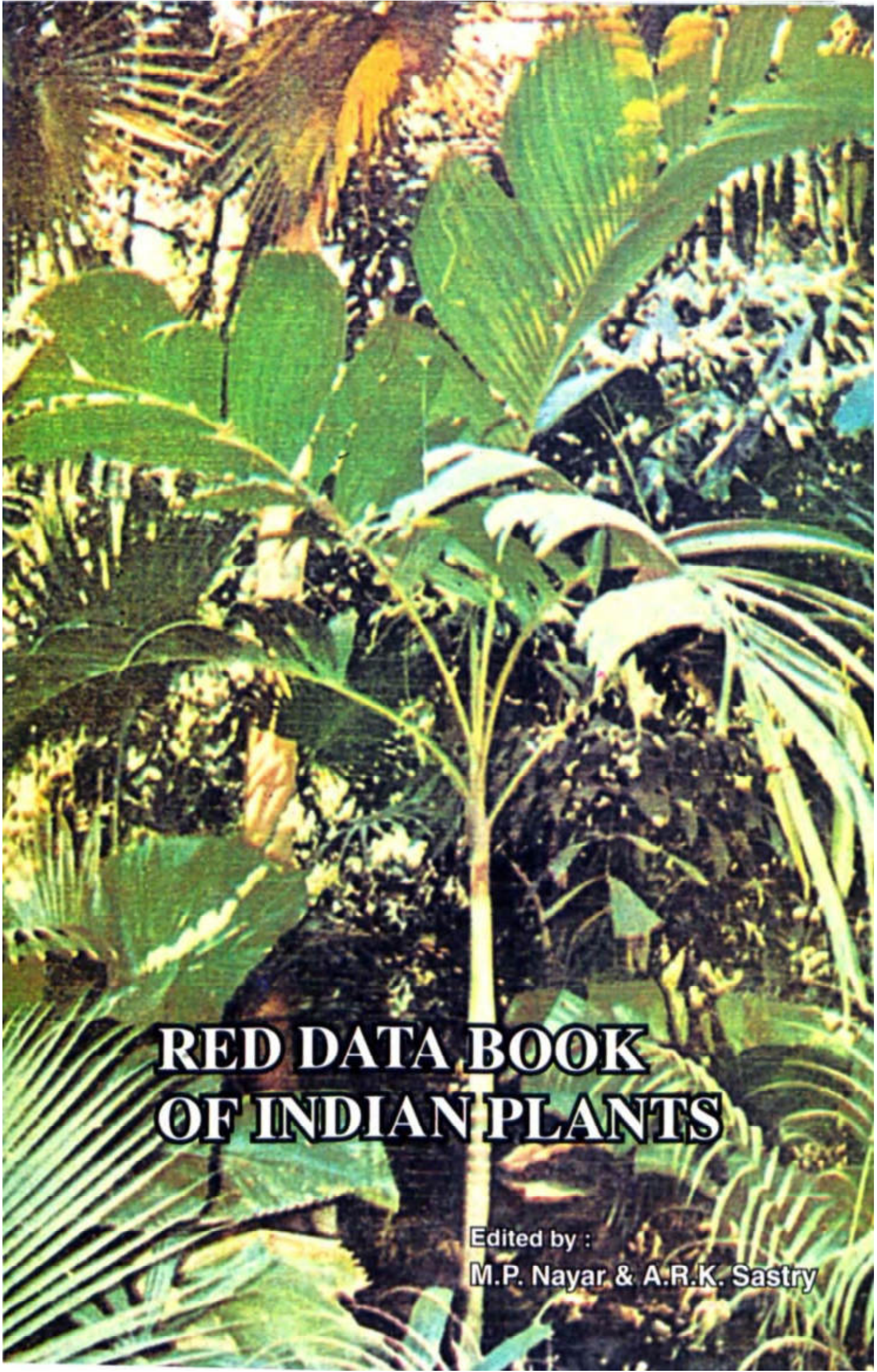

RED DATA BOOK OF INDIAN PLANTS

Edited by :
M.P. Nayar & A.R.K. Sastry

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Bentinckia condapanna
Courtesy : S. K. Basu

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PREFACE

The first volume of the Red Data Book on Indian Plants was published by the Botanical Survey of India in March, 1987. In the introduction to the first volume the editors (M. P. Nayar & A. R. K. Sastry) briefly outlined the magnitude of the problem of the threatened plants on a global basis, the IUCN estimates on the world's threatened vascular flora and the publication of Red Data Book, the problems on Indian threatened plants and the work done in our country and the future programmes of the Botanical Survey of India. In the back-drop of this general information it was considered worthwhile and useful to reproduce the IUCN Red Data Book categories and the definitions on threatened plants as also some pertinent information on extinction and rarity in plants (as Annexures I & II respectively) for better understanding of the problem and collection of scientific data on the subject. 235 data sheets on different threatened taxa of the Indian region have been included in the first volume.

The present volume includes 192 data sheets on threatened vascular flora and some of these are also distributed in similar phytogeographical areas in the neighbouring countries of the Indian subcontinent.

The presentation of the scientific data for each species is in accordance with the style of the first volume with the families, genera and species arranged in alphabetical order, the currently accepted botanical name (in roman bold print) on the left side with its corresponding family (in capital letters) on to its right at the top of the page. The scientific data for each species is presented following the format in the IUCN Plant Red Data Book (eds. Lucas & Synge, 1978) adopted in the first volume of the Indian Plant Red Data Book. Illustrations are given for several species with suitable captions and have been placed nearest to the corresponding data sheet. Also, black and white and colour photographs of some species have been given at the beginning of the book.

As has been stated in the first volume, efforts have been made to bring uniformity while editing the data sheets; however, some variations still exist due to different styles of presentation followed by different authors.

A combined index to species dealt in the first and second volumes of Red Data Book on Indian Plants is given at the end for easy reference.

We welcome any suggestions on these publications and appeal to scientists working on the lower groups of Indian flora to collect data on threatened and endemic species and to send it to the Director, Botanical Survey of India for inclusion in future volumes.

M. P. NAYAR
A. R. K. SASTRY

Editors

PREFACE TO THE FIRST REPRINT

The UN Biodiversity meeting at Earth Summit in Rio de Janeiro held in June 1992 laid immense stress on biological diversity of our globe and the need to preserve it for posterity. Over the past few decades, the populations of many plant and animal species have declined at an alarming rate due to ecological disturbances caused by human population explosion and industrial expansion. Some of them have even become extinct. The IUCN was the first to publish the accounts of plants and animals which have become rare, threatened and/ or extinct in the form of Red Data Books from time to time. Realising this alarming situation various countries in the world have brought out Red Data Books of plants and animals at country level. The Botanical Survey of India has published three volumes of "Red Data Book of Indian Plants" edited by M.P. Nayar and A.R.K. Sastry in the years 1987, 1988 and 1990. Two more volumes (4 & 5) are in various stages of publication. Since the publication of these volumes, there is a great demand for these books by people from all walks of life and stocks have exhausted. All these volumes provide basic data to undertake detailed study and conservation of species included. The Botanical Survey of India has initiated the Status Survey of all the species included in these volumes and since these studies take a very long time to produce revised editions of Red Data Books, to meet the pressing demand for books on my suggestion, the Programme Advisory Committee of BSI and ZSI, Ministry of Environment and Forests, Govt. of India, recommended the reprinting of the first editions of volumes as such. The Reprinted Volumes hope to meet the immediate demand of all who are in need of these volumes for study and conservation of Biodiversity.

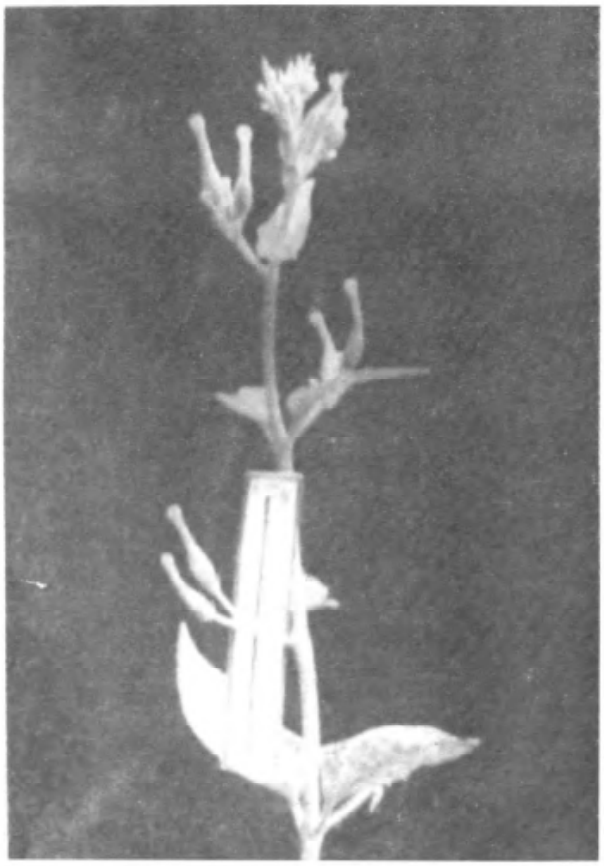
Director
Botanical Survey of India
P-8, Brabourne Road (N.P. SINGH)
Calcutta 700 001

ACKNOWLEDGEMENTS

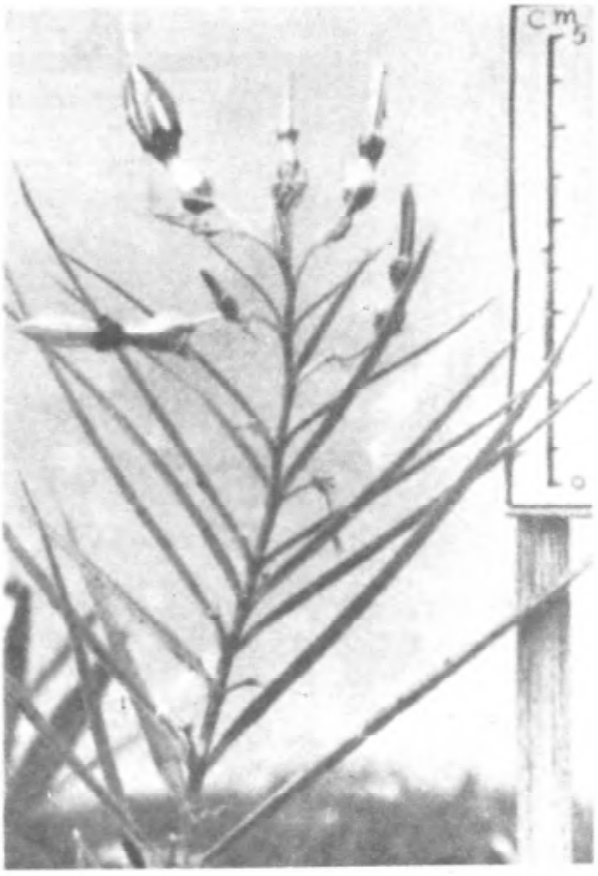
We place on record our grateful thanks to Dr. B. P. Pal, F.R.S., Hon. F.L.S., formerly Chairman, National Committee on Environmental Planning and Coordination and National Man & Biosphere Committee and Dr. M. S. Swaminathan, F.R.S., President, IUCN, for their keen interest in this work. We express our deep gratitude to Shri K. P. Geethakrishnan, Secretary and Dr. A. C. Ray, Additional Secretary in the Ministry of Environment and Forests, Government of India for their kind encouragement and support. We are grateful to Prof. A. K. Sharma and Prof. H. Y. Mohan Ram, former and present Chairmen, Programme Advisory Committee, for their advice and suggestions.

