **CU5-I5** (-2) mm long}; leaves somrtmies in wlojls of 3-5: (lor;ti pitruinialfer (sepal* 0.5-) 2-2.f> mm long, petals ± 2,5 mm long, brad* oles ± 1 mm long).

Annual. Known from a single gathering from Tenasserim, Myanmar.

fQTen?/Hdf). Endemic to Myanm;ir: •**BUJ**.

Limnophila beterophylla (Roxburgh) Benlham \L fO#-!fii7g/tiG. Don. l., n^tox**Bcntham**]; Fig. i"ii

Submerged stems up io 80 cm long, **glabrous**; aerial stems **erect**, 5-10 cm high, **glabrous** to shortly **hh-Miu-** below, usually with sessile glands towards the apex. **Submerged** leaves in whorls of (3-) 8-11. compound-pirn Kite, (h5-3 (-5.5) cm long; stg-mcnLs multifid. capillary*; aerial leaves decussate or in whorls below, the blades **simple**, sessile, linear-lanceolate to oval-oblong, f>-10 (-20) mm long, 2-4 (-7) mm wide, glabrous, margin **tubcrenate** io serrate, **apex** acute. Flowers solitar\ and axllaty. sessile or nearly so, **sometime*** forming a lax terminal spike, **dcfetOg*** flowers **cottttnon**; bracteoles absent. **Sq>l rube** (2-) 3-4 mm long, without hairs but bearing sessile glands, not striate at maturity; scpaJ lol^s **Subccoal**, I fi—2 ml" long, ± as long as the **tube**, with sessile fiJands. shortly **acuminate**. Petals 5-6 (-10) mm long, pale pu^ tet **pinkish-rose**. **Jet**, **glabrous** outside. Capsules globular.

(-1) mm long; (tyk lip to f) mm long. "i" 2 lateral processes at the apex **beta*** **ih<- idgma**. So ~ <•inieiform, ±0.5 mm long, 4-or 5-anguJar. muricau•.

Aquatic perennial or perhaps sometime* annual. I» is usually found in fresh or brarkish water in *ponds* and backwaters: sometimes **also** in rirr fields. It is **Hie** *L.* vw/i/W hut has **Lhe** upjicr aerial leaves entire and Rowers in a fax terminal spike. It is, perhaps. **not specifically distinct**

l(©)? Vit/Hyp/Tt-n?). Tropical Asia: Ban. Bui. **Ind.** Nep: **As**, **Kl**, **Kt**, **Mn**, **Mp**, **RJ**; **Tn?** Up, Wb.

Limnophila indica (Linnaeus) Druce {*L. aquatica* (Roxburgh) Alston, *L. grtrtioUidet* auct Ind., non R. Brown, *L. hyuopifaiia* Roth, *L. nununa* Bentham, *L. titlamidn*]. D. Hm>kerj; Rg. jf>l

Submerged stems up to 1 m or more long, braiuhmg, glahrous or hrtr>- aerial stems erect or rtei-piiig below, simple or sparsely branched, up to 40 **OO** &&> with or without cglanduliu hairs, with sessile or stalked **gbnd**. **Submerged k&fe*** in whorls of V2-) 6-*2- 0.7-3 (-o) cm long, <:ompoin<l->inri;ii(- ur pinnaiistct. the lobes divided into capillary or [incur and llauened segments; **acria**] **leave*** **decUMUe** arid usually rnlirt- or whorled and variuti-ily dissected, 0.5-2 (-3 cm) **""***

when dissected, up to ± 6.5 cm when entire; **entire leaves** with J. 3 or nrndy S nerves arising from the **hue**, **without bain hm often** -sessile glands, **punctate above**, margin **finely spionlosr-st'rratc-**. **FaWCW** pedicel late, **mbtaty**, axillary, **sometimea** single, mostly in decussate paii-s, all chasmogarnous; bracts leaf-like (divided or entire) becoming reduced and scale-like towards the apex of old shoots; pedicels slender. (1-) **6-12 tr&i**) mm long, **mostly** exceeding die bracts, bearing sessile or stalked glands; bracteoles (0) 2, linear **lo linearJanceoJate**, (13-) 3-4 mm long, simple ur divided, glandular or 0*>t Sepal **woe** 1.5-3 mm long, glabrous or hispid. bearing sessile gl»"di. ^{Jlilt stmt(* a)J} **maturity, becoming nibglobose** in older **flower***; sepal lobes su'beqial, **HnewJattceotatt**, 2-3 mm long, acuminate, occasionally **efffete**. **Pettll** (6-) **MS** mm **Umg**. entirely **white**, cream, pale yellow or blue w purple, with or without a yellow fleck at the top of the Oimai; petal tube usually greenish-wliittr, glabrous or slightly pubescent, outside, softly villoua **towdes** petal lobes subequal. entire. Capsules subovr>iri. 3-33 (-5) mm long; style up to 4.5 mm long with 2 lateral processes

± 0.2 mm wide at the **BpCS** b<low the **stigma**. **Seeds** cylindrical **to obiong-cuiirau:**. 0.5-0.7 mm long. ± 0.25 mm in diameter, **Ar** or a-angled, muricate.

Annual or [M.'rcnnial. 1^ is found in a wide variety of aqujitic habiiais. From the poim ol view of hahir **it if a** very plastic species. In shallow water it It as dissected leaves under water and normal ± enure ones **above**. **En** deep water lhc siems look like bottle brushes and very few huninaie leaves develop (usually only those **sub-tending** Mowers). On land, however, it >'develops normal laminate leaves and is **branched** forming dense mats. Flowers open by ± ! 0.0U, arc fully open by IJ .30 and **doic** ± 15.00. Thr submerged leaves **chw** ami wrap zu'Otiud ihi: item at nigliL It is used **in** incdicme as an antiseptic and **M** »> **Cure** for dyseniery.

It is bight? variable with regard to leaf form and pubescence. Some of this variation is enviromiK-iii.ilh induced and some is genetically determined. Most authors **recognize** *L. nquatka* as a species disiinci from *L. inttica*. *L.imnophita wpatilu.u* is **characterized** by Iwing **annual** with hirsute submerged .menu and entire aerial leaves in dccu.wati¹ pairs. In Sri Lanka and SW India ii sroms to be distinct but elsewhere then: are so many iiiii<i!n(li.iFt.s **thai** it is impossible to delimit them as two separate species. I feel it is wiser, pending experimental investigations, to combine them into one species. I rather suspect that *Ittmnayodes timnophilmdes* also belongs here

Ljmrtopinia UBamxds is known only from two gather- ings front llu* banks of Ktillung River. Assam; it \\\ *Wkv !., itutira* but is smaller in at! its parts (sepal tube 2.5-3-5 mm long, sepal **lobe*** t-15 mm lung, pcials 5-5.5 mm **long**, capsules 1.5-S>6 mm long, style 1.2-1.75 mm long) and is. totally ylabroiw. It is proba- bly *no* more than a depauperate suite of *L. indka*.

timtiofihila indica is known to hybridize wkh *l. msilijltrn-* This hybrid (*l. X ludwieiana Tbieret*) is ferile*. it is not recorded from Ind><i.

t(O) Vit/Hyp/(Tcn)|₄ **TropfcsJ Afrka, Asia** and Australia: Ban. 5tir, *Qzf*. Intl. Nep? Pak: As, Uo. Jk, KJ, Rt. Mh. Mn, Mp, Or, Rj, Sk. In. Op, VVj.

Ijmuoffhila faxa Bentham [*SUmedia diffusa* Bcntham): **Fig. 351**

Like *L. repent* but flowers mostly solitary in asils; ptdUels longer ((0*5^[^]) **S*fi** (-7) mm long); main steins and branches usually **hairy** with moderately long. <traighi and spreading hairs, particularly towards **the** apex; sepals longer (4-#!>mm long); petals puberu- leni outside, deep violet to white.

Annual. Il is found at **the edges of ponds, Jakes** and rivers, **SotOethDM** it **gro*M** in **bn<** kisb water.

[O Hel/Ten?]. Sri Laitka and SK Asia from Myanmar ID **Somatrtt** Bur, Gey unconfirmed.



FIG. 351. *Ittmnayodes timnophila* a, flowering shoot (1 cm); b, part opened (5 mm); c, **Htt** (5 mm). A. turn d. **flowering** (5 mm). /_ **Mbmxtte**: g, **flowering** *hoot (1 cm); h. **Swra** (5 mm).

Annual. Ecology unknown but probably a plant from marshes. I am not sure that this is really a good species. Perhaps it should be combined with *L. Uixa*.

[O Hd?/Ten?]. Endemic to Myanmar, Bangladesh and West Bengal: •Ban. •Bur. *Ind: Wb.

Limnapkita repetu (Benth) Benth. *con/trl* (Benth) Benth. *L serrata* (L.) W. & A. [Fig. 352

Stem* decumbent, rooting at nodes; nr erect, simple or branched from or near the base. 5-40 cm high, glabrous or hispid on the upper part, the hairs mostly not spreading. Leave* decussate; blades simple, sessile or sub-petiolate, oblong-lanceolate to oblong. (5-) 12-26 (-55) mm long, (2.5-) 4-8 (-15) mm wide, punctate, pinnately nerved, glabrous or hispid: the base cuneate to subcordate; the base of the leaf sheath (senate to wrate; the upper part sessile to shortly pedicellate, solitary in leaf axils or occasionally in short axillary spikes or racemes: pedicels (0.5-) 1-2 (-4) mm long, subglabrous to hispid. creel at maturity; branched (3.5) mm long, finely spatulate. Sepals 4-5 mm long; the lobes 1-3 mm long, subglabrous to hispid. stamens at maturity; the lobes subequal. 2-3 mm long, narrowly lanceolate-acuminate, ciliate. Petals white, pink, blue or magenta (often variable with color); glabrous or finely pubescent outside, reticulate; petal tube 6-8 mm long; abaxial petal lobe ± 4 mm long, sub-truncate. Capsule* wide to ellipsoid. 2.5-3 (-4) mm long; style up to 4 mm long with 2 lateral processes at the apex below the stigma. Seeds cylindrical and bluntly angular. ± 0.3 mm long. ± 0.3 wide, brown and slimy.

Annual. Widespread in marshy places and in rice fields; it is locally dominant. The leaves smell and taste slightly like lemons; they are sometimes added to food in p.m.

[O Hd/TYn?]. Tropical Asia: Ban. Bur. Cey. Ind, Nep: A*. K. Ki. Mh? Or. Sk, Wb.

Umnophitta nigosa (Merrill) Merrill [*L. roxburghii* (L.) Merr. Ind. G. Don, ?*L. chaidna* (Benth) Merr. ex W. J. Narendranath Mohan Iyengar. *Strantheia mnthastrum* (Benth) Merr.]: Fig. 355

Stems solitary, simple or branched; 15-50 cm long, glabrous to densely hairy. Leaves decussate, petiolate; petioles 5-30 mm long, sparsely to densely hairy; blades simple or ovate to oblong-ovate, 1.5-9 cm long, 7-50 mm wide, pinnately nerved, glabrous to densely hairy adaxially. Hirsute to scabrous; the base of the stem is decurrent into the petiole, the margins crenate to crenate-fimbriate, the apex acute. Flowers sessile, solitary in leaf axils or in axillary, short or long pedunculate heads, (the lower in

11 calls or clusters subtended by a subspherical bract; oblong, brae-like leaf, 11-13 mm long, 3-5 mm wide, 3 or 5-nerved from the base, glabrous or glaucous at the base; petiole 2-35 mm long, glabrous to hirsute; bracteoles absent. Sepals 3-5 mm long, glandular, hirsute on the main nerves, not striate at maturity; sepal lobes linear-lanceolate, adaxial lobe 11 mm long. ± 4 mm wide, broadly ovate-lanceolate, acute, dilate; remaining sepal lobes 6-9 mm long, narrowly ovate-lanceolate, ciliate. Petals 13-15 mm long, pink to violet with yellow in the throat, pilose outside and inside; petal tube ± 7 mm long; abaxial petal lobe ± 6 mm long. Capsules flattened-ovoid, 5-6 mm long; style up to 5 mm long, broadened above just below the stigma. Seeds cylindrical, ± 0.5 mm long, 0.25 mm in diameter.

Annual. Marshy places, stream* and river banks. It flowers in preference in shady habitats. In permanently wet habitats it flowers throughout the year.

[O Hd/Ten?]. Tropical Asia: Ban, Bur, Cey, Ind, Nep: Ap. As. Bh, KJ. M. Mn, Mp, Or. Sk, Tp, Up. Wb.