We also thank all the botanists who have contributed the Red Data Sheets, illustrations and photographs included in this volume.

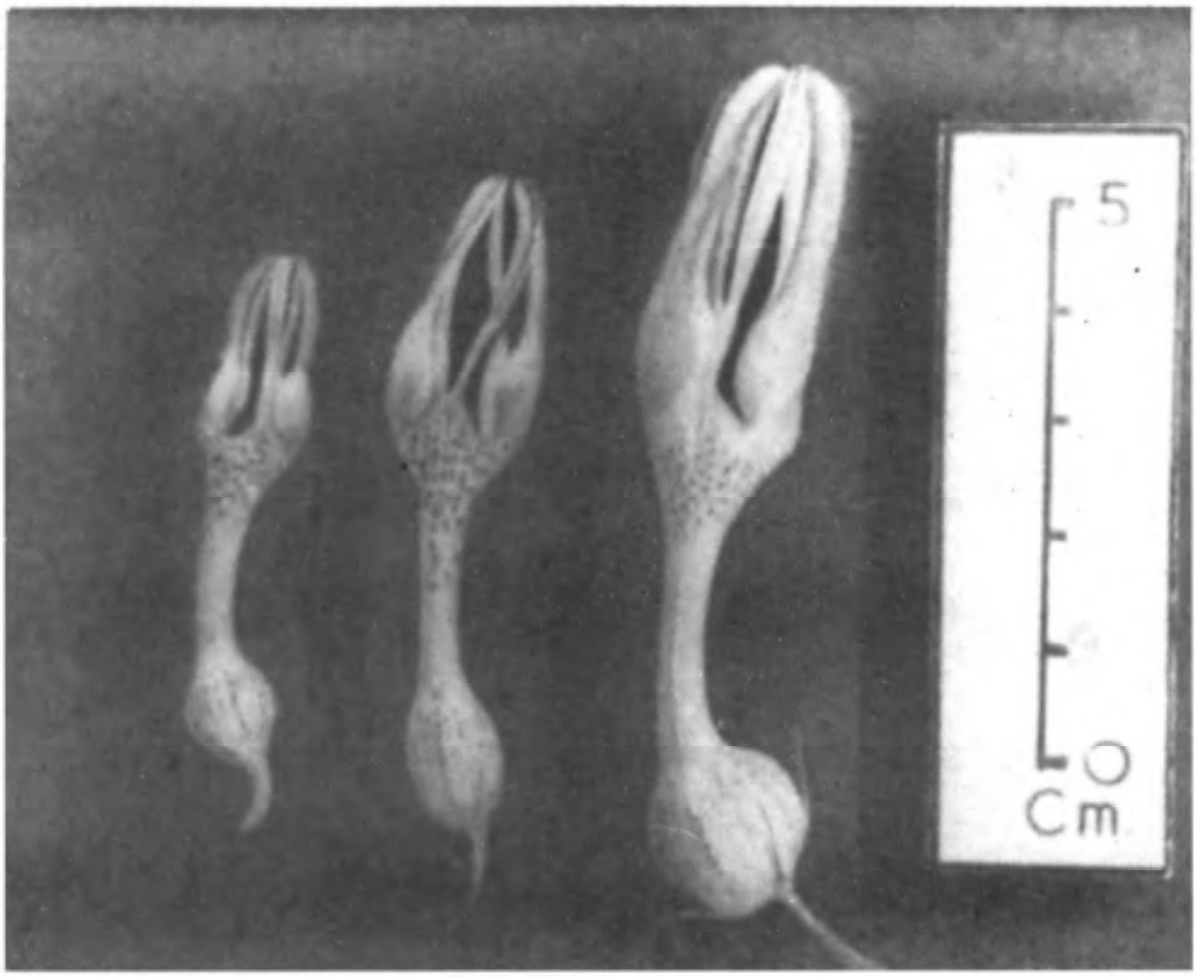
Shri S. C. Pal, Publication Officer and Shri R. V. Kammathy, Scientist B, have rendered help in processing publication of this book; Shri L. P. Sikder, ex-senior Artist made improvements in some of the illustrations and Shri D. C. Chakravarty, Stenographer rendered help in typing work; we thank them all for their help.



Ceropegia maccannii Courtesy : M. Y. Ansari



Ceropegia noorjahaniae Courtesy : M. Y. Ansari

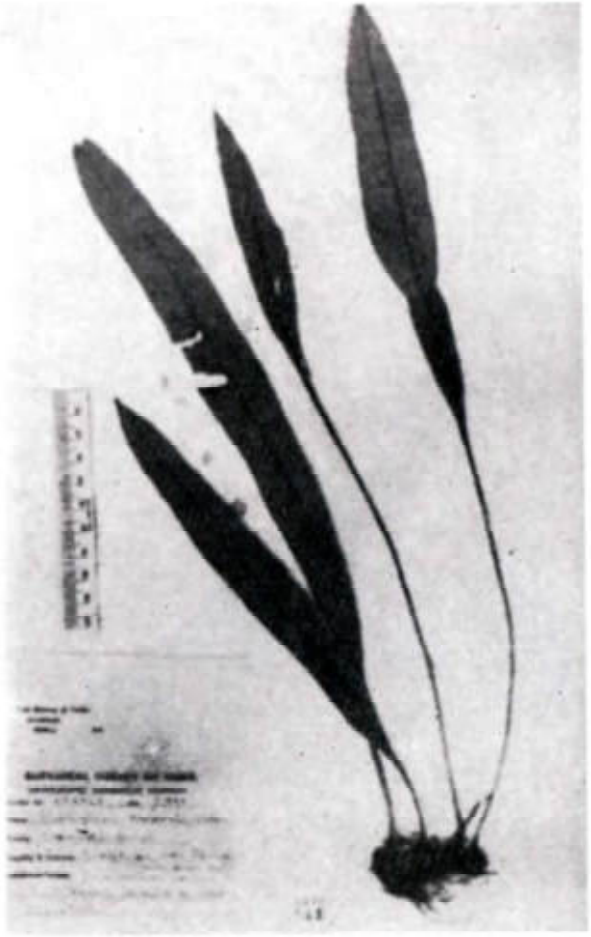


Ceropegia vincaefolia

Courtesy : M. Y. Ansari

Christensenia assamica Courtesy : S.R. Ghosh

Drynaria meeboldii Courtesy : S.R. Ghosh



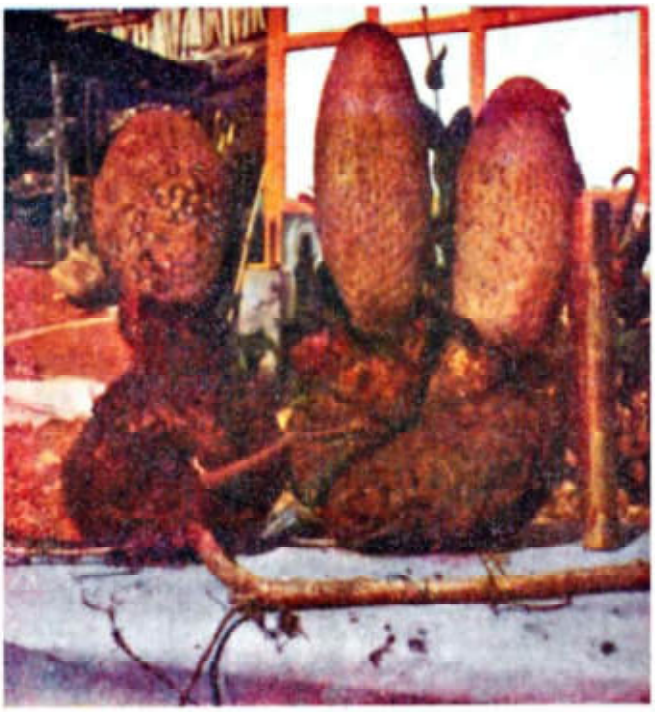
Elaphoglossum beddomei Courtesy : S.R. Ghosh

Cyathea crinita Courtesy : R. D. Dixit

Bentinckia condapanna Courtesy : S.K. Basu

Bentinckia nicobarica Courtesy : S.K. Basu

Inula racemosa Courtesy : P. K. Hazra



Rhopalocnemis phalloides Courtesy : A.S. Chauhan

Status: Rare. The species has not been collected in the recent years.

Distribution: Panchgani, Satara Dist., Maharashtra. Endemic.

Habitat and Ecology: On open grassy plateau.

Conservation Measures Taken: None.

Conservation Measures Proposed: The type locality and neighbouring areas need to be explored for this species. The plants or seeds are required to be collected and cultivated in the experimental gardens.

Biology and Potential Value: The plant is worth introducing in botanic gardens as an ornamental for its beautiful mauve coloured flowers.

Cultivation: Not known.

Description: Undershrubs, upto 1 m tall, much branched, stem 4-angled, obscurely winged; basal leaves ovate or rounded, 14×10 cm, upper ovate-oblong or oblong, 15-20 ×6-8 cm, leathery or papery, rigid, apex acuminate, base rounded. Bracts foliaceous, broadly elliptic-lanceolate, shorter than calyx. Flowers in dense terminal spikes, dark purple inside, mauve outside; corolla 6-10 cm long, tube 4-5 cm, enlarged upwards, upper lobes with an elongated dark purple blotch. Capsules oblong, smooth. Seeds disc-shaped.

Reference:

1. Blatter, E. & McCann, C. (1928). Some new species of plants from the Western Ghats. *J. Bombay Nat. Hist. Soc.* 32: 733. pl. 1.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status: Indeterminate; reported from only one locality. The species has not been collected after its type collection.

Distribution: Meroli, Khandala ghats, Pune Dist., Maharashtra. Endemic.

Habitat and Ecology: In forest clearings forming large patches.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: The Type locality and neighbouring areas need to be thoroughly explored; if the plants are found, collection of live plants and seeds for introduction in botanic gardens be attempted.

Biology and Potential Value: Not known.

Description : Erect branched herbs, branches woolly-tomentose; leaves ovate, apex acute or acuminate, base tapering, pubescent on both sides; petioles densely pubescent. Inflorescence in axillary or terminal umbels or cymes; peduncles woolly tomentose, 1.0-3.5 cm long; floral bracts in unequal pairs, one suborbicular, apiculate, the other ovate to subovate, sparsely hairy and strongly nerved; flowers pinkish; calyx divided nearly to the base; corolla upto 1.7 cm long, tube pubescent, bent just below the lobes, limb 2-lipped, upper longer than the lower. Capsules obovoid, obtuse or rounded, densely hairy. Seeds minutely tuberculate.

Reference:

1. Santapau, H. (1952). The Acanthaceae of Bombay. *Univ. Bombay Bot. Mem.* 2: 80-81.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status : Rare; due to loss of its habitats.

Distribution : Endemic to hills of South Canara, Coorg, Wynaad and Travancore in the South Western Ghats, South India.