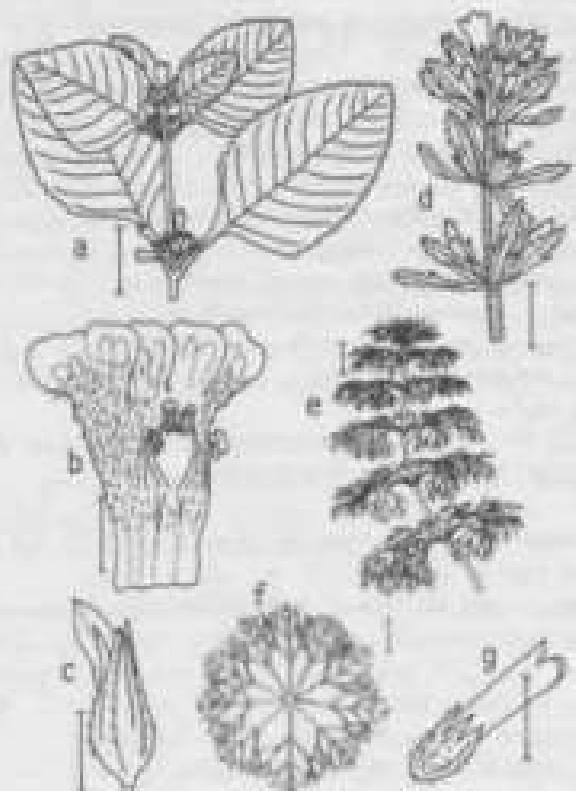


FIG. 355- *Umnophitta nigosa*: i. tip of a flowering shoot (2 cm); b. petal (4 mm); t. submerged shoot (2 mm); d. lip of a flower (1 cm); v. submerged shoot (2 mm); r. whorl of submerged leaves (2 mm); g. flower (5 mm).

Limnophila sessiliflora (Vahl) Blume: Fig. 353

Submerged stems 10-60 cm long, glabrous to subglabrous; aerial stems erect or creeping, simple or branched, 5-20 cm high, subglabrous to hairy. Submerged leaves in whorls of 5-12, (5-) 10-20 (-30) mm long, glabrous, compound-pinnatisect; lobes divided into capillary or linear and flattened segments; aerial leaves in whorls of 3-8, usually dissected or rarely entire, 4-12 (-20) mm long, glabrous, when laminate densely punctate, 1- or 3-nerved. Flowers solitary in the axils of leaves, sessile or very nearly so, frequently cleistogamous; bracteoles usually absent or if present then not more than 1.5 mm long and entire. Sepals 3-4 at anthesis becoming 5-7 mm long in fruit, densely to sparsely hirsute, not striate at maturity; sepal lobes subequal, lanceolate, 2-3.5 (-4) mm long, acuminate. Petals (5-) 8-10.5 mm long, blue to violet or purple, glabrous outside. Capsules flattened-globose, 3-4 (-5.5) mm long; style \pm 3 mm long with 2 lateral processes at the apex below the stigma. Seeds cylindrical to ovate-oblong, \pm 0.5 mm long, \pm 0.2 mm in diameter, 5-angular, muricate.

Annual or perennial. Found in permanent and temporary water. It is very like *L. heterophylla* but differs in being usually glabrous and lacks finely divided aerial leaves and bracts. These characters are readily modified by environmental factors and perhaps *L. heterophylla* and *L. sessiliflora* should be united. Further investigations are needed. *Limnophila sessiliflora* is also like *L. indica* but the flowers are usually sessile (if pedicellate then the pedicels not exceeding 1.5 mm long); submerged stems glabrous; emergent stems and sepals with patent white hairs; bracteoles absent or minute; cleistogamous flowers common. It is known to hybridize with *L. indica*. This hybrid (*L. X ludovitiana* Thieret) is fertile; it is not recorded from India.

1(0) Vit/Hyp/Ten?}. Tropical and E Asia: Ban, Bur, Cey, Ind, Nep: As, Mg, Mp, Sk, Wb.

Lindernia [Bonnaya, Ilysanthes, Vandellia]: \pm 80 species: warm regions of the world

Stems erect ascending or creeping, usually quadrangular in transverse section. Leaves opposite, simple, sessile or shortly petiolate, entire, crenate or toothed. Flowers solitary in bract axils or in terminal or axillary racemes or umbel-like clusters; bracts leaf-like or scale-like. Sepal lobes 5, shallow or almost reaching the base of the tube; sepal tube 5-nerved, each nerve with an obscure or distinct rib or wing. Petals tubular, 2-lipped; adaxial lip 3-lobed, spreading, longer than the abaxial lip. Stamens either 4 and all with fertile anthers or with 2 fertile and 2 sterile; filaments of the adaxial pair frequently bear spur-like or elongate appendages at or

near the base; anther locules divergent, free or joined. Style capillary, erect; stigma 2-lipped. Capsules globose to narrowly cylindrical, with septicial dehiscence, usually leaving the entire septum as a median plate.

Annuals or short-lived perennials. Most species grow in wet places. They may be seasonally submerged or partly emergent but none are strictly aquatic. Pollination is by insects or some are autogamous or even cleistogamous. The disseminules are seeds; dispersed in mud or otherwise. Several have been reported as weeds in aquatic systems but they are rarely considered to be troublesome. Mukherjee, S. K. Revision of the Indo-Burmese species of *Lindernia* Allioni. Journal of the Indian Botanical Society 24: 127-134 (1945); Philcox, D. A. Revision of the Malesian species of *Lindernia*. Kew Bulletin 22: 1-72 (1968); Yamazaki, T. Revision of the Indo-Chinese species of *Lindernia* All. Journal of the Faculty of Science, University of Tokyo, Section III, Botany 13(1): 1-64 (1981); Sivarajan, V. V. and Mathew, P. The genus *Lindernia* All. (Scrophulariaceae) in India. Journal of the Bombay Natural History Society 80: 131-140 (1983). For this account I have mostly relied on the work of Takasi Yamazaki.

1. Sepals united to above the middle
 2. Capsules linear-cylindrical, \pm twice as long as the sepals
 3. Leaf blades elliptical-ovate to oblong, the teeth along the margins terminating in spines *L. ciliata*
 3. Leaf blades ovate-orbicular to almost orbicular, the teeth along the margins not terminating in spines *L. nummularifolia*
 2. Capsules ellipsoid to oblong-ovoid, not or slightly longer than the sepals
 4. Petals 7-11 mm long; all flowers solitary and borne in the axils of leaf-like bracts *L. crustacea*
 4. Petals 4-5 mm long; the uppermost flowers forming umbel-like clusters and borne in the axils of scale-like bracts *L. molluginoides*
1. Sepals free almost to the base or if united then to below the middle
 5. Stamens 4, all bearing well-developed anthers
 6. Capsules much longer than the sepals *L. unguiculata*
 6. Capsules equalling or shorter than the sepals
 - At least the uppermost flowers in terminal racemes with each flower subtended by a scale-like bract
 - 8- Petals 9-12 mm long; stems robust, erect; leaf blades 3-13 cm long, 2-5 cm wide *L. ***&"*
 - Petals less than 6 mm long; stems slender, usually creeping below; leaf blades less than 3-5 cm long, 0.3-2 cm wide

9. Bracts gradually decreasing in size towards the top of the inflorescence; capsules ellipsoid, 3-4 mm long, 1.5-2 mm wide *L. elata*
9. Bracts suddenly decreasing in size towards the top of the inflorescence; capsules globose, 2-2.5 mm long and wide * *viscosa*
7. All flowers solitary in the axils of leaf-like bracts
10. Leaf blades palmately 3- or 5-nerved (appearing parallel-nerved from the base to the tip of the blade)
- II. Capsules cylindrical, 9-13 mm long, more than twice as long as the sepals *L. micrantha*
11. Capsules ellipsoid, 3-4 mm long, \pm as long or slightly longer than the sepals *L. procumbent*
10. Leaf blades pinnately nerved or 1-nerved
12. Capsules obovoid to globose, 2-4 mm long and wide; adaxial petal lip brown *L. pusill*
12. Capsules ellipsoid, 4-5 mm long, 25-3 mm wide; adaxial petal lip white to pale violet or purple
13. Anthers of abaxial stamens much smaller than the adaxial ones; petioles not more than 0.5 cm long; adaxial anthers with tails *L. hookeri*
13. Anthers of abaxial stamens \pm the same size as the adaxial ones; petioles 1.5-4 cm long; adaxial anthers without tails *L. mollis*
5. Stamens 2 or 4, when 4 then 2 staminodial (not bearing fertile anthers)
14. Leaf blades palmately 3- or 5-nerved {appearing parallel-nerved from the base to the tip of the blade)
15. Capsules ellipsoidal, 5-7 mm long, \pm twice as long as the sepals
16. Leaf blades linear-lanceolate to oblong, 5-30 cm long, 1-6 mm wide *L. hyssopioides*
16. Leaf blades elliptical to ovate, up to 10 mm long, up to 6 mm wide *L. mtnilaliana*
15. Capsules \pm globose, 2.5-4 mm long, \pm equal to or shorter than the sepals
17. Stems creeping or decumbent; all flowers subtended by leaf-like bracts; adaxial petal lip with entire margins (South India and Sri Lanka) *L. rottmdifoha*
17. Stems erect; upper flowers subtended by scale-like bracts; adaxial petal lip with saw-like margins (Sri Lanka) *L. snlankana*
14. Leaf blades pinnately nerved or 1-nerved
18. Most flowers alternate, leaf opposed (1 flower only at each node)
19. Capsules oblong-globose *L. pannflora*
19. Capsules ellipsoid to cylindrical (at least twice as long as the sepals)
20. Bracts \pm as long as the pedicels (pedicels up to 7 mm long); sepals up to 6 mm long; petals white; staminodes absent (SW India) *L. estammiodiosa*
20. Bracts much shorter than the pedicels; sepals in fruit 4 mm or less long; petals pink blue or purple; staminodes present (SW India)
21. Capsules ovoid-ellipsoid, \pm twice as long as the sepals; pedicels (0.5-) 2-5 cm long; sepals 3-4 mm long *L. hyssopoides*
21. Capsules cylindrical, 3 to 4 times as long as the sepals; pedicels 0.2-1 (-1.7) cm long; sepals 15-2 (-4) mm long *L. tenuifolia*
18. Most flowers in opposite pairs
22. Capsules shorter than sepals, ellipsoid to almost globose, not more than 5 mm long
23. Stems and leaves hairy, creeping below, with more than 3 pairs of leaves (N India) *L. hookeri*
23. Stems and leaves glabrous or nearly so, erect with rarely more than 3 pairs of leaves (S India) *L. minima*
22. Capsules much longer than the sepals, ellipsoid to almost globose, not more than 5 mm long
24. Leaf blade margins bluntly and shallowly toothed {teeth \pm 3 mm apart} or almost entire (W India) *L. estaminodiosa*
24. Leaf blade margins saw-like (with sharp teeth, less than 3 mm apart)
25. Leaf blades linear to oblong, the margins never saw-like *L. oppositifolia*
25. Leaf blades broadly ovate to elliptical, the margins saw-like
26. Leaves petiolate (petioles 4-20 mm long) *L. rueltoides*
26. Leaf blades sessile or very nearly so
27. Teeth along the leaf blade margin not terminating in spines; staminodes \pm 3 mm long *L. antipoda*
27. Each tooth on the leaf blade margin terminating in a spine; staminodes \pm 1.5 mm long *L. ciliata*
- Lindernia anagallis* (N. L. Burman) Pennell [*Vandellia cordifolia* (Colsmann) G. Don, *V. angustifolia* auct. Ind., non Bentham, *V. pedunculata* Bentham]: Fig. 354
- Stems glabrous, spreading, creeping and rooting at nodes, (3-) 20-60 cm long. Leaves glabrous, sessile or shortly petiolate; petiole up to \pm 5 mm long; blades ovate to elliptical-deltate, 0.5-2.5 cm long, 0.3-1.8 cm wide, pinnately nerved, base subcordate to truncate, margins appressed crenate to subentire, tips subacute. Flowers solitary in the axils of leaf-like bracts; pedicels 0.6-5 cm long, stiff, glabrous. Sepals deeply 5-lobed almost to the base, 4-6 mm long; lobes narrowly lanceolate, acuminate, glabrous. Petals 10-16 mm long, \pm 5 mm in diameter, white to pink or purple, with or without white flashes on the lip; petal tube \pm 6 mm long; adaxial lip \pm 3.5 mm long, entire; abaxial lip

± 3 mm long. Stamens 4, all with **critical** anthers; adaxial pair with ± 1.5 mm **knag** filaments, *Qx* anthers ± 1 mm long and **spurred** at both ends; abaxial pair with 3.5 mm long filaments, each with a **rounded**, spur-like; *tp|ienrfage*, 0.4-1 mm long, arising near the *bam*, the anther each with a basal spur as long as the **anther** itself. Capsules cylindrical, acuminate, 0.8-1.2 cm long, 1.5-2 mm in **diameter**, more than twice the length of the sepals, arching upwards when ripe. **Seeds** shortly **cylindrical**, 0.3-0.5 mm long, ± 0.15 mm in diameter, longitudinally grooved, minutely pitted.

Annual. Gregarious; *mtl* locally abundant in marshy places, banks of ponds, riversides and wet rice fields. Used as a remedy for gonorrhoea

[O Het]. Tropical Asia and Australia: Cey, Ind, Nep: As, Mi, Gj. Go. Kl. Mb, Mn, Mp, Or, R, Sk. Tn, Tp. **Up, Wb. 0-1400 m.**

tjndrm'wi antipoda (Timbucu) Alston [*Uyumnth vrbnuiefolia* (Colsmann) Ken\ *Borinayu veronidfolia* (Remus) Sprang?], *B. graulijhm* (Retzius) Sprengel]: Fig. 354

Stems glabrous, prostrate and **fooling** below, spreading above. 5-20 (—11) cm long. Leaves sessile, oblance-

olate to obovate-oblong, 0.6—4.5 cm long, 0.2-1 cm wide, pinnately nerved, base narrowed, margins shallowly saw-toothed, lips acute. Flowers solitary in the axils of leaf-like bracts or in lax racemes, borne singly or in pairs; bracts oblong-lanceolate to linear, 3-7 mm long, margins saw-like; pedicel stout, 2-6 mm long at anthesis, becoming 4-17 mm long in fruit, glabrous. Sepals deeply 5-lobed almost to the base. 3-5 mm long at anthesis. 5-6 mm long in fruit; lobes linear-lanceolate, minutely scabrid and minutely toothed. Petals 8-10 mm long, ± 6 mm in diameter, white for throat, purple, usually yellow in the throat; petal tube ± 5 mm long; adaxial lip 3-4 mm long, entire; abaxial lip 5-6 mm long, with 2 yellow tongues below. Stamens 4, 2 with 4-angled anthers; filaments ± 2 mm long, anthers ± 1 mm long; staminodes 2, ± 3 mm long, yellow, hooked at the tips, glabrous, the hooks convergent. Capsules cylindrical, apiculate, 10-16 mm long, 1-1.5 mm in diameter, 2 to 3 times as long as the sepals, spreading horizontally or slightly deflexed when ripe. Seeds shortly cylindrical, 0.3-0.5 mm long, ± 0.2 mm in diameter, striate, minutely pitted-

Annual, Along the banks of rivers, tanks and ponds, on banks, in rice fields, in short grass and in exposed rocky hollows, its height is rather variable

[O Hel], Temperate and tropical Asia, Australia and Polynesia: Ban? Bur, (Yf Ind, Nep: An. As. Rh, Kl. Mn, Mp, Or, Rj, Tn, Tp. **Up, Wb. 0-2300 m.**

Liudeniitt dliata (Colsmann) Pennell [*Ipomoea serotina* (Roxburgh) Urban, *Bonnaya brathia* Link et OW], *B. bruetmmia* Blatter et Hallbeig): Fig. 354

Stems glabrous or sparsely hairy at the base, laxly branched, erect or **ascendent**, 5-20 cm tall. Leaves glabrous, sessile, elliptical-obovate to oblong, 0.6-3.5 cm long, 0.2-1.2 cm wide, pinnately nerved, base narrowed and semi-amplexicaul, margins saw-toothed, the teeth very sharp and each bearing a spine. Flowers in upper part of the stem, in opposite pairs; bracts reduced. Sepals linear, 5-8 mm long; pedicel 1-2 mm long at anthesis, 8 mm long in fruit, Sepals glabrous, when young lobes almost to the base later. Sepals 5 mm long; lobes lanceolate, the outer one smaller. Petals 6-8 mm long, up to 1 cm in diameter, petal tube ± 5 mm long, whitish to pink or blue below, blue or purple in the throat; adaxial lip 2-6 mm long, oblong; abaxial lip 4-8 mm long. Stamens 4, 2 with 4-angled anthers; filaments ± 1.5 mm long; staminodes ± 1.5 mm long, the tips divergent. Capsules cylindrical, acuminate, 7-17 mm long, 2-3 times as long as wide



FK: 354. *t.indi>ntiti anagiltii*: a, flowering shoot (3 cm); b, petal tube opened (2 mm); c, seed (0.15 mm). *L. antipodal* d, **flowering** (2 cm); e, petal tube opened (2.5 mm). *L. dliati*. f, flowering shoot (2 cm); g, petal tube opened (1.7 mm).

sepals, arching upwards when ripe. Seeds **ellipsoid** with truncate ends, ± 0.3 mm **bnj**, ± 0.15 mm in thickness, pitted.

Annual. Often gregarious, found along the **banks** of post-monsoon streams. **En rite** field*, moist ground, damp rocks, **latritic** slopes and in wet grassland.

{O Ht-}. Tropical Asia and Australia Bur, Cey, Ind. Nep: Ap, As, Bh, Dl, Gj, Go, KJ, Ki, Mh, Mn, Mp, Or, Pj, Rj, Sk, Tn, Up, Wb. (I TOO m.

Undentia crustacea (**linnaew**) F. von Muclfer [.. rntitarea var. rrtirhd Ciiri ft Majunalar, *Vandetlia racemose* Bonati. V. *grarilis* & wKV'A: Fig. 355

Stems **Wangled**, glabrous or **ipandy** pubescent on (lie angles, laxly **branched prostrate** or erect, with ascending branches, occasionally rooting below, 2-2(1 cm long. Leaves peioliiae becoming sessile towards iht lips; petiole up to 1 **GD** long, glabrous or **pubescent**; blades **orate** n> almost rhomboid or suborbicular, 0.5-1.7 cm long, ± 0.4-1.5 cm wide, pinnately nerved, glabrous to sparsely hispid on the margins, base truncate to cordate, margins coarsely toothed

with rounded or pointed teeth and <ilt.nc. tips suba- « ua:. Flowers solitary in the *axih* of lcnl-like bracta, borne in opposite pairs- bracts becoming smallot above; pedicel 0.1-2.5 cm long, sometimes Conning h\ terminal racemes. Sepals tubular, united from above **the middle**, often red, .1-4 mm **long at amhexis becoming** 4-6 mm long in fruit: tube :Vrihhed. ridged or alighdy winged. sparM-h hispid on the main nerves; inhes short, aruC- Petals 7-tl mm long, ± 4 mm in **diameter**, white or pink to **btoc** or purple or white with blue flecks on the margins; petal tube 4-1 mm long, sometimes pale yHUnv ,n [he base; adaxial lip)£-\$ rtm long, 2-lobed: abaxial lip 2-4 mm long. Siamem 4, all with fertile anthers; jdaxial pair with ± 1.5 mm long lilaniniti-, the anthers ± 0.7 mm **Iottgi** ab.ixi.it **pail with** ± !V5 mm long filiimenus, each with a subulate, pur* plish-hhtf blunt **appendage** 0.4-0.5 (-0.9) mm long, near the base, the anthers like (he abaxial otic<> OL]stiles oblong-ovoid, 3-5 mm long. 2-3 mm in diameter, not or slighth CM icrhnR ihe steals, patent, when ripe. Seeds oval, 0.3-0.5 mm long, ± 0.25 mm in diameter pitted.

An ituiil. Low ly%> pastures, river banks, rice fields after the harvest and drying out tanks. **Sometime*** ii grows near the sea shoie. Mostly common and gregarious, the small leaves iuirl large Mowers make it a elegant plant. Used in medicine for biliousness, dysentery, in poultices for boils and against ringworm.

{O **Hef**}. Warm and tropical Old Worltl, naturalized in the New World: Oy, Ind. Nep: An, Ap, As, Dl, Cj, Co, Kl, Kt, Mh, Mn, Mp, *Mi*, Or, Rj, Tn, Tp, Up, Wh. ri-1800 ni-

Indemia rlatn fBtrnihain) Wettstt-in \VantMUa urthi/it-HdHanceJtFig. 355

Stems laxly branched, creeping and rooting at nofics or subcref *i*, 10-50 cm Inng, sparsely **to densely** hispid with spreading long white hairs intermixed with glandular hairs. Leaves sessile or shortly petiolate: peiioies 2-13 mm long, with long white hairs: hfades ovaic to ovate-deltate, 4-20 mm long, 3-15 mm wide, pinnatcty nerved, with long white hairs intermixed with glandular hairs 00 both surfaces, the base **truncate**, margins sharp toothed, tile tip acute. Flower* either solitary or in clusters of 4-6 flowers at nodes; pedicels slender, 2-10 mm long, with long white hairs, Sepals 3-5mm long, cleft almost to ihe Iwui-, with spreading white hairs: lobes lincar-lanceohiie, acuminate. Petals 4-5 mm long, while lo bluish, fragrant; adaxiil (upper) !i|> 2-lobed: abaxial {lower} lip 3-toIM'd, longer than the adsxial lip, the central lobe larger, 3-1 mm long. Stamens 4, all with ferule anthers; aba\;il (tower) paireath with a rounded, knee-like appendage ± 0.4 mm long. Capsules ellipsoid, S-4 mm long,



Flc, 555. *Unttrmia oru&umi* ft, **flowering •hod** <1 cm); **b**, peLlI ntbe openrri (U mm); c- "TM!* with (ilP-wlc (1.6 mm); d, wed (0.25 mm). *L eltna*: **e**, **fkwerfng h** (1 < m); **i**, peial tube optnert (I mm); **g**, wpalu = h capsule (1.6 mm).

1.5-2 mm wide, shorter than the sepals, spreading or deflexed when ripe. Seeds shortly cylindrical, ± 0.33 mm long, ± 0.25 mm wide, minutely pitted.

Annual. Mostly in dry sandy fields and meadows but it also grows in rice fields and marshes.

[O Hel]. Tropical Asia: Bur, Ind: An.

Lindernia estam'radiom (Blatter et Hallberg) Mukherjee: refer to Fig. 362

Like *L. tmtijoliti* but larger, leaf blades oblong to oblanceolate, 15-30 mm long, the margins with shallowly saw-like teeth; flowers in lax terminal and lateral racemes; bracts \pm as long as the pedicels; pedicels up to 7 mm long; sepals up to 6 mm long in fruit; petals white; stamens absent: (flowers in terminal racemes).

Annual, lowlands and backwaters, The description and orthography of the name in Sivang and Madieu (1983) do not agree with the original description of Blatter and Hallberg — I have seen no herbarium material and have followed the original description.

[G Hel]- Endemic to SW India: • Ind: Kl. Kt. Mh.

Lindernia hookeri (C. B. Clarke) Wettstein [L. hookeri var. *Amisii* T. W. Pennell, *Vandusia itumaidn* A. V. N. S. Fig. 356

Like *L. anagallis* but capsules shorter than sepals, ellipsoid, ± 5 mm long; pedicels not exceeding 15 mm long; the abaxial stamen pair sterile, bearing a ± 0.3 mm long spur near the middle and rudimentary anthers.

Annual. In moist and wet places, also in running water on hill slopes.

[O Hel]. Himalayas: Indo-China (India, Nepal, Sikkim), India: Bur, Ind, Nep: Ap? Ar? As, Bh, Mg, Mp, Or, Up.

Lindernia hyssopoides (Linnaeus) Haines [*hyssopoides* orth. ni. h Fig. 371

Stems glabrous, simple or diffusely branched, erect or ascending, rather brittle, 1-30 cm or more tall. Leaf blades linear-lanceolate to oblong, 5-30 mm long, 1-6 mm wide, glabrous faintly: (tied from the base or 1-nerved, base narrowed, margins entire or minutely dentate, tips acute. Flowers solitary in the axils of leaf-like bracts, borne singly or very rarely in pairs; bracts linear, reduced and scale-like above; pedicel (0.5-) 2-5 cm long. Stamens 3-4 mm long, deeply lobed almost to base; lobes linear-lanceolate. Petals (1-) 10-15 mm long (mostly more than 10 mm long), ± 8 mm in diameter pale to deep blue, to purple at the throat, with whitish lower; petal tube 6-9 mm long; adaxial lip ± 4 mm long, slightly notched, with dark blue lines; abaxial lip ± 5 mm long, obtuse, with dark blue blotches at the bases of the lobes. Stamens 4. the adaxial 2 with fertile anthers; filaments 2-2.5 mm



Fig. 356. *Lindernia hookeri*: a, flowering branch (1 cm); b, petal tube (2 mm); c, capsule with operculum (2-4 mm); d, capsule with operculum (2 cm); e, capsule with operculum (4 mm); f, capsule with operculum (4 mm).

long, anthers ± 0.7 mm long; stamens ± 0.7 mm long, with a linear and glandular hairy appendage. Capsules ovoid-ellipsoid, 5-9 mm long, 2-3 mm in diameter, almost 2 times as long as the capsule, deflexed when ripe. Seeds oblong, ± 0.4 mm long, ± 0.15 mm in diameter, longitudinally *reticulate*.