Habitat and Ecology : Grows in shady moist evergreen forests in the altitudes of 1000-1500 m.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Detailed survey of the populations and the habitats to be protected and introduction of the species in botanic gardens are suggested.

Biology and Potential Value : With its profuse white flowers tinged with orange or red, the species can be grown in gardens as a horticultural hedge plant.

Description : Erect shrubs, 1-2 m. Leaves lanceolate, long caudate-acuminate, tawny pubescent beneath; main nerves 10-12 pairs. Flowers in heads, single or 1-3 together, very villous with small involucral bracts; bracts linear-oblong, obtuse; bracteoles narrow. Corolla tube cylindric.

References :

1. Beddome, R.H. (1868-74). *Ic. Pl. Ind. Orient.* t. 213. (*Strobilanthes caudataus* T. And.).

2. Clarke, C.B. (1884). Acanthaceae. *In :* Hooker, J.D., *Fl. Brit. India* 4 : 441.

3. Gamble, J. S. (1957). *Fl. Pres. Madras* 2 : 729 (repr. ed.) Botanical Survey of India, Calcutta.

4. Ramamoorthy, T. P. (1976). *In :* Saldanha, C. J. & Nicolson, D. H. *Fl. Hassan Dist.* p. 553.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Endangered or possibly extinct. An endemic species known only from its type collection made around 1850; might have been lost due to rapid destruction of the area for habitation and cultivation of commercial crops.

Distribution : India, Tamil Nadu, North Arcot District : Polur (4).

Habitat and Ecology : On black cotton soil (4).

Conservation Measures Taken : None.

Conservation Measures Proposed : Efforts should be made to find out whether it still survives in its type locality/adjoining regions in the upland. If available, it should be introduced in Botanic gardens.

Biology and Potential Value : A species of scientific interest on account of its geographical isolation especially in the dry regions.

Description : An undershrub; stems procumbent, terete, subteragonous when young, softly hairy. Leaves 2.2-5 × 0.6-2.5 cm, sessile, ovate, velvety on both surfaces, entire, acute or rounded at apex. Flowers very small in terminal, simple 2.5-5 cm long spikes; bracts upto 12 mm long, ovate, imbricate, pubescent, ciliate along margin, acute at apex; bracteoles small, subulate. Calyx 2-partite; posterior 3-lobed less than half-way down; anterior 2-lobed nearly to the base. Corolla tubular below, funnel-shaped above, 2-lipped. Stamens 4, didynamous, included; filaments short; anterior anthers 2-loculed, posterior 1-loculed; connective hairy. Capsules upto 8 mm long, oblong, 4-seeded; seeds compressed, hairy (2-4).

References :

1. Ahmedullah, M. & Nayar, M.P. (1987). *Endemic Plants of the Indian Region* 1 : 150. Botanical Survey of India, Calcutta.

2. Anderson, T. (1865). *J. Linn. Soc. Bot.* 9 : 499.

3. Clarke, C.B. (1884). *In :* Hooker, J.D., *Fl. Brit. India* 4 : 491-492.

4. Gamble, J.S. (1957). *Fl. Pres. Madras* 2 : 743-744. (repr. ed.)

5. Kumari, G.R. (1987). *In :* Henry, A.N. *et al, Fl. Tamil Nadu* Series I, 2 : 153.

The material for this sheet was supplied by A. N. Henry and M. K. Janarthanam, Botanical Survey of India, Coimbatore.

Status: The original materials were collected in 1890 and 1914 by Gamble and Lushington respectively (3, 4) from the hills of Visakhapatnam; later reported from Orissa as a rare plant (9).

Distribution: Endemic to N. Circars: Andhra Pradesh, Visakhapatnam hills, Peddavalsa, Endrica and Vantala (3), and in Orissa at Karlapat, Kalahandi (9).

Habitat and Ecology: Hills of E. Ghats from 700 to 1500 m.

Conservation Measures Taken: None.

Conservation Measures Proposed: The type locality falls within the proposed "Biosphere Reserves of the Eastern Ghats" (8, 10). This species is included in the list of rare and threatened plants (5, 9).

Biology and Potential Value: Phytogeographical interest, as the related elements are mostly confined to Western Ghats.

Description: Erect shrubs; stems tetragonous, glabrous except at apex. Leaves upto 12 × 6 cm, ovate, hairy above, strigose beneath, crenulate, acute at base, acuminate at apex; petioles upto 2 cm long. Flowers in dense heads at apices of branchlets; bracts upto 2 cm long, obovate, leaf-like, densely villous near base, acute at apex, bracteoles upto 1.5 cm long, linear, strigose-hispid. Calyx 5-lobed nearly to base; lobes linear, silky hairy, equal to bracteoles in length. Capsules upto 1 cm long, oblong-obovate, glabrous; seeds orbicular, glabrous (3, 4).

References:

1. Ahmedullah, M. & Nayar, M. P. (1987). *Endemic Plants of the Indian Region* 1 : 150. Botanical Survey of India, Calcutta.

2. Bremekamp, C. E. B. (1944). Materials for a monograph of the Strobilanthinae (Acanthaceae). *Verh. Kon. Ned. Akad. Wetensch., Afd. Naturk., Twede Sect.* 41 : 173.

3. Gamble, J. S. (1923). *Kew Bull.* 1923 : 373.

4. Gamble, J. S. (1957). *Fl. Pres. Madras* 2 : 728. (repr. ed.).

5. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of India. *J. Bombay Nat. Hist. Soc.* 75 : 692.

6. Mahajan, K. K. (1982). Endangered species (Plants and Animals). *Proceedings of the Seminar on Resources, Development and Environment in the Eastern Ghats,* p. 88. Andhra University, Waltair.

7. Nayar, M. P., Raju, D. C. S. & Ahmedullah, M. (1986). The dwindling Flora of Andhra Pradesh—A call for conservation. *Indian J. For.* 9 : 285.

8. Rao, R. S., *et al* (1982). Wild Plant Resources and the proposed Biosphere Reserves of the Eastern Ghats of Northern Andhra Pradesh. *Proceedings of the Seminar on Resources, Development and Environment in the Eastern Ghats,* p. 169. Andhra University, Waltair.

9. Saxena, H. O. & Brahmam, M. (1983). Rare and endemic flowering plants of Orissa. *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of the Threatened Plants of India,* p. 84. Botanical Survey of India, Howrah.

10. Subba Rao, G. V., Nair, N. C. & Kumari, G. R. (1982). . Plant Resources of the Eastern Ghats. *Proceedings of the Seminar on Resources, Development and Environment in the Eastern Ghats,* p. 31. Andhra University, Waltair.

11. Vajravelu, E. & Daniel, P. (1983). *In* : Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of threatened plants of India,* p. 31. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. N. Henry and M. K. Janarthanam, Botanical Survey of India, Coimbatore.

Status: Endangered due to restricted distribution with limited number of individuals in the population and human interference and livestock grazing in the natural habitats.

Distribution: Endemic to south-eastern parts of Tamil Nadu. Type collected in 1958 from Nallakulam in Alagar Hills of Madurai District at an altitude of about 200 m above M. S. L. Recent searches in the type locality failed to locate the species. However, it has been located recently in Narthamalai in Pudukkottai District and Thiruthuraipoondi in Tanjore District. However, the populations were extremely small.

Habitat and Ecology: Streamsides in scrub jungles and dried ponds and paddy fields. It flowers and fruits in January to March soon after the N.E. monsoon.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Intensive search should be conducted in lower hill areas of Madurai and Pudukkottai areas to locate the species and protective measures taken to prevent human and livestock disturbances in those areas.

Biology and Potential Value: This monotypic genus is endemic to the area and is closely related to *Plaesianthera*, an endemic genus of Sri Lanka.

Cultivation: So far not attempted.

Description: Erect glabrous herbs, 10-25 cm high; branches mostly basal, decumbent; stem quadrangular, swollen at nodes. Leaves ovate-oblong, lanceolate to oblanceolate, subentire to minutely crenulate, 1-3.5 cm long, 0.3-0.8 cm wide; nerves 5-7 pairs; petiole upto 3 mm long. Flowers in axillary open dichasial cymes, becoming sympodial and unilateral, usually shorter than leaves. Corolla funnel-shaped, bilipped, 5-10 mm long, purple. Stamens 4, all fertile, posterior pair shorter. Capsules linear-oblong, flat, *ca* 6 mm long, *ca* 1 mm wide, 10-40 seeded; retinacula minute, conical, straight, slender, blunt; seeds ellipsoid, compressed, glandular puberulous.

References:

1. Balakrishnan, N. P. & Subramanyam, K. (1963). A new genus of Acanthaceae from Peninsular India. *J. Indian Bot. Soc.* 42: 411-415, ff. 1-11.

2. Kumari, G. R. (1987). Acanthaceae. *In:* Henry, A.N., *et al, Flora of Tamil Nadu, India*, Series I: *Analysis* 2: 160.

The material for this sheet was supplied by N. P. Balakrishnan, Botanical Survey of India, Coimbatore.

Status: Rare; so far known only from one locality.

Distribution: Khandala, Pune Distt., Maharashtra. Endemic.

Habitat and Ecology: Along the ghats in gravelly soil.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Type locality and neighbouring areas should be searched, if found, plants be collected and introduced into the experimental gardens.

Biology and Potential Value: Not known.

Cultivation: None.

Description: Perennial, erect plants, about 3.0-3.5 m tall, stems terete, woody, branches spreading, young parts pubescent; leaves many, deciduous; lower 20×9 cm or more, decreasing in size upwards, elliptic or lanceolate, apex acute or acuminate, base acute or cuneate, glabrous above and pubescent beneath, 10-12-nerved; petioles upto 3 cm long, pubescent. Flowers initially erect, then deflexed; inflorescence about 5-6 cm long, densely pubescent; bracts persistent, ovate. Perianth 1 cm long, green, margins scarious; stamens 5, staminodes fimbriate, rose-coloured. Capsules 0.5 cm long with persistent style and perianth. Seeds solitary, brown.

Reference:

1. Santapau, H. (1948). Novitates Bombayenses. *Kew Bull.* 1948: 488-489.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.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cm

Status: Endangered. It is known only from its type locality, viz., Nadari, Travancore, Kerala. After C. A. Barber, this species has not been collected so far. This may be due to the habitat destruction for developmental activities.

Distribution: Endemic to South India. Kerala, Travancore, Nadari. (Type in MH.).

Habitat and Ecology: Hill forests of South Western Ghats.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: Intensive search should be made in and around the type locality to relocate this species, and also to ascertain its population size. If found in large numbers, the area may be protected with the help of State Forest Department. Otherwise seeds/seedlings should be introduced in Botanical Gardens.

Biology and Potential Value: Being an endemic species to South India, it has great phytogeographical and evolutionary significance and botanical interest.

Cultivation: Not known under cultivation.

Description: Trees. Leaves 3.5-12.0×1.2-4.3 cm, alternate, but crowded at the ends of branches, elliptic-oblong, obtuse or very slightly acute at apex, rusty-villous beneath when young; main nerves regular, many (about 20), sub-horizontal, straight and parallel; petioles slender, 0.7-1.2 cm long. Inflorescence 2.5-11.0 cm long, branched, pubescent. Flowers white, small, in panicles. Calyx persistent. Petals 4-5, oblong, recurved. Stamens 8-10, free. Styles short. Stigmas truncate.