Annual. Common and abundant, often forms mats in perennially moist places and is harvested for use in fields. A very variable form sometimes intergrades with *L. formosensis* and *A. manihotensis*.

[O Hel]. SE Asia: Bur? Cey, Ind: As, Bh, SI, Mg, Mn, Mp, Or, Rj, Tn.

Lindernia latifolia (Blume) Koorders [*Lindernia latifolia* Bonnier: Fig. 867

Stems erect, 1-2 m high; branches prostrate. Leaves prostrate, almost sessile above; petioles up to 2.5 cm long; blades elliptical, ovate or obovate, (2.5-) 7.5-10 cm long, (1-2) 2.5-6 cm wide, pinately hairy on both surfaces, particularly along the nerves on the abaxial surface, base cuneate, margins saw-like, lobes obtuse. Flowers in terminal or axillary racemes; racemes with up to ± 50 flowers;

pedicels slender. 10-25 mm long, with glandular hairs; hram.subt.laie, 1-1.5 nun ^ag. Sepals A-> **ma** long **ai** amhesu becoming **10-13** mm long In fruit, cleft **atao*** to the base, with spreading hairs **and** glands; lobes linear-lanceolate, acute, ciliate. Petals **8.5-12** mm long, **white** to pink with **or** without a yellow throat; **adawai** hp broadiv **ovate**, 2-iobeil; abaxial **lip** longer than the adaxial lip. Stamens 4, all with fer.ile arithe»: adax.a] pair with \pm 1 nm long **BtaM**« «&t&J pair each with a rounded, knee-like appendage \pm 0.7 mm wide the filaments \pm 3 mm long. Capsules ellipsoid **10** globose, 4^6 mm long, shurte, than sepals. **wnaiWOG we**« **When** Hpr. **Seeds** ovoid LO spherical. \pm 0-r. **ttm** m diameter^ pited.

Annual. A plant found on moUl ground, rarrly RTowing in we thin ds.

[O Hel). Tntpical SE Asia. Bur.

Undmun manilaliana V. V. Sivarajafi: Fig. 957

likt- *L. btntifiwtbxK mm* rather stuxutciu and stoui: leaf **Wadea ahrayi so*0e**, m-au- to rllipii^h **pt<ted**s not

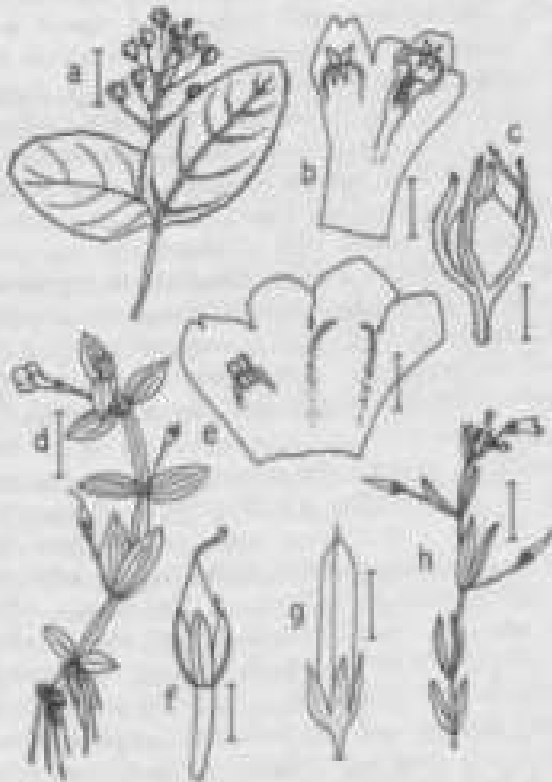


Fig. 357. *Lindernia latifolia*: a, flowering shoot (5 mm); b, petal tube opened (1.5 mm); c, sepals with capsule (3 mm). *L. manilaliana*: d, flowering shoot (1 cm); e, petal tube opened (2.5 mm); f, sepals with capsule (4 mm). *L. micrantha*: g, flowering shoot (1 cm); h, petal tube opened (1.5 mm); i, sepals with capsule (3 mm).

more than 1 cm long, remaining **erect** in fruit; bracts all leaf-like; sepal lobes oblong-obtuse; petal 6-7 mm long; si ami nodes rather smaller and simple.

Annual. In swampy lowlands. It grades into *L. parvilorn* which, in turn, grades into *L. hjS&pUxUs*, I suspect it is *n* laic developing ratlifr xrroinoi phii ter-restnaJ eeddof *L. panfifiom*.

[0 Heft. Endemic to S India: *Ind: K1 (Calicut). August-L-December.

Undent to micrantha D. Don \Vandellia angxislifotia **Bentfaam**]: Fig. 959

Stems glahrous, laxly bi-<inched, erect or a^tndcnl, usually not rooting ai nodt-s, 7-25 cm (all. **Leaves** phibrous, st^ssil^, linear to linearlmiccolaic, 1-2 (-4) cm long, 0,3-6 mm wide, pinnatdy nerved, base attenuate, margins entire or sparsely and **obscurely crenatC**, tips **obOiae**. Flowers solitary in die axils of lcal-lic bracts; pedicels 0.5-2 (-3) cm long, glabrous. Sepals deeply Mobcd almost to the base, 2--1.5 mm long; lobes linear-lanceolate, acuminate, **globFOUS**. IVtats 8^9 mtn long, pale pmpile; adaxi;il lip \pm ^ mm long, emarginaie to shallowly 2-lobed; ahaxuil tip \pm 2 mm long. Stamens 4. alJ ivitli fertile anthc-rs; ;uit)it-rs \pm J itnn **fang** and spurred at both ends; iibaxial **fibmentt** each with a rounded appendage, 0.8-1 mm long arising near the base, the anthers each with a basa) spur as loti^ M the aritlu'r itself. Capsule* cylindrical, acuminate, 0.9-1.5 cm fong, 1-1.5 mm in diameter, more than I wee the length of ihe sepal*, arching upwards or hcrumitig defle>ted when **ripe**. Seeds shor?lv cylindrical, \pm 0,3 mm U)Bg, \pm 045 mm in diameter, tninnu-ly pitted.

Annual. Usually found in wet rice fields. It often grows with *L. ntttigallis* v/htrh tl closely resembles in floral structure. It is almost cenaiuly under-recorded in India.

[0 Hel]. **Tropcal** and E Asia: Cey. Ind, Nep: KJ. Rj.

Lindernia minima (ftentham) Mukherjre: Fig. 358

likti *L. TtiUmdifolia* but slems erect, simple below, 2.5-7.5cm long; leaves in 2-3 pairs; leaf blades 2,5-6.5 mm long, the lip obtuse, the margin entire; pedicels 6.4-17-5 mm long: petals 6.4-S.3 mm long; capsules subgtobosc, \pm 2.5 mm in diameter, \pm equalling sepals.

[G Ht-1). Endemic to S India: »Ind: Tn (Patayan-kartal).

Liudernia inoltu (Kctuhain) Wettstem [/, rnttam (\amazaki) Pliilcox, *Vandrltia taontana* (Bhime) **Koordon**^ Fig. 359

Stems **creeping** and rooting at nodes, 20-50 cm long. **Sparsely** to densely covered wiili spreading long white hairs. leaves sitbscssile or shortly pctiolate; pei-



FIG. 358- *Ijudmtta minima*: A, flowering plant (1 cm); b, perianth tube opened (1.4 mm); c, longitudinal section of the corolla tube (1.4 mm); d, petal tube opened (2.5 mm); e, longitudinal section of the ovary with capsule (2.5 mm). *L. tnylittigituntln*: I, flowering shoot (1.3 cm); g, longitudinal section of the corolla tube (1 mm) with one enlarged adaxial stamen (inset); h, sepals enclosing the capsule (1 mm).

leaves 0.5-13 mm long, with long white hairs; blades ovate to amplexicaul, 15-4 cm long, 0.8-3 cm wide, pinnately nerved, with long white hairs above and below. The base prostrate to nerved, the margins rounded or pointed teeth, the lip subacute to obtuse. Flowers either in a cyme of 4-6 flowers, borne at the ends of sympodially branched stems or without peduncles and 1- or 2-flowered; pedicels slender, 1-2 cm long, with long white hairs; bracts linear-lanceolate to linear, 1-3 mm long. Sepals 4-7 mm long, deflexed to the base, with spreading white hairs; lobes almost linear, acute, ciliate, the abaxial one usually shorter than the others. Petals 8-11 mm long, white to pale violet, fragrant; adaxial (upper) lip 2-lobed, the lower lip 3-lobed, longer than the adaxial lip, the central lobe larger 3-4 mm long. Stamens 4, all with fertile anthers; abaxial (lower) pair each with a rounded, knee-like appendage ± 0.4 mm wide at the base. Capsules ellipsoidal, 4-5 mm long, 2.5-3 mm wide in diameter, shorter than the sepals, spreading or deflated when ripe. Seeds shortly cylindrical, ± 0.3 mm long, ± 0.2 mm wide, pitted.

Annual. Marshy land and seasonally inundated places on clayey soil. Glabrescent plants are sometimes called *Lindernia nutans*.

[O Hel]. S and SE Asia: Batavia, Bur. Ind. ?AW. AS. Malaya, Ng. Sit, Wb.

Lindernia maliuginoides (Benth.) V. Vetslein: Fig. 359. Like *L. minima* but flowered 2-10 in umbel-like clusters or rarely solitary-axillary, smaller (sepals 3-4 mm long, petals 4-5 mm long); leaf blades lanceolate to oblong-ovate; capsules ellipsoid, ± 0.5 mm long, ± 0.2 mm in diameter, shorter than the sepals, deflexed when ripe; lilamem appendages clavate.

Annual. Sandy ground on river beds or in open wet meadows.

[O Hel]. India. Myanmar and Thailand: Bur. Ind.: K. A. low altitudes.

Lindernia nummularifolia (D. Don) Wellst. f. [*nummularifolia* orth. var. *nummularifolia* Benth.]: Fig. 360.

Stems single, with short hairs on the angles, simple or laxly branched, erect, 4-17 cm tall, occasionally decumbent and rooting at lower nodes. Leaves subsessile, coriaceous; petioles up to 3 mm long; blades suborbicular to ovate-orbicular, 1-2.5 cm in diameter, pinnately nerved, looking palmate! The base rounded to truncate, the margins with sharp saw-like teeth and ciliate, the tip obtuse. Flowers solitary or in the axils of leaf-like bracts or in leafy cymes; bracts scale-like, 0.7-1 mm long; pedicels 0.3-1.5 cm long, glabrous below sparsely hispid above. Sepals campanulate, ± 1.5 mm long at anthesis, becoming 2-3 mm long in fruit; lobes subequilibrant as the tube, sparsely pubescent on the nerves and margins, 7-10 mm long, white and pink or reddish to purple with a yellow streak at the throat. adaxial lip ± 9 mm long, pale violet-brown, 5-angled: abaxial lip ± 4 mm long, middle lobe with a pale yellow blotch at the base, Stamens 4, all with fertile anthers; abaxial filaments each with a rounded appendage, ± 0.15 mm thick, arising near the base. Capsules linear-cylindrical, acuminate, 5-11 mm long, ± 2 mm in diameter, the wall almost transparent, 1-2 times as long as the sepals, arching upwards when ripe. Seeds ellipsoidal to obovate, 0.4-0.5 mm long, ± 0.3 mm in diameter, obscurely longitudinal and ribbed, minutely pitted.

Annual or perhaps sometimes perennial, in open ground in evergreen forest, along mountain ridges usually in wet places, particularly in rice fields. The epithet '*sessiflora*' refers to cleistogamous flowers.



RG. 359. *Undmia nummulanifolia*: a, flowering shoot (1 cm); b, petal tube opened (1.6 mm); c, sepals with capsule (2.5 mm). *L. oppositifolia*: d, flowering shoot (2 cm); e, sepals (2 mm); f, petal tube opened (2 mm).

plants which have very short pedicels; they are particularly common during the monsoon.

{(©) Hcl}. African mountains and Asia from Kashmir to W and C China: Bur, Cey, Ind, Nep: As, Bn, Hp, Jk, Kt, Mn, Mp, Ng, Sk, Tn, Up, Wb. 0-2900 m.