References:

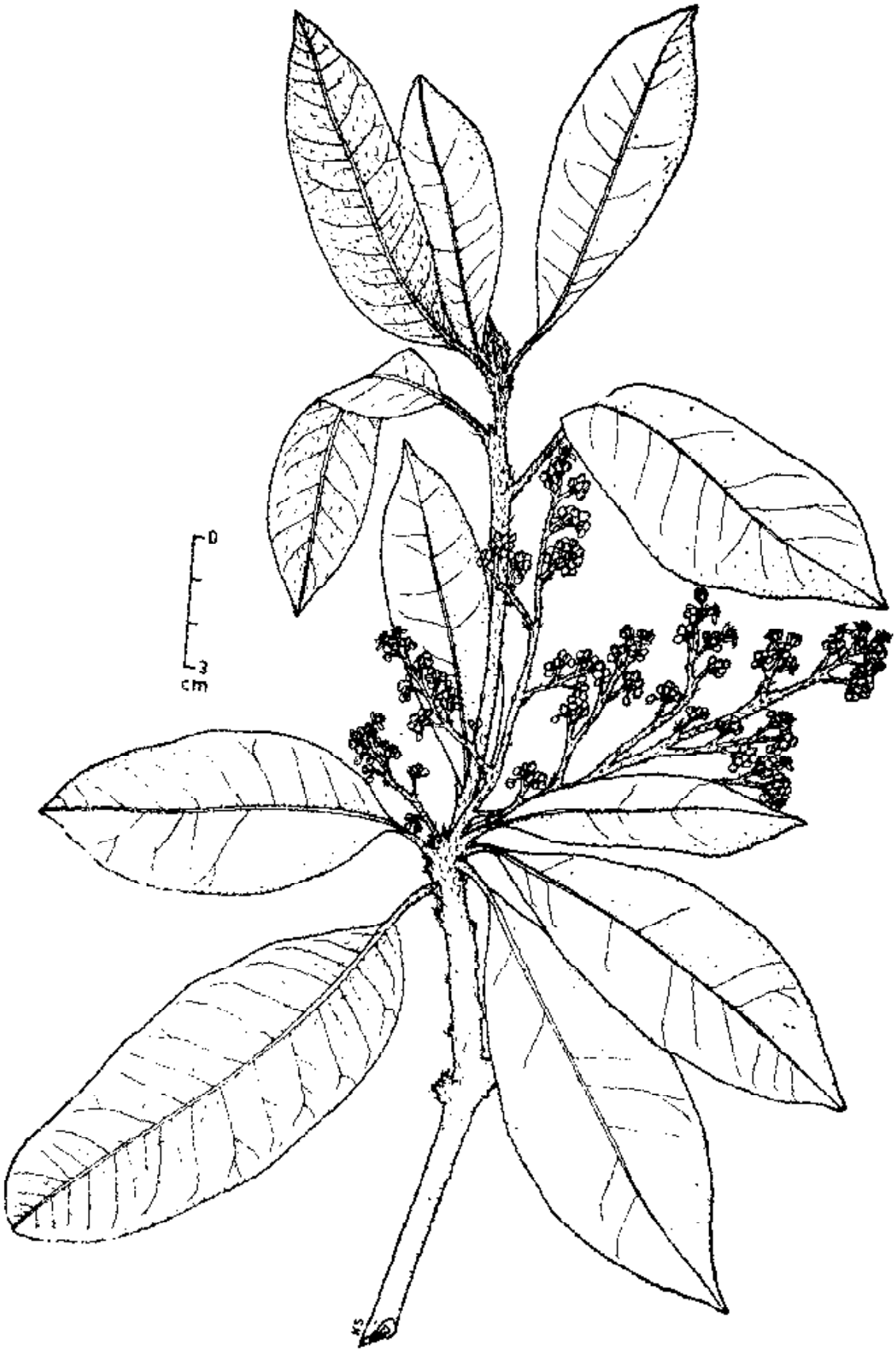
1. Gamble, J. S. (1916). *Kew Bull.* 1916: 135; *Fl. Pres. Madras,* 259. 1918 (repr. ed. 1: 184. 1957).

2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). *J. Bombay Nat. Hist. Soc.* 75: 687.

3. Vajravelu, E. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Plant Conservation Bulletin* 4: 23.

4. Vajravelu, E. & Daniel, P. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 15.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.



Buchanania barberi Gamble

Status : Endangered. After the type collections by Beddome from Tirunelveli Hills, this species has not been traced out by any botanist, though botanical explorations were carried out in this region. Causes of threat not clearly known, but may be due to habitat destruction for developmental activities.

Distribution : Endemic to South India. Tamil Nadu, Tirunelveli Hills. (Type in MH.)

Habitat and Ecology : Hill forests of South Western Ghats.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: The type locality should be throughly explored to relocate the species and to ascertain its population size. Accordingly the conservation measures can be taken up either *in situ* with the help of State Forest Department or *ex situ* conservation methods.

Biology and Potential Value: Endemic to South Western Ghats. Therefore, it is of phytogeographical importance and botanical interest.

Cultivation: Not known.

Description: Small trees with rufous-villous branchlets. Leaves 8.5-23.0 × 1.2-3.5 cm, sub-opposite, linear-oblong or oblong-lanceolate, gradually long acuminate-obtuse or acute, membranous, shining, much reticulated beneath ; nerves parallel, 20-30 pairs, slender, arched; petioles stout, 5-10 mm long, very shaggy rufous-villous. Racemes very short. Flowers tetramerous. Petals glabrous. Stamens 4 with villous filaments.

References:

1. Beddome, R. H. ex Hooker, J. D. (1876). *In:* Hook. f., *Fl. Brit. India* 2 : 40.

2. Chithra, V. (1983). *In:* Nair, N. C. & Henry, A. N. (ed.). *Fl. Tamil Nadu* Ser. I *Analysis* 1 : 88.

3. Gamble, J. S. (1918). *Fl. Pres. Madras,* p. 265; (repr. ed. 1 : 189. 1957).

4. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). *J. Bombay Nat. Hist. Soc.* 75 : 687.

5. Vajravelu, E. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Plant Conservation Bulletin* 4 : 23.

6. Vajravelu, E. & Daniel, P. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 16.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India Coimbatore.

Nothopegia aureo-fulva Bedd. ex Hook.f.

Status: Vulnerable. It is known from its type collection only. Due to habitat destruction for developmental activities like establishment of Tea, Coffee estates, this species has apparently become very scarce.

Distribution: Endemic to Southern India: Western Ghats in the Wynaad, Nilgiris and Anamalai hills, Tamil Nadu, at *ca* 1600 m (Type in MH).

Habitat and Ecology: In hill forests (Sholas/Evergreen forests) in the altitudes 1500 m and above.

Conservation Measures Taken: Nilgiri hills, Wynaad and Anamalai hills are covered under Biosphere Reserve and Wildlife Sanctuaries. Therefore, the habitats are protected.

Conservation Measures Proposed: The type locality should be thoroughly explored for relocating this species since it has not been collected after the type collection. If a large population is found, that area should be protected (*in situ* conservation); seeds/seedlings be collected and introduced in botanical gardens for multiplication of the species (*ex situ* conservation).

Biology and Potential Value: Being an endemic species, it is of phytogeographical and evolutionary significance and botanical interest.

Cultivation: Not known under cultivation.

Description: Large shrubs with glabrous branches. Leaves 1.5-9.0×0.5-3.5 cm, linear-lanceolate or elliptic, obtusely pointed at both ends, coriaceous, glabrous; petioles 2-6 mm long. Peduncles axillary, glabrous, bracteoles 2-3, basal. Sepals and outer petals subequal, ciliate. Inner petals broadly ovate-lanceolate, glabrous. Stamens 8, 1-seriate. Ovaries glabrous; styles oblong or globose; ovules 1-2. Carpels pisiform, glabrous.

References:

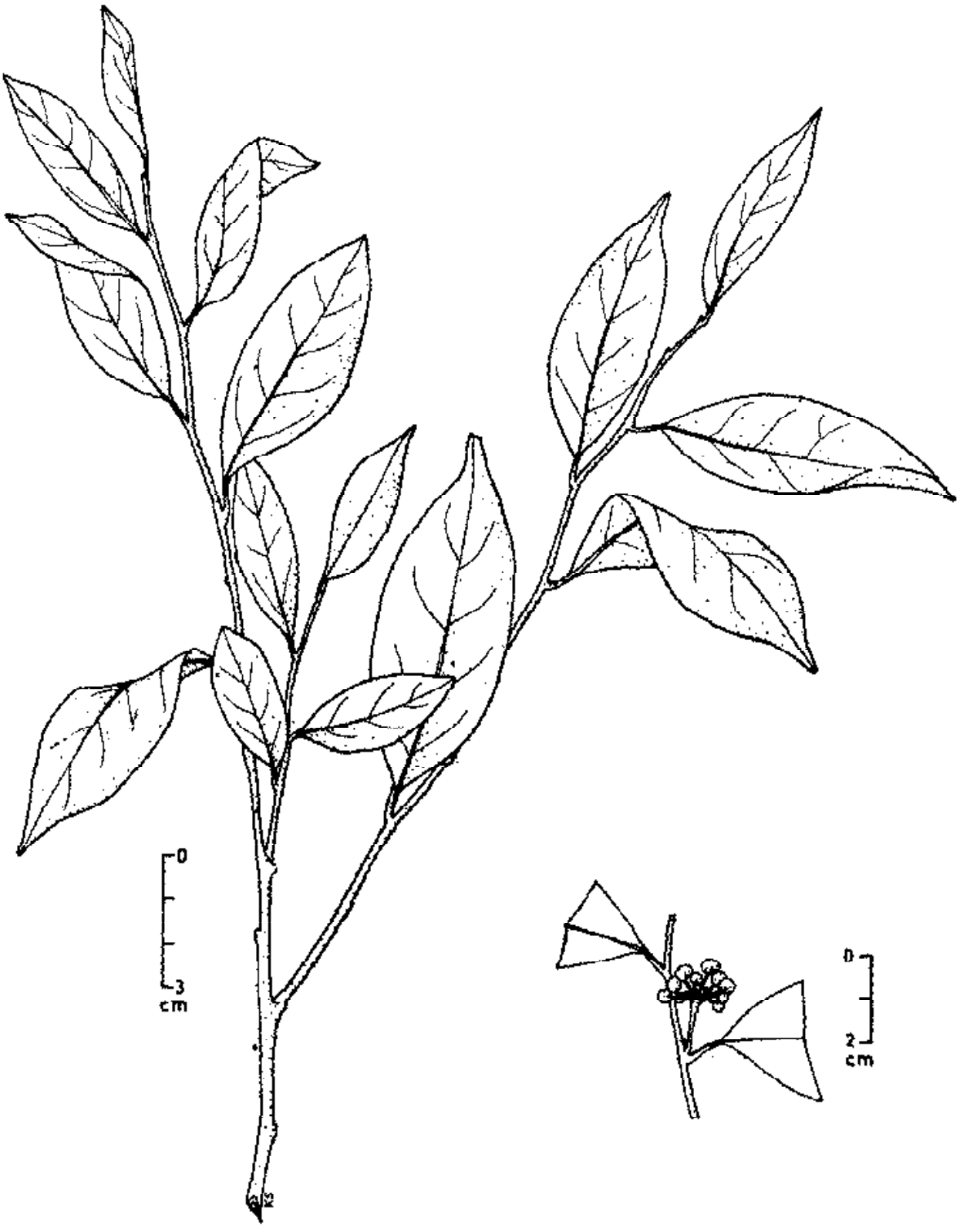
1. Beddome, R. H. (1868-74). *Ic. Pl. Ind. Orient.* t. 88.