Lindemia oppositifolia (Retzius) Mukherjee [*Gratiol* oppositifolia* Reuius, non G. Don, *Bonnaya minima* G. Don]: Fig. 359

Stems erect, up to 30 cm tall. Leaves sessile or nearly so, linear-lanceolate to oblong-lanceolate, 2-3.5 cm long, 0.4-0.7 cm wide, pinnately nerved, base narrowed, margins saw-like, tips acute. Flowers axillary or leaf-opposed, solitary or in racemes, borne singly or in opposite pairs; bracts leaf-like below becoming linear and reduced above; pedicel up to ± 1 cm long. Sepals 3-6 mm long; lobes lanceolate, acute. Petals 2.5-3 mm long, ± 2.5 mm in diameter; pinkish below, with blue to whitish lobes, with or without a yellow fleck at the throat; petal tube ± 3 mm long; adaxial hp ± 2.5 mm long, entire, obtuse; abaxial lip ± 3 mm long. Stamens 2; filaments ± 1.5 mm long, anthers unequal, ± 0.5 mm long; staminodes linear, ± 0.6 mm long, acute.

Capsules lanceolate, ± 0.7 cm long, much exceeding the sepals, deflexed.

Annual. Wet lowlands, scrub jungle and pasture land. Often found in rice fields after the harvest. It is often gregarious and is easily seen as it has very lush green leaves. It is used locally in medicine.

{(©) Hel}. S and SW Asia: Ind, Nep: Bh, Gj, Go, Kl, Kt, Or, Tn. Up, Wb. 0-1400 m.

Lindemia parviflora (Roxburgh) Haines: Fig. 360

Stems erect or ascending, simple or branched from below, slender, 7-15 (-30) cm tall, glabrous. Leaves sessile; blades linear-lanceolate to oblong-lanceolate; the lower ones 3-10 (-15) mm long, 15-3 mm wide, 3- or sometimes 5-nerved from the base, base rounded, margins entire, tips acute; the upper ones smaller and narrower, often 1-nerved, often minutely 1- to 2-dentate. Flowers axillary, mostly borne singly and alternating or sometimes in opposite pairs; bracts leaf-like below becoming smaller above and sometimes scale-like; pedicels slender, 3-10 (-15) mm long, often reflexed in fruit. Sepals 1.5-2 (-3) mm long, deeply



FIG. 360. *Lindemia parviflora*: a, flowering shoot (1 cm); b, sepals with capsule (2 mm); c, petal tube opened (2 mm); d, seed (0.2 mm). *L. procumbent*: e, flowering shoot (1 cm); f, petal tube opened (1.6 mm); g, sepals with capsule (1.6 mm); h, seed (0.13 mm).

lobed; lobes linear-lanceolate, glabrous, acute. Petals 4-6 mm long, ± 2.5 mm in diameter, white or pinkish-white, with 2 yellow dots at the throat; adaxial lip ovate, notched; abaxial lip with 3 oblong lobes. Stamens 4, the adaxial pair with fertile anthers; filaments ± 1 mm long, anthers ± 0.4 mm long; staminodes clavate, ± 0.5 mm long. Capsules oblong-globose, slightly oblique at the tips, 3-4.5 mm long, 1.5-2.5 mm in diameter, 1.5-2 times as long as the persistent sepals. Seeds narrowly ellipsoidal, ± 0.2 mm long, ± 0.12 mm in diameter, longitudinally ridged, reticulate.

Annual. Moisture loving, in humid sandy places and rice fields. Gregarious and locally abundant in perennially moist areas and along river banks. The flowers opening after 10 a.m. A very variable species that sometimes intergrades with *L. hyssopoides*.

{O Hel}. Old World tropics: Cey, Ind, Nep: Ap, As, Bh, Dl, Gj, Kl, Kt, Mg, Mh, Mn, Rj, Tn, Up, Wb. 0-1800 m.

Lindemia procumbens (Krocker) Borbás [*L. pyxidaria* Linnaeus, *Gratiola integrifolia* Roxburgh, *Vandellia erecta* Bentham]: Fig. 360

Stems erect or ascending, 5-20 (-30) cm tall, glabrous. Leaves sessile; blades elliptical to ovate-elliptical, glabrous, 0.7-2.5 cm long, 0.3-1 cm wide, 3- or sometimes 5-nerved from the base, base rounded, margins entire, tips obtuse. Flowers solitary; pedicel 0.5-2 cm long. Sepals lobed almost to the base, 2.5-3 mm long; lobes linear-lanceolate, acute. Petals 4-5 mm long, pale pink; adaxial lip ovate, notched; abaxial lip with 3 rounded lobes. Stamens 4, all with fertile anthers; adaxial filaments each with a clavate to linear spur 0.4-1 mm long arising near the base, anthers notched at the ends. Capsules ellipsoid, 3-4 mm long, 2.5-3 mm in diameter, subequalling or slightly longer than the persistent sepals. Seeds oblong, 3-4 mm long, ± 1.5 mm in diameter, longitudinally ridged, reticulate.

Annual. Rice fields, river beds and other moist and muddy habitats.

{O Hel}. Temperate to tropical Eurasia: Ind, Nep: Bh, Jk, Mp, Or, Pj, Rj, Sk, Up, Wb. 0-2400 m.

Lindernia pusilla (Willdenow) Boldingh [*L. caespitosa* (Blume) Panigrahi, *L. laxa* (Bentham) Mukherjee, *Vandellia scabra* Bentham, *Torenia hirta* Chamisso et Schlechtendal]: Fig. 360

Stems hispid with spreading long hairs, prostrate, ascending or erect, 5-15 (-25) cm tall; branches widely spreading from the root stock. Leaves sessile or shortly petiolate; petiole up to 3 mm long; blades ovate to suborbicular, 5-12 mm long, 4-14 mm wide, pinnately nerved, pubescent above, hirsute beneath, base truncate, margins obscurely toothed, tips acute. Flowers solitary or

in clusters of up to 4 in the axils of leaf-like bracts, borne singly or in opposite pairs; pedicels 3-15 (-30) mm long, hispid. Sepals 2-3 mm long, cleft almost to the base, glandular hairy; lobes lanceolate, acute, ciliate. Petals 5-8.5 mm long, ± 7 mm in diameter, violet, yellow and/or white at the throat or white, usually with a brown adaxial lip; petal tube 4-5 mm long; adaxial lip erect, 2.5-3 mm long, entire or 2-lobed; abaxial lip longer than the adaxial lip, ± 3 mm long. Stamens 4, all with fertile anthers; adaxial pair with ± 1.5 mm long filaments, the anthers ± 0.7 mm long, with broad connectives; abaxial pair with 3 mm long filaments, each with a rounded, knee-like appendage ± 0.2 mm wide, the anthers like the abaxial ones. Capsules obovoid or globose, 2-4 mm in diameter, the septum winged, shorter or equalling the sepals, spreading or deflexed when ripe. Seeds shortly cylindrical, 0.3-0.5 mm long, ± 0.2 mm wide, truncate at both ends, minutely pitted.

Annual. Borders of ponds or tanks, in marshes, in wet grassy places and in rice fields. Often locally very abundant.

{0 Hel/Ten?}. Old World tropics: Cey, Ind, Nep: As, Bh, Go, Kl, Kt, Mp, Ng, Or, Sk, Tn, Tp, Wb.

Lindernia rotundifolia (Linnaeus) Alston: Fig. 361

Stems 4-angled, with short hairs on the angles, decumbent and rooting at lower nodes, with branches ascending, up to 20 cm tall. Leaves sessile or subsessile, blades ovate to orbicular, 5-13 mm long, 4-12 mm wide, 4- or 5-nerved from the base, base truncate, glabrous, margins minutely toothed towards the tips, tips obtuse. Flowers solitary in the axils of leaf-like bracts; pedicels 0.5-1.5 cm long, glabrous. Sepals divided to the base; lobes \pm equal, lanceolate, 2.5-3 mm long; ± 1 mm wide, minutely glandular hispid. Petals (9-) 11-14 mm long, bluish-white; tube white at base; adaxial lip 2-lobed, usually with a yellow patch inside, abaxial lip 3-lobed, white with purplish-blue blotches at the bases of the lobes. Stamens 4, with 2 bearing fertile anthers; filaments 1.5 mm long; staminodes linear to club-shaped, curved outwards at the tips, dark blue with age. Capsules ovoid-globose, 2.5-3.5 mm long, equal to or slightly shorter than the sepals. Seeds oblong ± 0.5 mm long, with transverse bars.

Annual or perhaps sometimes perennial. In rice fields, particularly after harvesting, along ditches and the edges of ponds and tanks.

{(O) Hel}. Mauritius, Madagascar, W and S India and Sri Lanka: Cey, Ind: KJ, Kt, Tn.

Lindernia rueUoides (Colsmann) Pennell [*'rueUoides* orth. mm., *Bonnaya reptans* (Roxburgh) Sprengel]: Fig. 361

Stems sparsely pubescent, prostrate, branching and rooting below. Leaves petiolate; petioles 4-20 mm



FIG. 561. *Urtica strobilifera*: a, flowering branch (1 in); b, petal tube opened (2 mm); c, stipules with capsule (1 mm). *U. nuokidsy*: d, petal tube opened (2.5 mm); e, stem with node (1.1 cm); f, stem with node and stipule (3.3 mm).

long; blades elliptical or orbicular-elliptical; 1-5 cm long, 0.5-2.5 cm wide, pinnately-nerved, sparsely pubescent, base, narrowed, margins closely denate with inward teeth and acute at the apex, lips acute. Flowers axillary, in a lax cyme. bracts borne in opposite pairs; bract linear, 4-6 mm long pedicels 5-20 mm long in fruit, glabrous. Sepals deeply 5-lobed to the base, 7-9 mm long; lobes 12-15 mm long, 9 mm in diameter, pinkish to lilac, purple or violet; arched lip 3-lobed. Siamensis 4. 2 with fertile anthers; filaments \pm 2 mm long, anthers \pm 0.7 mm long, cylindrical broad; stamens 2, 2-3 mm long, hooded, pubescent; books elliptical, Capsules cylindrical, arched, 1(1-20) mm long, 12-2 mm in diameter, 2-2.5 times as long as the sepals, arching upward when ripe. Seeds ellipsoid, 0.35 mm long, \pm 0.25 mm in diameter, imbricately pitted.

Annual, Rice field*, riversides, stream sides and swampy grasslands.

[O Hill. Tropical and subtropical Asia: Bur, Ind, Nep: As, Kl, Mg, Ng, Sk, Tn,

Undaria sritankana Gamet et Phitcux: refer to Fig. 360

Like *U. paxilla* but leaves 5-nerved from the base; stamens 2 with fertile anthers and 2 sterile; the sterile ones lid-like, bending outwards.

Annual. In open grassy localities. Flowering in February.

[O Hill. Endemic to Sri Lanka: Ceylon]

Lindernia tenuifolia (Colson) Alston *L. tenuifolia* v. *psgmatum* Sivrajati et Millip M; Ht-wl: Fig. 362

Stems glabrous, simple or weakly branched, erect or acaulescent, 5-20 (-40) cm tall. Leaves sessile or nearly so, glabrous, linear to linear-lanceolate or almost filiform, usually somewhat succulent, 0.5-3 (-5) cm long, 0.5-5 (-9) mm wide. 1-nerved (lateral nerves obscure), base decurrent, margins entire to sparingly crenate, tips obtuse or subacute. Flowers solitary, usually leaf-opposed and subtended by a small bract; bract scale-like, linear, 0.5-2.5 mm long; pedicels stout, 2-10 (-17) mm long. Sepals deeply 5-lobed almost to the base, 1.5-2 (-4) mm long; lobes

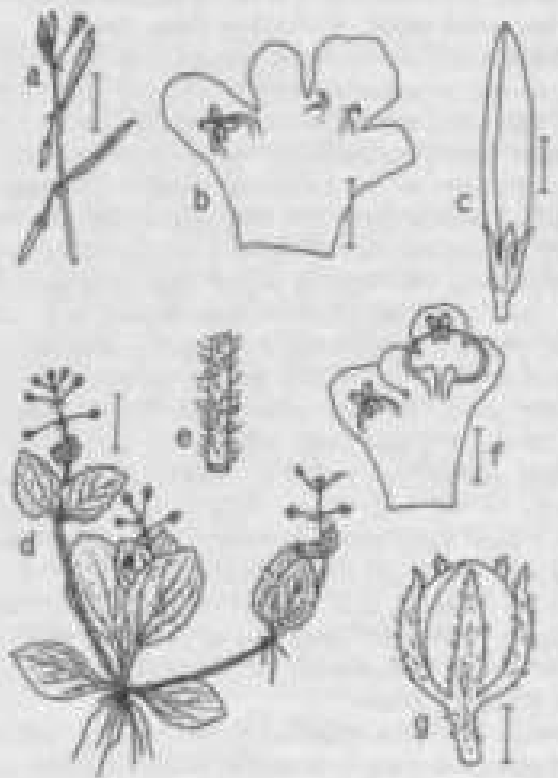


FIG. 562- *Lindernia unguiculata*: a, tip of a flowering branch (1 cm); b, petal tube opened (1 mm); c, capsule (1.6 mm). *L. unguiculata*: d, flowering plant (2 in); e, enlarged view of stem with node; f, petal tube opened (1 mm); g, stem with capsule (1 mm).

lanceolate, obtuse. Petals (2,5-) 3-4 mm long, 2-5 mm in diameter, pinkish-white to blue or purple. Stamens 4, the adaxial 2 with fertile anthers; adaxial filaments ± 0.7 mm long, anthers unequal, ± 0.3 mm long; staminodes 2, filiform. 0.3-0.5 (-1.5) mm long. Capsules cylindrical, acute, 4-8 (-12) mm long, 0.7-1 mm in diameter, 5-4 times as long as the sepals, **dehiscent** when ripe. **Seeds** **obovoid** 0.6-0.7 mm long, minutely pitted.