2. Dunn, S. T. (1915). *In:* Gamble, J. S., *Fl. Pres. Madras*, p. 22. (repr. ed. 1 : 15. 1957).

3. Hooker, J. D. & Thomson, T. (1872). *In:* Hooker, J. D., *Fl. Brit. India* 1 : 87.

4. Ramamurthy, K. (1983). *In:* Nair, N. C. & Henry, A. N. (ed.) *Fl. Tamil Nadu, India* Ser. I. *Analysis* 1 : 5.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.



Miliusa nilagirica Bedd.

Status: Rare; due to loss of habitats.

Distribution: Karnataka: Coorg; Kerala: Wynaad and Travancore; Tamil Nadu; Tirunelveli. Endemic to Western Ghats in Southern peninsular region.

Habitat and Ecology: The species grows in forest slopes of the Ghats upto 1200 m in evergreen forests.

Conservation Measures Taken: Some of its distributional areas in Wynaad are now included in the Nilgiri Biosphere Reserve established recently.

Conservation Measures Proposed: To be protected in its natural habitats. Seeds/ seedlings to be introduced in Botanic Gardens as a measure of *ex situ* conservation.

Biology and Potential Value: The species is of botanical and distributional interest as it belongs to one of the primitive group of flowering plant families.

Description: Small trees, 5-7 m, glabrous. Leaves ovate, acute. Flowers pale-yellow with pinkish base inside. Petals 6, in 2 whorls, outer ovate, inner clawed. Stamens 12. Fruits globose.

References:

1. Beddome, R. H. (1968-74). *Icon. Pl. Ind. Orient.* t. 69.

2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 17 (repr. ed.). Botanical Survey of India, Calcutta.

3. Hooker, J. D. & Thomson, T. (1872). *In:* Hooker, J. D., *Fl. Brit. India* 1: 90.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Endangered. After the type collections by Beddome in 1880, this species has not been collected. It may be due to habitat destruction and clearing of forests for various purposes.

Distribution : Orissa, Ganjam District, Russelkonda hills, Goomsur forest. Endemic. (Types in CAL & MH.)

Habitat and Ecology : Hill forests at about 700 m in the Eastern Ghats.

Conservation Measures Taken : None on record; however this species has been listed in the Threatened Plants list.

Conservation Measures Proposed : Intensive search should be made to relocate the species from the above area. On ascertaining the population size, action be taken for *in situ* or *ex situ* conservation. Seeds/seedlings be introduced in botanic gardens.

Biology and Potential Value : An endemic species of great phytogeographical and evolutionary significance. It is of botanical interest.

Cultivation : No attempt has been made so far.

Description : Scandent shrubs. Leaves 11.5-18.5×3.0-6.5 cm, oblong, acuminate, rounded at base, rusty-pubescent beneath when young, later on glabrous; nerves 12-15 pairs; petioles 6-10 mm long. Flowers leaf-opposed, pendulous. Calyx globose, splitting irregulary, often connate at base; sepals 3, rounded at apex, stellate-tomentose. Petals 3+3, *ca* 1.5-2.0×1.0 cm; ovate, rounded at apex, united at base, tomentose. Stamens many in staminate flowers, truncate, fleshy. Carpels many, multiovulate. Ripe carpels oblong, 1.0-1.5×0.8-1.2 cm, with rusty tomentose stalks of 0.5-1 cm long. Seeds many.

References :

1. Beddome, R. H. ex Dunn, S. T. (1914). *Kew Bull.* 1914 : 182.

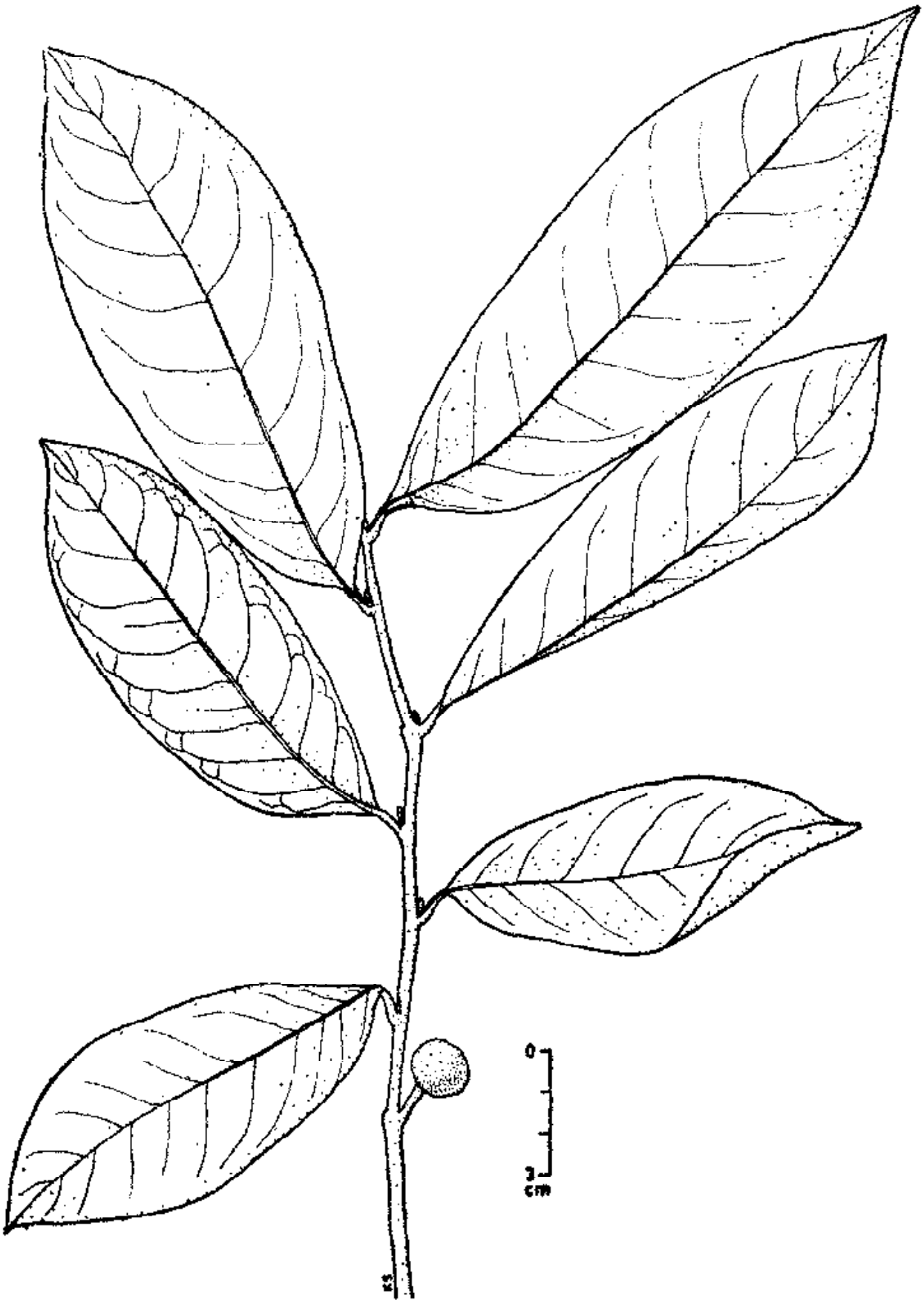
2. Mitra, Debika (1982). *Fasc. Fl. India* 10:15. Botanical Survey of India, Howrah.

3. Gamble, J. S. (1915). *Fl. Pres. Madras,* p. 13; (repr. ed. 1 :9. 1957).

4. Vajravelu, E. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Plant Conservation Bulletin* 4:16.

5. Vajravelu, E. & Daniel, P. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 9.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.



Uvaria eucincta Bedd. ex Dunn

Status : Indeterminate; apparently rare and not collected since 1892. The area of its report in north Sikkim is not botanically well-explored and a search by the contributor in 1984 could not reveal even a single population in or around Momay Samdong.

Distribution: India; restricated to north Sikkim at Momay Samdong. It was collected only once by G. A. Gammie in 1892 and was described by Mukherjee in 1978 (1).

Habitat and Ecology : In alpine meadows, details not known as the plants have not been collected again.

Conservation Measures Taken None at present. The area itself faces no threat except perhaps grazing.

Conservation Measures Proposed : Restriction of over-grazing, a causative factor for decline of alpine species.

Biology and Potential Value : Not studied.

Description : Dwarf, 2-10 cm, caulescent herbs; stems branched from the middle. Root a globose tuber. Leaves pinnate, with 5 leaflets; petiole sheathing at base; leaflets trilobed. Peduncle stout, quadrangular. Bracts absent, bracteoles linear. Fruit ovate, 1 mm, stylopodium depressed, cushioned.

Reference:

1. Mukherjee, P. K. (1978). A resume of Indian Umbellifers. *Actes du Ie Symp. Internatl. sur les Umbelliferes* (Peripignan, France 1977), Paris. p. 52.

Material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Indeterminate; not collected since 1849. This is represented by types only at the Kew herbarium and also a single specimen (a syntype?) is present at Calcutta herbarium (CAL.). The area of its reported occurrence is not well botanised after Hooker and it is likely that some populations may still be surviving.

Distribution : India; endemic to north-east Sikkim at Chola and Yakla passes, at an altitude of 3800 m.

Habitat and Ecology : No details known but apparently it might be growing in open situations along steam courses like the other Angelicas.

Conservation Measures Taken : None so far.

Conservation Measures Proposed : Attempts to rediscover the species should be made for planning conservarion measures.

Biology and Potential Value : Not screened as yet, but reports about other Angelicas reveal of high economic importance like their uses in flavouring sweetmeats and beverages. The indigenous use of roots as a cordiac stimulant by the hillmen is also reported (1).

Description : Stout, erect, branched pubescent herbs, 1-2 m tall. Lower cauline leaves including the petiole 3 partite to ternate-pinnate or ternate, upto 3.5 dm long including the petiole. Leaflets ovate or ovate-lanceolate, 5-10 cm long, 2-3 cm broad, serrate, decurrent. Peduncles stout upto 30 cm long. Bracts 4-12, linear, caducous, to 1cm long. Rays 30-50, unequal, 3-16 cm long, pubescent, spreading or ascending. Pedicels 15-30, not all bearing mature fruits, unequal, 1-1.5cm long, pubescent. Bracteoles 4-12, linear, to 5 mm long. Flowers not known. Fruits orbicular, 5-8 mm long, 4-6 mm broad, emarginate at both ends, glabrous, dorsal ribs prominent, obtuse, the laterals broadly thin winged, wings slightly broader than the body. Vittae solitary at the intervals, lacking or fragmentary on the slightly convex commissure.

Reference :

1. Krishna, S. & Badhwar, R. L. (1952). Aromatic plants of India, Part XV. *J. Sci. Indust. Res.* 11(12) : 254-261.

Material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Possibly extinct in India. The species was described by Clarke (1) with the Type' having doubtfully been collected in Sri Lanka. He cited another specimen by T. Lobb from Mysore that seemed to him the same. Wolff (3) described another species, *Bunium nilghirense* based on Gamble's collection from the Nilgiris, Sispara, collected in 1883. The two were merged by Mukherjee under the present name in 1983. (2) No other collection from Sri Lanka with definite locality or from the Nilgiris after 1883 is available although the areas have been well-explored and it is apprehended that the species is extinct in its natural habitats in India.

Distribution: Sri Lanka (?); India : Nilgiri mountains in South India.

Habitat and Ecology : With perennating tuberous roots, probably in open places on hills above 2000 m.

Conservation Measures Taken : The Nilgiri region has been recently declared as a Biosphere Reserve.

Conservation Measures Proposed: Explorations for relocating the species; in case relocated, *in situ* and *ex situ* conservation and study of its biology.

Biology and Potential Value : Not screened; of botanical interest. Fruiting in November.

Description : 8-20 cm long, erect, branched, glabrous herbs from tuberous roots. Leaves 5-8 cm long, ovate-triangular, triternatisect, segments very linear, apically trilobed or not. Bracts 3-6, linear-lanceolate, 0.7-1 cm long. Rays 4-7, subsequal, 2-3.5 cm long. Bracteoles about 10, lanceolate, 5 mm long, Pedicels 5-10, subequal, 1.5-2 mm long. Fruit elliptic-oblong, glabrous, *ca* 4 mm $\times$ 2.5 mm, laterally compressed, mericarps pentagonal in c.s., ribs prominently raised, not winged, vittae solitary at the valleculae, 2 at the commissure; commissure face plane; carpophore bipartite.

References :

1. Clarke, C. B. (1879). Umbelliferae. *In :* Hooker, J. D., *Fl. Brit. India* 2:681.

2. Mukherjee, P. K. (1982). Nomenclatural transfers in Indian Umbelliferae. *Bull. Bot. Surv. India* 24:43.

3. Wolff, H. (1930). Umbelliferae Asiaticae novae relictae II. *Feddes Repert.* 27:334.

The material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Chaerophyllum orientalis (Clarke) Mukh. APIACEAE
(*C. reflexum* var. *orientalis* Clarke)

Status : Indeterminate; known only from Type specimens collected in 1885 by Clarke from Jakpho, Naga Hills. The Naga Hills are yet to be fully explored botanically and chances of locating living plants of this species cannot be negated, although several areas have since been cleared and subjected to 'Jhum' cultivation.

Distribution : India, Naga Hills, at about 2300 m altitude. The species has not been collected from the neighbouring areas in Arunachal Pradesh, and is apparently restricted in distribution.

Habitat and Ecology : Details not known.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Explorations to relocate the species and to evaluate its biology, also to evaluate the prospects of its *in situ* conservation by protecting the habitat.

Biology and Potential Value : Not studied; of botanical interest.

Description : 30 cm or so tall, branching, pubescent herbs. Leaves ternate-pinnately decompound, ovate, 4-12 cm long and 5-15 cm wide; leaflets ovate-lanceolate, coarsely dentate or incised or pinnately lobed, 4-8 mm long, 3-6 mm broad, pilose on upper side. Umbels terminal and lateral, peduncles upto 13 cm long. Bracts 4, linear, *ca* 6 mm long. Rays 8, unequal. Bracteoles 4-6 linear, *ca* 3 mm long. Flowers polygamous. Pedicels 12-15. Calyx teeth evident, lanceolate. Fruits 3-5 mature ones per umbellule, glabrous, ovate-lanceolate, 4-6 mm $\times$2-3 mm, constricted at the commissure, ribs slender, mericarps terete in cs., vittae solitary at the valleculae, 2 at the commisure, commissure face deeply grooved; carpophore entire.

References :

1. Clarke, C.B. (1899). *J. Linn. Soc. Bot.* 25 : 28 t. 16.

2. Mukherjee P.K. (1982). Nomenclatural transfers in Indian Umbelliferae. *Bull. Bot. Surv. India* 24 : 44.

The material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Rare. The habitats of the species in its distribution range have undergone considerable change due to biotic activities in the recent decades.

Distribution : Endemic to the Nilgiri and Pulney mountains of the Peninsular India.

Habitat and Ecology : A prostrate herb on sunny open hill slopes and along forest margins at about 2000 m altitude.

Conservation Measures Taken : Some areas of its distribution in the Nilgiris are now declared as a Biosphere Reserve and are being protected.

Conservation Measures Proposed : Protection of some of the habitats in the Shola areas is likely to conserve some of its populations.

Biology and Potential Value : The species is of biological and distributional interest.

Description : A prostrate, villous herb, rooting at nodes. Leaves simple, long petioled, orbicular-reniform, 2-6 × 2.5-5 cm, marginally 7-lobed, crenate, setulose. Umbels simple, axillary and leaf-opposed, sessile or very shortly peduncled, 5 to 15-flowered. Fruits suborbicular, 1 × 2.5 mm, laterally subcompressed, whitish, smooth or obscurely punctate, ribs slender, vittae absent.

References :

1. Fyson, P.F. (1915). *Fl. Nilgiri and Pulney Hills.* t. 124.

2. Wight, R. (1846). *Ic. Pl. Ind. Orient.* t. 1002.

The material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status: Indeterminate. The species was described by Clarke (1) based on the materials collected by Wight and Beddome from Anamalai hills, and was recollected by Meebold in 1910. Of late N. C. Nair has collected it from Silent Valley in Kerala (*N. C. Nair* 64259—MH). It is likely that more plants of this would be available in this area.

Distribution : India; apparently endemic in the hills of Peninsular India-Anamalais and adjoining hills, at an altitude of about 1300 m.

Habitat and Ecology : In open glades and along streams (?).

Conservation Measures Taken : The Silent Valley area has been recently declared as a National Park and it forms a core area of the proposed Biosphere reserve.

Conservation Measures Proposed : Search for the plants in its new locale; study of its biology and protection of its habitat are recommended.

Biology and Potential Value : Not studied. Fruiting in November.

Cultivation : Not reported, may be tried for its potentialities, etc.

Description : Slender, erect, glabrous to pubescent herbs, 30-60 cm tall. Leaves oblong-ovate, 10-20 cm long including the petiole, 2-4-pinnate; leaflets linear to narrowly oblong, 2.5-6 cm long, 3-5 mm broad, acute, serrulate; cauline leaves reduced upwards, the sheaths little dialated. Umbels terminal and lateral; peduncle 6-12 cm long. Bracts lacking or a few, minute, linear-oblong. Rays 4-8, subequal, 1-3.5 cm long. Bracteoles 3-5, ovate-lanceolate, *ca* 2.5 mm long. Pedicels 8-10, slender, unequal, 3-6 mm long. Flowers yellow, petals lanceolate with a narrow inflexed apex; calyx teeth minute, lanceolate. Fruit orbicular, *ca* 7 mm × 6 mm., emarginate at both the ends, dorsal ribs filiform, laterals broadly thin winged; the wings narrower or equalling the body; body brownish yellow. Vittae 1-2 at the valleculae, 4-6 at the commissure ; commissural face plane; carpophore bipartite.

Reference:

1. Clarke, C.B. (1879). Umbelliferae. *In:* Hooker, J.D., *Fl. Brit. India* 2:710.

The Material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status: Indeterminate. The species is known only from the Type collected from Kohima by C. B. Clarke in 1885. The type is preserved in Herbarium Kew. Its distribution areas have undergone considerable degradation due to biotic factors since its type collection.

Distribution : India; endemic to Kohima, Nagaland, at about 1780 metres; its report from from China is doubtful.

Habitat and Ecology : Not known.

Conservation Measures Taken : Not known.

Conservation Measures Proposed : An intensive and extensive search for relocating the populations of this species, followed by *ex situ* conservation and study of biology are needed to determine the status of the species and to attempt to conserve the species.

Biology and Potential Value: Not known ; of botanical interest.

Description : Erect, flaccid, branched and sparsely leafy herbs. Pilose in younger parts. Leaves triangular-ovate, pinnate with 3-7 broad ovate-triangular to ovate-oblong petiolulate leaflets with acute apices. Umbels terminal and lateral. Bracts and bracteoles lacking. Rays 3 or 4, very slender, subequal, 0.5-2 cm long. Pedicels 3-6(-10), slender, spreading, 6-8 mm long. Calyx teeth obsolete. Fruit ovoid, to 2 mm in diameter, subterete in c.s., glabrous, ribs filiform, vittae not seen, carpophore bipartite(?).

Reference :

1. Clarke, C. B. (1889). On the plants of Kohima and Munneypoore. *J. Linn. Soc. Bot.* 25 : 28. t. 15.

The Material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Rare. The specimens cited by T. Cooke in his Flora of Presidency of Bombay under *P. candolleana* (sensu Cooke) belong to the present species, whereas his description is based on a specimen of *P. candolleana* Wt. & Arn. collected by Meebold from the Nilgiris. True *P. candolleana* common in the Nilgiris & Pulney hills along Western Ghats, does not occur in Maharashtra.

Distribution: Endemic to Katraj Ghats and Panchgani Plateau in Maharashtra State.

Habitat and Ecology : Western Ghats of Maharashtra in deciduous forest floors. The areas receive high rain-fall.

Conservation Measures Taken : None.

Conservation Measures Proposed: Attempts should be made to collect the plants and mature seeds to grow them in experimental gardens.

Biology and Potential Value : Not known; of botanical interest.