Annual. A **deciduous** herb, often gregarious in marshy ground, along backwaters and in rice fields after the harvest. Sometimes it is found close to the sea shore. On dry sand or in gravelly soil it is **terrestrial** in the me with stems ± 2 cm tall, with minute flowers and almost filiform leaves ± 3 mm long; these plants have been named var. *pygmaea* Sivarajan et Philip Maffew.

[0 Hd]. S and SE Asia: Bur, Cey, Ind: Co, Kl, Tn.

Lindenbergia viscosa (Hornemann) Boldingh *Vandellia hirsuta* P. Harnilhi CX Firm ham, *V. mujiom* (Roxburgh) G. Don]: Fig. 362

Stems sparsely to densely hispid with spreading long hairs, laxly branched, erect or ascending, 5-15 cm tall; branches widely spreading from the root stock. Leaves sessile or **petiolate**; **petioles** 1-8 mm long; hinder ovate to **obovate** (1.5-3.5 cm long, 1-2 cm wide, pinnately nerved, hirsute on both surfaces, base truncate, margins undulate or **crenate-dentate**, tips **acute**. Flowers in lax racemes borne at the ends of **branches**; pedicels 4-8 mm long, glandular pubescent; bracts lanceolate to subulate, 1-2 mm long. Sepals 2-3 mm long, cleft almost to the base, with spreading hairs and glandular; lobes linear-lanceolate, acute, ciliate. Petals ± 5 mm long, ± 7 mm in diameter, **white** to pink with or without a **yellow throat**; adaxial lip broadly ovate, 2-lobed; abaxial lip longer than the adaxial lip, ± 3 mm long. Stamens 4, all with **fertile** anthers; adaxial pair with ± 1.5 mm long filaments, the anthers ± 0.7 mm long, with broad **connate** abaxial pair each with a rounded, knee-like appendage ± 0.15 mm wide, the anthers like the adaxial ones. Capsules globose, 2-2.5 mm in diameter, sinuate or dehiscent when ripe. Seeds shortly cylindrical, ± 0.3 mm long, ± 0.2 mm wide, minutely pitted.

Annual. Wayside, edges of forests, swamps and moist shady places. It is rarely found in wetlands. Giabrescent **perennial** here *Mimosa* *incana* as a separate species — *Undulata mulijhm* (Roxburgh) Mukherjee.

[O Hd?]. Tropical Asia: Ban, Bur, Cey not found recently, Ind, Nep: An, Bh, Go, KJ, Mg, Mp, Pj, Rj, Sk, Up. Wb.

Microcarpaea [excluded from *Puffidium*]: 1 species *Microcarpaea minima* (J. G. König v. Retzius) Merrill *X. mirtum* R. Brown, *Ammannia denitrides* S. Kurz: Ssg. 363

Stems 1-15 cm long, capillary, creeping, **rooting** at the base ascending at the apex. **Leaves** decussate, subsessile; blades simple, linear to oblong-linear, 2-5.5 mm long, 0.5-1 (-2) mm wide, glabrous, **inerved**. **margin** entire, tip **obuse**. Flowers minute, sessile or nearly so, solitary in leaf axils; submerged flowers **clitogamous**: bracts absent. Sepals 1.5-2.5 (-3) mm long: lobes 5, slightly shorter than the tube, **recurved*** margins **and** **acute**. Petals 2-3 mm long pink or light purple: tube $\pm 1-1.5$ mm long; lobes 5, ciliate to the apex, **the*** adaxial lobe longest (± 1 mm long) and **exceeding*** **the** **sepals**. **Stamens** 2, **adaxial**; **Stamens** **with** **filament**, ± 1 mm long: anthers exserted, appearing 1-locular in maturity. 0.2 mm long. Style linear, ± 1 mm long; stigma capitate. Capsules ellipsoidal to globose, 1.2-2 mm long, locally **dehiscent** Seeds ellipsoid, ± 0.4 mm long.

Annual, Small creeping plants forming mats of vegetation in seasonally **inundated** areas and along it.

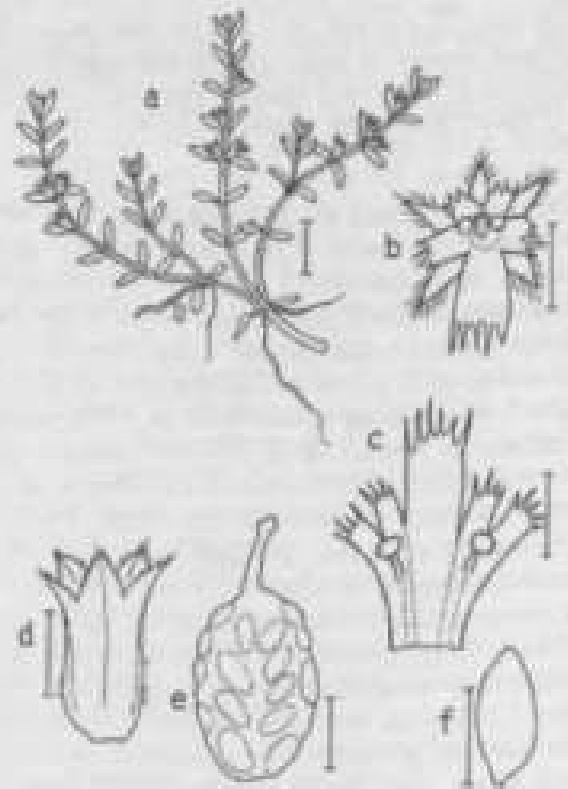


Fig. 363, *Microcarpaea minima*: a, flowering plant (3 mm); b, **front** view of the flower (1 mm); c, corolla tube (1 mm); d, sepals (1 mm); e, capsule (0.5 mm); f, seed (0.25 mm).



FIG. 364. *Mimulus aurantiacus*: a, tip of a flowering shoot (2 cm); b, 1 flower (2 mm). *Mimulus aurantiacus*: c, flowering plant (1 cm); d, two capsules (2 mm); e, staminal tube (1 mm); f, capsule (1 mm).

grows in streams and ponds. Autogamous or perhaps sometimes entomophilous. The disseminules are seeds; [seed dispersal is unknown, probably carried in mud]. Frequency found in rice fields but not considered to be troublesome.

India: Tenasserim, Tropical Asia and Australia: Ban. Bur, Cey, Ind, N; p: Kl, Kt, Mp, Rj, Tn.

Mimulus: 150 species: cosmopolitan, mainly New World
excluded: wetland plant confined to the Himalayas
Mimulus nipaletus Hemsl.

Found in wet or damp places but not in wetlands:
Stimulus xstrictus H. N. Tham [M. gmds BOEL hid., DOB
R. Brown, A, fmsillus IVntham 1

Mimulus aurantiacus Wallich ex Benham: Fig. 364

Stems creeping and branched, up to 50-100 cm long, rooting at nodes. Leaves opposite; petioles 0.2-3 mm long; leaf blades elliptic-lanceolate, 0.9-3 cm long, up to ± 3 cm wide, attenuate at the base, entire, rounded apically at the apex. Flowers solitary or paired in leaf axils; pedicels 1.3-4 cm long as long or longer than the ovary. Sepals 3.5-4.3 mm

long, 5-angled with 5 longitudinal ribs, & united, the teeth deltate. Petals 12-15 mm long, tubular, 2-lipped, slightly constricted towards the throat, bluish-white to purple with a yellow spot; the upper lip exterior in bud, 2-lobed; abaxial lip shorter, 5-lobed, with middle lobe 2-lobed. Stamens 4; filaments inserted to the lower part of the petal tube 7 mm long; anther locules 2-angled at the apex, more or less spreading. Style ± 4 mm long; stigma 2-lobed, with sensitive lobes 1-5 mm in diameter. Capsules ellipsoid, 5-8 mm long, 3-4 mm wide, somewhat insular, with longitudinal dehiscence and persistent style. Shreds of the cylindrical, ± 0.2 mm long, ± 0.2 mm wide

Perennial perhaps sometimes annual. Often found in mud in shallow water or in shallow water in lakes, ditches and fallow land. It is a very common brackish water plant and it often grows in estuaries and lagoons by the coast. Bailey, L. K. and Matty, G. G. Observations on the distribution of salinity on a link known plant, *Mimulus aurantiacus* Wall, ex Benth. (Scrophulariaceae). Bulletin of the Botanical Survey of India 2(1-4): 1-14 (dated 1990, published 1992).

(?) Hypothesis. Tropical Asia: Ban, Bur, Ind: Or. Wb. May-December.

Peplidium [excluding *Mimulus*]. 2 species: tropical and subtropical Old World

Peplidium maritimum (Linnaeus f. L.) Aschersan [f. *hutchinsonii* Delile, *Mimulus rochfordii* J. G. König ex J. E. Smit: Fig. 364

Stems much branched, creeping, rooting at most nodes, leaves decussate, subsessile; blades orbicular to obovate or spatulate, somewhat succulent, 5-10 mm long, 4-6 mm wide, glabrous, pinnately netted, base distinct. Margins entire, apex obtuse. Flowers minute, usually solitary in leaf axils but sometimes 2 or 3, sessile or shortly pedicellate; submerged (lower corolla lobes); pedicel up to 1 mm long. Sepals tubular, 1.7-2 mm long, 5-ribbed, bluntly 5-toothed, enlarged in fruit. Petals ± 2 mm in diameter, white or pinkish white; tube ± 2 mm long; lobes 2, ca. equal, ± 1 mm long, undulate, obtuse. Stamens 2, adaxial; filaments flattened, curved and narrowed above, facing each other, ± 0.8 mm long; anthers 1-locular, reniform, 0.2 mm long, style linear, ± 0.5 mm long; stigma 2-lobed. Capsules globose, 2-angled in diameter, dehiscing irregularly or regularly by 2 or 4 valves. Seeds oblong to cylindrical, ± 0.5 mm long, longitudinally striate.

Annual. A small, mat-forming plant growing in seasonally inundated places, flowering as the water recedes. It tolerates saline water and is sometimes found in coastal marshes along the coast. Autogamous or perhaps sometimes entomophilous. The disseminules

abaxial lobe the toaltept Stamens 2; filaments diverging laterally, bearing the anther beyond the petal. Style elongate, 1.3-2 (-3) mm long. Siliques capsular, flattened laterally. 5-10 mm long. 2-3 mm wide, locules 2, dehiscent at maturity. Seed also dehiscent. Seed oval, flattened, 0.6-0.7 mm long.

Annual or short-lived perennial (usually dying after flowering). Found in a variety of aquatic habitats, seawater, submerged, floating or emergent. Pollinated by insects. The disseminules are flattened seeds; dispersed by adhesion to animals or by water, used locally in medicine, the leaves are used as a vegetable and it is cultivated for decoration. I have seen no material from lowland India but it is frequently recorded.

(O Hel/Plc/Vit). Almost cosmopolitan: Bhu. Ind. Nep: IM, Jk. Mp, Pj. Rj. Up, Wb. ?-4700m.

SPHENOCLEACEAE (sometimes united with CAMPANULACEAE): 1 genus

Sphenocleis 2 species: 1 In W Africa the other pan-tropical, binomially naturalized in America and SE Asia. *Sphenocleis uyanica* G. Don, *CR Fip*, 3(37)

Stems erect or decumbent, usually swollen at the base up to ± 150 cm high. Leaves alternate; stipules absent; petioles up to 10 cm long; blades lanceolate, up to 10 cm long, up to 3 cm broad. Reticulate, entire, tips ± acute. Inflorescence a dense terminal spike, up to 7 cm long, ± 1 cm in diameter. Flowers bisexual, radially symmetrical. Sepals united to the ovary, white, 5, oval, imbricate lobes. Petals bell-shaped, perianthous: lobes 5, as long as the sepals, greenish-white. Stamens 8, alternate to petals, alternating with the petal lobes; filaments very short. (very semi-interior). 2-lobed; style 1. short; stigma very shortly 4-lobed. Fruit a capsule, siliquose, apically flattened, opens along a horizontal line; the valve opening off like a lid; seeds minute, mucilaginous, attached to a lateral and apical axile placenta.

Aitnu. il. Seawater, submerged, emergent or temporarily terrestrial, often found in swampy areas, along the banks of water bodies in rice fields. It can tolerate brackish water, it is autogamous but perhaps also sometimes pollinated by insects. The disseminules are small seeds, dispersed in mud and perhaps also by other means. It is a troublesome weed in rice fields but it is also cultivated and eaten as a vegetable. *Mtmod. T. A pmpos du Sphenocleis uytattica*. *Adansonia ser.* 2, 20(2): 147-16* (1980).

(O Hel/Hypf. Almost pantropical: Ban, Cey. Ind. Nep. Pak: An, As, Dt. Cki. Kt. Mn, fy Rj, Up. U^



Fig. 367. *Sphenocleis zeylanica*: a, flowering branch (6 cm); b, single leaf (1 cm); c, petal with lobes opened (2 mm); d, detached lid (1 mm).

STERCULIACEAE excluded see p. 12.

TILIACEAE excluded see p. 12.

TRAPACEAE: 1 genus

Trapa: 1 polymorphic or up to ± 20 species warm to tropical world, native in N-Vnoria

This genus is very variable and without a satisfactory taxonomic treatment. In India it is now variable in the Himalayas where the following occur: *Trapa natans* var. *natans* (T. *gaedtispinosa* Roxburgh and T. *maximiliani* Konobinsky var. *inrisa* Steud. et Lucchini (a much smaller plant with smaller incise-dentate leaves and much smaller fruits which are long and thin spines), Kadono, Y. A preliminary study on the variation of *Trapa* in Japan. *Ada i hyoiaximomica ei Gobotanka* (Kyoto) 38: 199-210 (1987).

Trapa var. *bitittam* (Roxburgh) Makino
| *T. bitittam* K. K. J. K. 'Mi'
Stems elongate, mostly simple, flexible, submerged, horizontal. Leaves opposite below, alternate above.



Fig. 368. *Typha roseifolia*: A, flowering plant with branched root (2 cm); B, young plant with linear leaves (2 cm); C, leaf sheath (1 cm); D, seedling (2 cm).

dimorphic; submerged leaves sessile, linear, entire, caducous (after falling off green, pinnately branched, adventitious root* develop from the leaf scars, these roots are often mistaken for leaf* in the literature); floating leaves in terminal rosettes, the blades rhombic with toothed margins and broadly cuneate to truncate bases, **petiole** often with an ellipsoidal and spongy swelling. Flowers bisexual, radially symmetrical, solitary, shortly pedicelled, **often** cleistogamous. Sepals 4, triangular, united to the ovary, persistent, developing into 2, 3 or 4 hard spine* or horns in fruit. Petals 4, white or lilac, caducous. Stamens 4. Ovary half-inferior, 2-locular: ovules pendent, 1 in each locule, but only 1 develop*. Fruit a large, woody or bony, very polymorphic, variously sculptured, spinose mericarp with 2 large and 2 small (often rudimentary) spines: the spines with or without barbed lip

Annual or **perennial** Found in still or slowly flowing water, the seedlings are submerged, the adult leaves float in rosettes. Pollination **Biflagellate** or sometimes entomophilous. The disseminules are large spiny nutlets.

dispersed by animals and also by water - It is frequently cultivated in Asia (singhara in India) and elsewhere **Where** it is a staple food. The fruits are eaten raw or cooked; in China they are also used for making Hour-Tone art many cultivars; some of them are without spine*. The cultivated races are annual or **perennial** such. Large populations may be very troublesome to navigation, fisheries and recreation.

(O) Eph. Old World, it is widely cultivated and it is **difficult** to say today where it is native, probably mostly introduced in tropical India: Ban, Bur, Cey, Ind, Pak: As, Bh, 1). Itr. <Kl, <Ki, Mh, Mp, Upi Wb.

TYPHACEAE [excluding SPARGANIACEAE]:

1 genus

Typha: ± 8 species; cosmopolitan

Stem* erect and comi-like, connected by stolons or rhizomes, leaves distichous, sheathing below, not differentiated into petiole and **blade**, scale-like on underground parts otherwise linear; linear leaves mostly radical and upright, emergent or rarely submerged. **Flowers** arranged in superposed, cylindrical, unisexual spikes the female **below** the males. Perianth segments or hair-like, simple or branched, in female flowers modified to **antheroid** hairs. Male flowers ephemeral, lightly packed and hardly distinguishable from individual flowers; filaments usually united below; perianth hairs; the gynoecium (2 (in 2 kinds: diandrous with unilocular ovules; ovulate gynocarpium with unilocular ovules). Fruit stalked, opening by a single valve, a 1-seeded capsule (or follicle) or indehiscent. **Silicle** tofistyl, cylindrical, the chalazal end sharply pointed.

Perennial. Found in a variety of aquatic habitats, the juveniles are submerged, the adults emergent or sometimes **terrestrial**. It is usually gregarious and often **dominant** over large areas. **Perianth** by itself. The disseminules are 2-seeded capsules or follicles, dispersed by wind, releasing the seeds in **WUBB** when they are further transported by water or animals (mostly fish). The rhizomes and pollen are gathered by humans and eaten locally. The leaves are used in weaving mats and roofs. Large stands make favorable refuge for wildlife. In irrigation systems it is a serious pest and can even block navigable water. **Literature** is enormous, the following reference is a short **summary**, Smith S. G, *Typha*: its ecological significance of hybrids, **Annals**

see

VF.RBENACKU

dimorphic with pan **horizontal** and pun **vertical**; horizontal rhizomes usually deep, OW-2 m **bdON** the soil surface; **vertical** rhizomes terminate in aerial shoots crowded with persistent leaf bases. Scale leaves appressed to hut not surrounding and **enclosing** ilic baicrnodts. Photosyntheik leaves robust ami siilfwiih raiher sharp margins, up lo 4 m or more long, (14-) 17-22 (-40) mm wide, with a prominent adaxial **ridge** from base to ape*> in **transverse section distinctly** S-angled and conmining (1) 2 (S) rowis of gas chambers; shrath.% decurent. Inflorescence stalks up to 3 m or more tall, subtended by **numerous leaves which** about equal the flowering steim in **Length*** **Female** inflorescence in fruit 10-25 im long, dark reddish-brown, (itip between male and **female** inMoieiticiics 2-10 fin **Of WOIS** long- **M<k** (lowers: hairs simple. with spaihuLue or **chlb-shaped** tips; slamcm mostly single; filaments mostly simple, up to 2 mm lonp; anihers after dnihesii, ± 2.:>-> mni long; pollen in **Mtnfft**, individual grains (1 ft-) 20-26 (im in diameter. **Female** flowers subtended by simple **bracts** with dark brown to almost black, linear io slightly **dub^hajoed** lips: peiiantli hairs 1>-2I (-28), slightly swollen at the tip. arising from the base of the gynophore; stigmas linear* **lanceolate w** spathuiiau-. up to L **tana tong**, disihn iK **exceeding** the perianth hairs. Pistillodi-i najTowJv club-**abaped** with raucronate tips, overtopped by perianth hairs. Riiniuli in IVULI **With D3-OJ5** mm tall **band** part; **terminal** pvui 0.S-1.5 mm or pcTUaps **swvv**. long, icvittinang in a naked pistitlodium or a tuft ol- hairs or bracW. Seeds 1.1-1.3 nun long, ± Q,%~&SS mm in diameter.

Found in a **wide variety** nf wetland habitats, including alkaline and brackish conditions, 'flu- rhizomes readily spread from wet places into **dryer** ones; it ran thus **invade** fields used for **cultivating wheat**, maize or »oya. It is difficult to eradicate, li is **used** in mm and paper making.

fHyp/(Hel}}|. Warm to tropical Asia and perhaps also \hi.:t: Ban, Ind. Nep. Pak: As? Rj. Wb. This species is under recordexL

1 M lit:LMFERAE see APUCEAE

\ i; RISEN ACE AE ±91 genera

Trees, simile, liana* or herbs. Leaves usually opposite. without stipules. Flowers usually bisexual. **Sepals** inbul.u **below** with (4) 5 {-&) **lobe* abpw**, IVids tubni.li **below**, t irregular to 2-lipped **Stamens** 2 or 4; tilaments inserted on the petal **tube**. Ovary of (1) 2 carpels. Fruit a head ul 1-aceded mertcarps, a dmji<- or a 2- or 4-v.ike(i **capsule**. **Seeds** with a straight, **only** embryo.

Phyla | *Lipfria*] :±\ species

Phyla nodiflora (Linnaeus) E. Greene [*Uppia nodiflora* (Linnaeus) **Uicbauxjj** Fig. 5S0

Surms **Qreptng** and exiting at nodes. {5-} 30-95 **cm long, pubnceoi** with (**SeatiaQy attached** and appreeti **wbhe** hairs: llowefin^ **shoots**, soineimrs **aacetwiffg**, very rarely nu.ve than 10 **an taJL Uanea as** **oppositi pairs**, **sessik** or **tapezed** with **shoci snbptiolatc** **bases**, **oblance-olaie**, spathnhu- **Of Obovate**, (0:7-) 1--i (-7) **cm long**, **f'i.b-\ :U7 (-10) mm wide, apkaHy rounded at** **obtus.** rarely acute, marginally loothed lioin the middle **or just** abo\ t.; (eeth shaq>. (8-) 5 (-7) on earh side. **B** **ceoee** a very **dense**, many-fbwered. **cyfindricaJ** spike **with** (lowers home in the axils of Lightly **g^alaupiUg ta** **bracts omeatetibovafe**, 2r>-3 **mm long**, with **margin**, somewhat apimlate. **Sv\ rjA vwbv. sonn'w** **liiHtrm-rl.** with 2 narrow pubpsemi knls each running into ;m erect triangular to snhulau- **IHK-**. **lobes 1.5-2^{tn}** long, split io more than hall' their knRili. **estriirlinii** **beyond** the (mil. Petals white to pale mse-pnl'P^{lc}, **tubular**, 2-lipprtd. 4- or **Mobed**. Stamens **I.** in 2 p^{airs}; anther not rxendc **beyond** the **petals**. Fritif = t l i 0 **E^obose**, separaung into '2 **merkaxpt**, each **troneatt** **and** 1-2 mm long.



Ru. 370. *mi, mHttflw.* a, nwninR **plath** (< cm) **h11** (1 nm); c. inflorescence (1 cm); C, petal mbr **opened** **idsadal** < (1 mm).

Perennial or annual. Found in regions regularly flooded, flowering as the water recedes, particularly common on the banks of irrigation ditches and ponds but also found in moist grassland and regularly watered lawns. It forms a dense turf and is sometimes planted as ground cover. Used locally in medicine. It is very variable in form and some varieties have been described. A second, probably not wetland species, *Phyla canescens* (Kunth) E. Greene, has been reported from S India; it is like *P nodiflora* but it is covered with soft greyish hairs; leaves entire or bluntly toothed; mature spikes ovoid-globose; bracts elliptical-ovate; sepal lobes less than half as long as the tube; petals lilac or pink.

[<O)? Hell. Cosmopolitan in tropical to warm regions: Ind, Nep, Pak: <An, Ap, As, Bh, Dl, Gj, Go, Kt, Lk, Mh, Mp, Pj, Rj, Tn, Tp, Up, Wb.

VAHLIACEAE see SAXIFRAGACEAE excluded seep. 11.

XYRIDACEAE: 5 genera

Xyris: 250 species: almost cosmopolitan

Stems reduced, corm-like. Leaves distichous, mostly radical, simple, linear or capillary, sheathing at the base. Inflorescence a simple, terminal, bracteate head, borne on an elongate culm. Bracts overlapping, persistent. Flowers bisexual, tightly packed between bracts. Sepals 3, 2 lateral, keeled, persistent, the median large, membranous and hooded, covering the petals in bud. Petals 3, almost free, yellow or rarely white, withering before noon. Stamens 3, inserted on the petals. Staminalodes 3, filiform, forked, each arm brush-like, with numerous hairs. Pollen grains smooth. Ovary superior, 1-locular, with 3 parietal placentas; style without appendages; stigmas 3, linear. Fruit a capsule. Seeds numerous, ellipsoid-fusiform, with dark-coloured longitudinal ribs.

Perennial or annual. Most species are found in marshy or wet areas and may grow seasonally ^merged. Pollinated by insects, the petals usually wither by midday. The disseminules are seeds; dispersal unknown. Some are used locally in medicine and some are cultivated for decoration; the culms are used to make figures for Hindu temples. Hansen, B. Xyridaceae in Flora of Thailand 5(1): 130-140 (1987).