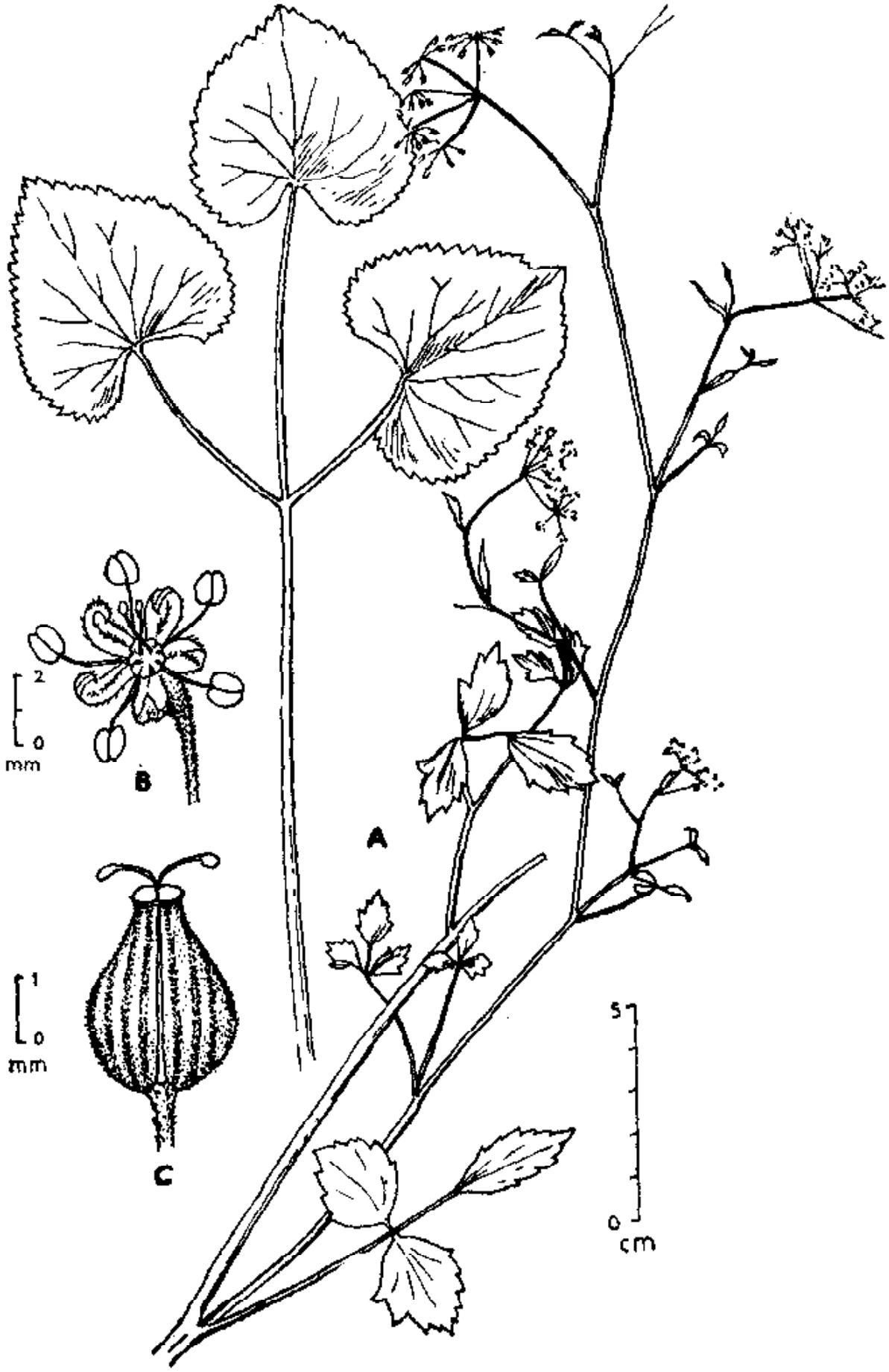
Cultivation: This species was introduced and cultivated in the experimental garden, Botanical Survey of India, Pune; however it did not survive for long.

Description: Erect, aromatic herbs, 0.5-1.2 m tall, with perennial, fusiform roots; stems striate. Leaves pinnately trifoliate, basal leaves sometimes simple in young plants, ovate-orbicular in outline, apex acute, base cordate to truncate, margins coarsely toothed, minutely puberulous on lower surface, 1.6×0.5-5.0 cm, uppermost leaflets smaller. Inflorescence in terminal compound umbels, primary rays about 4.5 cm long. Flowers 6-13 per umbel, white, ebracteolate, calyx obsolete, petals 5, ovate-oblong, base obcordate, apex with inflexed acute tips, midnerve greenish, white ciliate on the lower surface. Fruits ovoid in outline, covered with hispid hairs; mericarps 2, with rounded back and slightly depressed inner surface, 5-ridged, vittae 2, in between two ridges.

Reference :

1. Rao, R. S. & Hemadri, K. (1976). *Pimpinella katrajensis* Rolla Rao *et* Hemadri—a new species of Apiaceae from the Sahyadri ranges, Maharashtra State. *Ind. For.* 102: 232-234. fig. 1-7.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.



Pimpinella ketrajensis Rolla Rao *et* Hemadri A. Flowering branch. B. Flower. C. Fruit. (after *Hemadri* 108784A—*Type*).

Status : Endangered due to restricted distribution with limited number of individuals and biotic interference within its natural habitats.

Distribution : Endemic to Tirupati Hills, Chittoor District of Andhra Pradesh. Type collected in 1958 from open scrubs on the way to Japalathirtha in Tirupati Hills at an altitude of about 1000 m above M.S.L. Recently it has been located in a few places between Dharmagiri and Talakona area in Tirupati Hills at altitudes of 1000-1300 m.

Conservation Measures Taken : Nil.

Conservation Measures Proposed : Since the flora of Triupati Hills contains several rare and endemic species, and also because the hill range being an important and busy pilgrimage area, it is suggested that the whole hill range should be conserved and protected, preferably as a Biosphere Reserve to avoid future depletion of the floristic wealth.

Biology and Potential Value : Not known. It flowers and fruits in rainy season from June to December.

Cultivation : Not attempted so far.

Description : Erect herb with woody stem base, upto 50 cm high; stem simple below, branched above. Lower leaves simple, ovate-obtuse, acute or deeply cordate, 1.5-4 cm across; petioles 2.5-8 cm long, sheathing at base. Upper leaves palmately 3-partite with oblanceolate to linear-lanceolate acute segments, narrowed towards base, sometimes cut and lobed, 1-2.5 cm long; petioles 1-3.5 cm long, sheathing throughout the length. Uppermost leaves cut into small setaceous lobes and often reduced to mere sheaths. Flowers in compound umbels; primay umbels with 3-6 slender rays; partial umbels 5-16-flowered; bracteoles 1-2, linear subulate; petals white, *ca* 1 mm long, obovate, suborbicular, inflexed at apex; stylopodium conical, persistent. Fruits *ca* 1.5 mm long, ovoid, papillose-scabrous.

Reference :

1. Balakrishnan, N. P. & Subramanyam, K. (1960). A new species of *Pimpinella* from Tirupati Hills, South India. *Bull. Bot. Surv. India* 2 : 427-428, ff. 1-9.

The material for this sheet was supplied by N. P. Balakrishnan, Botanical Survey of India, Coimbatore.

Status: Rare, the only specimen available is the Type, collected in 1961. It is likely that further explorations in the area might help in locating more plants of the species.

Distribution: India, Tirap district in Arunachal Pradesh. Possibly endemic.

Habitat and Ecology: Not reported.

Conservation Measures Taken: None.

Conservation Measures Proposed: Exploration for collection of wild populations study of biology; prospects of *ex situ* or *in situ* conservation to be studied.

Biology and Potential Value: Not known; of botanical interest.

Description: Erect, slender, 30-40 cm tall herbs. Rhizome subterranean, fleshy. Leaves long petioled, ovate, ternate-decompound, leaflets 1-4 cm×5-15 cm, pinnatipartite, glabrous above, sparsely hispidulous beneath, ciliate at margins. Umbels terminal, long peduncled; bracts absent; rays 20-50, spreading, ascending, unequal, 3.5-6 cm long. Pedicels 2-3, erect, very unequal, almost sessile to 3 mm long. Calyx teeth slightly evident, petals purple. Fruits oblong, slightly compressed laterally, glabrous, ribs filform, subequal, mericarps subterete in c.s., vittae solitary at the valleculae and 2 on the commissure.

Reference:

1. Deb, D. B. & Dutta, R. M. (1969). An addition to Umbelliferae from north-east India. *J. Sen Memorial Vol.* p. 421, f.1. Botanical Society of Bengal, Calcutta.

The material for this sheet was supplied by P. K. Mukherjee, Botany Department, University of Calcutta, Calcutta.

Status : Rare ; the species has been collected since 1836 and all the collections (about 20 in number) in the herbaria are without fruit until Mukherjee collected it in mature fruits in 1972 (3). Presently the taxon is confined only to the Palani Hills.

Distribution : Endemic in the hills of south India ; reported from the Shevagherry hills, Palani hils, Anamalai hills, Cardamom hills and Belgaum.

Habitat and Ecology : A trailing perennial, rooting at the nodes forming a ground cover in the Shola forests ; blooms from June to November and fruiting from September to January (5). Aberrant fruits are usually formed due probably to some flaw in its reproductive biology (4).

Conservation Measures Taken : None at present.

Conservation Measures Proposed : To protect some of the Shola areas which along with this species harbour many other endemic and rare species of plants.

Biology and Potential Value : A very striking member of the Apiaceae with uncertain tribal position (1). Coumarins like Osthol, Osthenol, Suberosine, and Coumarine derivatives like Columbianadine, Columbinetine, Marmesine, Suberosine, Imperatorinem, Cnidicine, etc., are reported to occur (3).

Description : Perennial, hispidulous, trailing plants rooting from the nodes. Leaves alternate, petiolate, oribicular, trifoliate, the terminal leaflet occasionally shallowly 3-lobed and the two lateral ones usually once-cleft nearly to the base ; leaflets spinulose-serrate, strigulose-hirsutulous. Umbels leaf-opposed. Bracts absent or one, *ca* 5 mm long. Rays 2-5 (-7), slender, 1-3.5 cm long. Bracteoles 2-5 (-7), linear-lanceolate, usually reflexed, acute 1.5-3 mm long. Flowers polygamous, marginal radiant and perfect, central regular and staminate ; petals white. Calyx teeth 2-3, linear, acute, persistent. Pedicels 7-14. Fruits ovoid-oblong, slightly compressed laterally, ribs filiform, vittae 2-3 at the valleculae and 2-6 on the commissure ; seed face sulcate ; carpophore absent.

References :

1. Blasco, F. J., *et al.* (1978). Etude multidisciplinaire du genre *Vanashuseva* (Wight) Mukh. & Const. *Actes du 2e Symp. Intern. Ombell.* p. 663.

2. Carbonnier, J. & D. Molho (1977). Contribution phytochimique a l'etude de la position systematique de *Vanasushava pedata* (Wight) Mukherjee *et* Constance (*Heracleum pedetum* Wight). *Bull. Mus. nat. Hist. natr.* 3 (484) : 1.

3. Mukherjee, P. K. (1983). Distribution and collection of rare Umbellifers in India. *In* : Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India.* Botanical Survay of India, Howrah. p. 202.

4. Mukherjee, P. K. & Constance, L. (1974). *Vanasushava*, An old south Indian Umbellifer renamed. *Kew Bull.* 29(3) : 593.

The material for this sheet was supplied by P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status: Indeterminate. It can still be collected in the wild from Vembanad lake in Kerala but is liable to be vulnerable in the event of disturbance to the habitat, loss of tubers due to diseases or any other natural calamity.

Distribution: Endemic to peninsular India and restricted to the States of Kerala and Tamilnadu. It had been once collected from Spur tank, Egmore, near Madras but could not be recollected from the area, hence possibly at present the species is now confined to Alleppey in Kerala only. It was first collected in 1893, but misidentified as *A. crispus* Thunb. till van Bruggen described it as a new species in 1968. Due to its close similarity to *A. natans* (L.) Engl. and *A. crispus* in the vegetative state it has been either overlooked or misidentified, hence its apparent rarity. It has been subsequently recollected from Alleppey by Rangachary as well as Venkoba Rao whose collections are at Kew. Recently it has also been collected by C. D. K. Cook. Though infrequent, it occurs in good patches wherever it is located. Bennett's record of its occurrence in West Bengal (*Flora of Howrah District*, p. 25.1979) is incorrect as it is a misidentification of *A. undulatus* Roxb.

Habitat and Ecology: Occurs mostly in brackish waters especially at a depth of 1.5-3 m. From April to September, the reclaimed rice fields alongside the canals and backwaters, are flushed with rain water from the mountains but from November to April brackish water displaces fresh water. It flowers only when the brackish waters inundate the rice fields during post monsoon. The inflorescence escapes attention as it occurs at great depths when water is very much turbid, and the leaves are also not quite visible from surface.