1. Bracts in the middle of the inflorescence with distinctly notched tips, margin otherwise ^entire

K r a T s in the middle of the inflorescence with entire tips, although sometimes irregularly torn, ,f notched then the margins ciliate

2. Bracts in the middle of the inflorescence with ciliate margins at least towards their tips; culms flattened above with 2 strong ridges; leaf margins rough to touch

X complanata

2. Bracts in the middle of the inflorescence without cilia on the margins; culms terete or if flattened then without 2 strong ridges; leaf margins smooth or rough to touch

3. Leaf blades with short transverse ribs connecting the longitudinal ones; the margins smooth; culms terete (circular or nearly so in transverse section), with 6-15, low, longitudinal ridges

X indica

3. Leaf blades without transverse ribs; the margins smooth or rough; culms terete or somewhat flattened toward the tip, smooth or with 1-7, longitudinal ridges

4. Bracts in the middle of the inflorescence without a greenish-brown or grey field below the tip, at most a longitudinal keel on the upper third of the abaxial surface

X capensis

4. Bracts in the middle of the inflorescence with a greenish-brown or grey field below the tip on the abaxial surface

5. Greenish-brown or grey field below the tip on the abaxial surface oblong-triangular, 3-10 times longer than wide, not protruding upwards; leaf sheath ciliate below (NE India and Mynamar)

X wallichii

5. Greenish-brown or grey field below the tip on the abaxial surface triangular, at most 2.5 times longer than wide, protruding or not protruding upwards; leaf sheath not ciliate

6. Leaves more than 3.5 mm wide, when dry smooth; greenish-brown or grey field below the tip on the abaxial surface not protruding upwards; plants robust (Myanmar)

X intersita

6. Leaves rarely more than 3 mm wide, when dry rough due to protruding cell walls; greenish-brown or grey field below the tip on the abaxial surface ridge-like and protruding upwards towards the tip of the bract; plants slender (wide sp read)

X paucifolia

Xyris capensis Thunberg [X. *capensis* Thunberg var. *schoenoides* (Martius) Nilsson, X. *schoenoides* Martius, X. *nilagarensis* Steudel]: Fig. 371

Leaves with and without Hgules; blades flat, (5-) 10-25 (-35) cm long, (1.8-) 2-3 (-4) mm wide, the margins slightly thickened. Culms terete, (13-) 25-60 (-70) cm long, 1-2 mm wide, with 1 or 2 ridges. Inflorescence globose, 6-9 mm long, 5-11 mm wide. Bracts in the middle of the inflorescence blackish-brown to light brown, smooth except for a longitudinal keel on

the upper third of the abaxial surface, margins entire, lateral sepals brownish with an entire and smooth crest.

Perennial. In open wet places in hills.

(Hdl. S and SE Asia, S Africa and S America: Ind. Ncp: As. Mg, Tn. 900-2700 m.

Xyris camptanata R. Brown (*X. ancrps* auct Ind., non Lamarck]; Fig. 371

Leaves with ligules; sheaths dark brown to black; blades flat; (3-5) 25-60 cm long. (0.8) 1-1.5 cm wide, surface smooth, the margins thickened and rough (with rows of outwardly pointing cells). Culms flattened in transverse section or subterete, occasionally-tangled, (10-) 70-80 (-90) cm long, (H.7-) 1.5-2 (-2.8) mm wide, with 1-5 longitudinal ridge*. Inflorescence ellipsoid to ovoid or cylindrical, 9-31 (-39) mm long, (2.5-) 6-8 mm wide. Bract is in the middle of the inflorescence greenish-brown to light brown, darkening with age, margins dilate towards the tip and entire below. Bract slightly notched at the tip: greenish-brown or grey. Held on the abaxial surface below the tip elliptical-rhomboid, 2.5-3 mm long, 1.5-2 mm wide, with some scattered light spots, lateral sepals brownish

with a ciliate crest. Capsules 2.4-4.5 mm long. Inflorescence reddish-brown. 0.35-0.4 mm long, with ± 14 dark brown ridges.

Perennial, in marshes, moist drainage ditches, along streams and other wet places. The petals may persist until well into the afternoon in this species.

(Hdl. S and SE Asia and Australia: Bur. Cev, Eni Bl. 0-1600 m.

Xyris indica Unnaeus [*X. mSwtha* Martins. ?X Halm:sl:Fig. 372

Leaves without ligules; sheaths reddish-green to reddish-brown; blades uniflorous, flat, (10-) 30-50 (-70) cm long, (1.5-) 3-5 (-13) mm wide, the margin not thickened, smooth or sparsely papillate, with 1-5 longitudinal nerves. Culms terete. (5-) 30-70 (-110) cm long (1.2-) 2-3 (-4.5) mm wide, with 6-13 longitudinal ridges. Inflorescence ovoid to cylindrical. ML KM5 (86) mm long. (5-) 8-14 mm wide. Bract in the middle of the inflorescence dark or light brown; margins entire, the tip entire or slightly notched; greenish-brown or grey. Held on the abaxial surface below the tip triangular-rhombic. 1-2 mm long. 0.8-2 mm wide, not protruding upwards. Lateral sepal light brown to almost hyaline, with a coarsely serrate margin. Bract 2.9-4.2 mm long. Seeds ovoid, 0.5-0.6 mm long, yellow, with 14-18 longitudinal ridges.

Perennial and perhaps sometimes annual. It grows in sand or muddy soil in swampy places, sometimes in shallow water in streams, pools, ditches and rice fields. It is used as cure for ringworm, itch and leprosy.

(10) Hel/Hyp. S and SE Asia and Australia: Bail. Bur, Qey, Ind: As, Go, Kl, Kt, M_K, Mh. Mn. Mp, Sk, Wb-

Xyris intmito Malme: Fig. 372

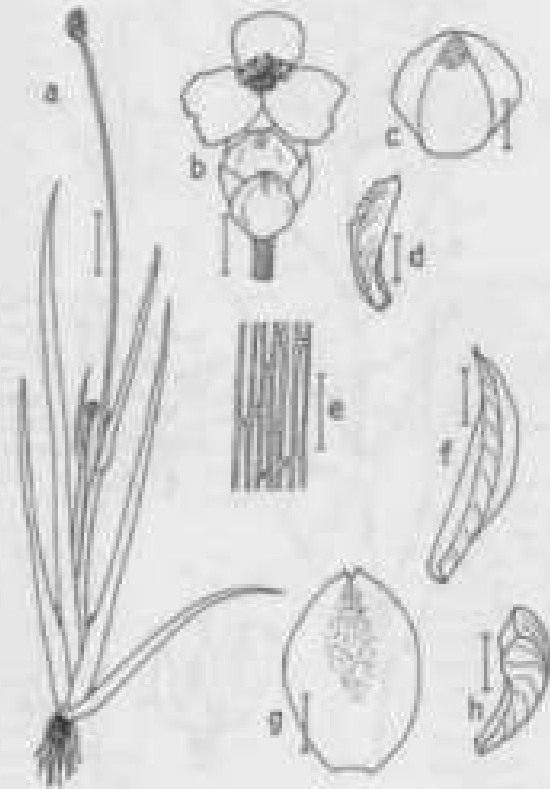
Leaves without ligules; blades flat, (7) 1-3 (-38) cm long. (3-) 5 (-7.5) mm wide, the margins widened but not thickened, smooth. Culms terete. (6-) 10-35 (-40) cm long, (0.7-) 1.5 (-2) mm wide, without longitudinal ridges. Inflorescence ovoid to globose, (6-) 7-11 (-14) mm long (0.5-) 7-10 (-11) mm wide. Bracts in the middle of the inflorescence light brown, with some scattered light spots, entire or minutely toothed towards the tip. Sometimes torn at the tip; grey-brown field on the abaxial surface. The tip triangular. U&S long, 1-1.5 mm wide. Lateral sepal (light brown to almost hyaline) with a ciliate crest.

Perennial. On moist sandy soil.

(Hel). IndoChina, Thailand and Myanmar: Bur.



Fig. 371. *Xyris camptanata*: a, flower (4 mm); b, a petal mm; c, lateral sepal (1.5 mm); d, bract (13 mm); e, (towering plant) (8 cm); f, spike with 1 flower (4 mm); g, branch (5 mm); h, capsule (4 mm); i, seed (0.8 mm).



Flc, S72. XyrU f « * » 4 flowering plant (4 cm); b, spike with 1 flower (3 mm); c, bract (1.5 mm); d, lateral sepal (1.5 mm); e, portoa of lea. ...rfece (4 mm); f, longitudinal section of lateral sepal (3 mm); g, lateral sepal (1.5 mm); h, lateral sepal (1.5 mm).

Xyris lobbiai Kunth: Fig. 372
 Leaves without ligules; sheaths with ciliate margins; blade flat, 5-30 cm long, 1.5-4.6 mm wide, the margins not thickened, smooth. Culms terete or slightly flattened, 3-5 mm long, 1.5-2 mm wide, without ridges. Inflorescence subglobose, 8-15 mm long, 6-12 mm wide. Bracts in the middle of the inflorescence light brown, with many light spots scattered below the grey-brown field, margins smooth, with a deep notch at the lip; greenish-brown field on the abaxial surface below the tip triangular, ± 2 mm long, ± 2 mm wide. Lateral sepals brown, firm, widening upwards, with an entire or minutely lathred crest. Perennial. Wet places in forests. (L. r. j. r. B. HdJ. V. k. n. a. m., Thailand and Myanmar. Bur. 1000-2150 m.)

with longitudinal ridges, mostly unridged. Inflorescence ellipsoid to ± triangular. 3.5-10 (-14) mm long. 2-7 (-12) mm wide. Bracts in the middle of the inflorescence light or dark brown to blackish, with some light spots scattered below the grey-brown field, margins entire; grey-brown field on the abaxial surface below the tip triangular, 0.7-2.1 mm long, 0.4-1.3 mm wide, sometimes widening in the upper half, usually protruding towards the tip of the bract. Lateral sepals light brown to hyaline, with a coarsely saw-like tooth at the tip. Dufur's 2.5-3 mm long. Seeds ellipsoid, 0.5-0.4 mm long, yellowish to reddish-brown, with 12-15 longitudinal ridges.

Annual or perhaps sometimes perennial. In open wet places, swamps, the margins of pools and rice fields. Flowering during and after the monsoon, [0? He!]. S and SE Asia and Australia: Borneo, Bur, Cey, Ind, Nep: Ap. Go. Kl. Kl, Tn. Wb. 0-1500 m.

Xyris wallichii Kunth: Fig. 873

Leaves without ligules; sheaths with ciliate margins; blade flat, 5-30 cm long, 1.5-4.6 mm wide, the margins not thickened, smooth. Culms terete or

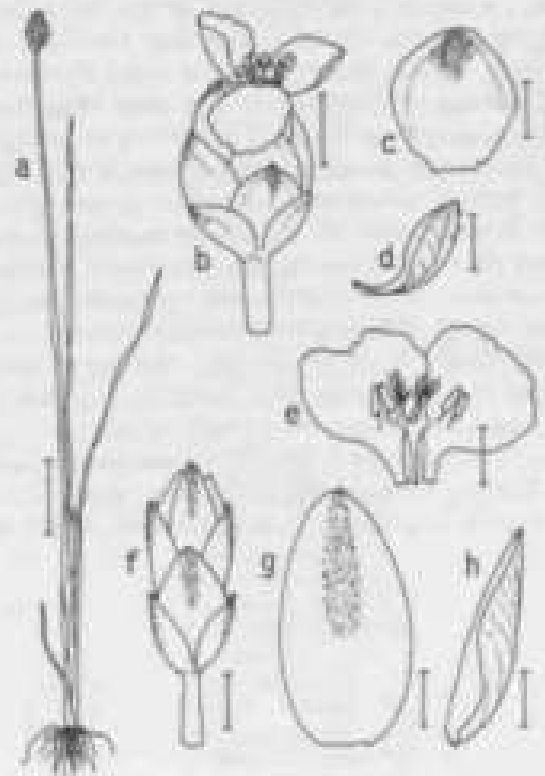


FIG. 373. Xyris pumila: a. Flowering plant (1 cm); b, spike with 1 flower (3 mm); c, bract (1.5 mm); d, lateral sepal (1.5 mm); e, cross-section of leaf with 2 mm scale bar; f, longitudinal section of lateral sepal (2 mm); g, lateral sepal (1.5 mm); h, leaf venation (1.3 mm).

Xyris pumila Willdenow: Fig. 373
 Leaves with or without ligules; sheaths red to reddish-green; blades subterete, (2.5-) 3-20 (-35) cm long, 0.4 (-3.7) mm wide, surface rough (papillate-scabrid) the margins thickened, rough (epidermis tuberculate). Culms terete or nearly so, (3-) 10-30 (-44) cm long, 0.5-1.5 mm diameter, rarely

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