Conservation Measures Proposed: Efforts should be made to propagate the tubers in similar habitats of brackish water in Kerala, South Kanara (Karnataka) and coastal Tamilnadu.

Biology and Potential Value: Tubers still form part of diet in Kerala and two year old tubers are preferred by local farmers as subsistence food.

Description: Submerged herbs. Tubers *ca* 10 mm, elongate, creeping. Leaves all submerged; lamina strap-shaped, 25-35×2-3 cm, undulate, base cuneate, with 2-4 pairs of lateral nerves; petiole upto 25 cm. Spikes lax, upto 15 cm long, peduncle as long as or longer than petiole. Flowers white. Tepals 2, obovate, broader than long, 0.8-1×1.5 mm, 1-nerved. Stamens 4-5 (6); filaments 1 mm. Carpels 2-3, 1.0×0.8 mm; ovules 1-2 per cell. Follicle 10-12×6-8 mm, beak terminal; testa simple, embryo obovate, crowned with a row of linear tortuous appendages.

References:

1. van Bruggen, H. W. E. (1968). A new species of *Aponogeton* from India. *Blumea* 16: 264-265. f. 5.

2. van Bruggen, H. W. E. (1970). *Aponogeton* in Asia and Malesia. *Blumea* 18: 461-462. f. 2. 5 (map 1).

The material for this sheet was supplied by R. S. Raghavan and B. D. Sharma, Botanical Survey of India, Pune.

Status: Rare.

Distribution: South Travancore and Tirunelveli Hills. Endemic.

Habitat and Ecology: Grows in the moist hill forests. Prefers more or less open slopes between 1000-1500 m altitude. The areas receive high rainfall.

Conservation Measures Taken: Already enlisted as a threatened palm (Jain and Sastry, Basu). Efforts are being made to introduce this endemic palm into cultivation.

Conservation Measures Proposed: Protection of its habitat to ensure natural regeneration; *ex situ* conservation are recommended.

Biology and Potential Value: A palm of great botanical interest. Its slender stem and feather-like leaves are very graceful, can be suitably cultivated as ornamental palm in botanic gardens and parks.

Cultivation: Cultivated in the Indian Botanic Garden, Howrah and Experimental garden, Botanical Survey of India, Yercaud, Dist. Salem, Tamil Nadu.

Description: Stem solitary, 6-8 m long, 20-25 cm in diameter near base, distinctly annulate. Leaves pinnate, arching from the crownshaft, each 1-1.5 m long; leaflets upto 40 in number on each side of the rachis, each 60-80 cm long, linear-lanceolate, acuminate. Inflorescence decompound, monoecious, infrafoliar; outer and inner spathes papery, caducous. Male and female flowers slightly pitted. Fruits ovoid, 1.2-1.4 cm × 7-8 mm, reddish-brown; pericarp fleshy. Seed ovoid, 6mm long; endocarp brittle; endosperm homogeneous. Seed germinates admotively. Eophyll bilobed.

Refefences:

1. Roxburgh, W. (1832). *Fl. Indica* 3: 621.

2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened plants of India—A State-of-the-Art-Report.* BSI & MAB, New Delhi. p. 40.

3. Basu S. K. (1933). Provisional Checklist of Indian Palms. p. 1-11. POSSCEF, Botanical Survey of India, Howrah. (Mimeographed).

The material for the sheet was supplied by S. K. Basu, Botanical Survey of India, Howrah.

Status: Endangered. This endemic palm species is getting depleted in its natural habitats. This species is allied to the mainland species, *B. condapanna* Berry ex Roxb.

Distribution: Nicobar Islands. Endemic.

Habitat and Ecology: Grows in tropical evergreen forests in the Nicobar Islands.

Conservation Measures Taken: None, although listed by many as endangered palm (Balakrishnan, Basu). The establishment of Biosphere reserve in Nicobar Islands would save the species

Conservation Measures Proposed: According to Kurz this endemic palm species was dominating the landscape in some islands of Nicobars. To prevent loss of natural population, its habitats need protection; at the same time seeds of this species have to be collected from the natural populations for *ex situ* conservation in the botanical gardens and reintroduction in the depleted natural habitats.

Biology and Potential Value: A genus of great botanical interest. This species is elegant and impressive by its gracefully arching leaves. It can be grown as an avenue tree. A very fast growing palm.

Cultivation: Cultivated in the Indian Botanic Garden, Howrah.

Description: Stem solitary, 12-15 m long, 25-30 cm in diameter near base; annulate, swollen at base. Leaves 3-4 m long; leaflets linear, 1-nerved on upper side. Inflorescence monoecious, decompound, infrafoliar; spathes 2, spatuliform, bicarinate. Male and female flowers pitted. Fruit 1-seeded, ovoid to subovoid, 1.5×1.2 cm, deep scarlet when ripe; endosperm brittle, adherent to seed coat. Seed ovoid, 9×7 mm; endosperm white, homogeneous.

1. Beccari, C. (1892). *In:* Hooker, J. D., *Fl. Brit. India* 6: 418.

2. Balakrishnan, N. P. (1978). Recent botanical studies in Andaman and Nicobar Islands. *Bull. Bot. Surv. India* 19: 132-138.

3. Basu, S. K. (1986). Threatened palms of India—some case studies. *J. Econ. Tax. Bot.* 7: 493-497.

4. Kurz, S. (1875). *Orania nicobarica*. *J. Bot.* 4:331. pl. 171. fig. 18-25.

The material for the sheet was supplied by S. K. Basu, Botanical Survey of India, Howrah.

Status: Rare. This palm species was described on the basis of E. H. Man's specimens collected from Andaman Islands. Original materials are in C. Beccari's herbarium, Florence, Italy(1). No other herbarium collection is available. Its natural population is unknown.

Distribution: Andaman Islands. Endemic.

Habitat and Ecology: *Pinanga* palms largely inhabit tropical evergreen forests. Gregarious in moist hollows and ravines.

Conservation Measures Taken : None, although listed as a rare palm (2 & 3).

Conservation Measures Proposed: Intensive survey of its habitat is necessary. Seeds should be collected from the natural populations for introduction into botanical gardens.

Cultivation: Nil.

Description: Stem 8-9 m long, 10 cm in diam., distinctly annulate. Leaflets many, falcate to linear-lanceolate, 2-nerved; petiole variable in length. Inflorescence monoecious, infrafoliar, distichously branched. Flowers in triads of 2 lateral male flowers and a middle female flower ; flower clusters longitudinally disposed in 2 rows. Fruit ovoid to ellipsoid, 1.3-1.5 cm long, 8-9 mm broad. Seed ovoid, 9.5 × 7 mm ; endosperm deeply ruminate.

References:

1. Beccari, O. (1934). *Atti. Del. Soc. Tos. Sci. Nat.* 44:121-122.

2. Balakrishnan, N. P. (1978). Recent botanical studies in Andaman and Nicobar Islands. *Bull. Bot. Surv. India* 19:132-138.

3. Basu, S. K. (1986). Threatened palms of India—some case studies. *J. Econ. Tax. Bot.* 7(2) : 493-497.

The material for the sheet was supplied by S. K. Basu, Botanical Survey of India, Howrah.

Status: Vulnerable. Beccari described this palm species on the basis of E.H.Man's specimens collected from Nicobar Islands. Type materials are in Beccari's herbarium, Florence, Italy. Central National Herbarium (CAL) has some old specimens and all of them were collected from South Andamans. The species has not been collected from the wild in the recent years.

Distribution: Nicobar and South Andaman Islands. Endemic.

Habitat and Ecology: Grows in the moist evergreen forests, often gregarious in shady situations.

Conservation Measures Taken: None for the wild populations; already listed as an endangered palm(3).

Conservation Measures Proposed: Protection of habitats for ensuring natural regeneration of this species; *ex situ* conservation through introduction into botanical gardens are suggested.

Biology and Potential Value: A palm of botanical interest due to its endemic occurrence. This species can be grown as ornamental plant. The hard endosperm can be chewed as betelnut and may contain useful alkaloids.

Cultivation: Not yet introduced into cultivation.

Description: Stem 15-16 m long, 10-11 cm in diam near the base. Leaves about 2 m long; leaflets ensiform, middle leaflets about 60 cm long, 3-5 cm broad, 2-3 partite, pale beneath. Inflorescence monoecious, infrafoliar, 10-50 cm long; rachillae about 50 in number, spirally disposed. Flower clusters in triads of 2 lateral male flowers and a middle female flower, arranged in 2 longitudinal rows. Fruit ovoid, 1.5 cm×9 mm. Endosperm ruminate, hard.

References:

1. Beccari, O. (1886). *Malesia* 3: 178.

2. Beccari, O. (1892). *In*: Hooker, J. D., *Fl. Brit. India* 6: 409.

3. Balakrishnan, N. P. (1978). Recent botanical studies in Andaman and Nicobar Islands. *Bull. Bot. Surv. India* 19: 132-138.

The material for the sheet was supplied by S. K. Basu, Botanical Survey of India, Howrah.

Status: Rare. A distinct palm species closely related to the Sino-Japanese species, *Trachycarpus fortunei* (1). The only published photo of this palm is of a plant in O. Beccari's garden in Florence, Italy, appeared in *Kew Bulletin*, 1912 :291.

Distribution: Mt. Takil, Kumaon, Uttar Pradesh. Endemic.

Habitat and Ecology: Grows on mountain slopes at 2000-2500 m, where it sustains frost and snow. It prefers cool narrow valleys in the north-west Himalayas. It was frequent at the height of 2500 m in the mixed forests of *Quercus* (2).

Conservation Measures Taken: None at present.

Conservation Measures Proposed: Collection of seeds from natural population and introduction into botnical gardens and demarcation of some of its habitats as protected areas, are suggested.

Biology and Potential Value: A palm species of great botanical interest. One of tha few palm species that thrives in frost and snow. The present taxonomic status demands further knowledge on this taxon ; therefore collection of materials from the wild for *ex situ* conservation and study is necessary. Its local uses are unknown.

Cultivation: Reported to be cultivated in the Chaubattia garden in Uttar Pradesh.

Description: Stem solitary, inclined, closely covered with leaf-sheath fibres and triangular leaf-base appendages. Leaves palmate; petiole margins crenulate. Inflorescence monoecious, decompound, interfoliar. Male flowers glomerulate with yellow fleshy bracts at base. Fruits reniform.

References:

1. Beccari, O. (1933) Asiatic Palms. Coryphae. *Ann. Roy. Bot. Gard. Calcutta* 13: 281.

2. Duthie, J. F. (1886). *Gard. Chron.* p. 457.

The material for the sheet was supplied by S. K. Basu. Botanical Survey of India, Howrah.

Status: Vulnerable. The species was first described as *Apama barberi* based on Barber's collection, dated May 1901, from Kannikatti in Tirunelveli district(1). Subsequently it was recollected from the type locality "after a lapse of over six decades"(2) and Dr. Ridsale reportedly located it from the adjacent Papanasam area in 1976(3). The natural habitat of the species is under threat due to various anthropogenic factors.

Distribution: Endemic to Tirunelveli in W. Ghats.

Habitat and Ecology: Shady places in evergreen forests at *ca* 1000 m altitude.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: Field surveys for analysis of the extant populations should be immediately carried out. Critical studies on biology of the species and populations are urgently called for. Since the Tirunelveli hills harbour many other interesting, rare, endemic species as well, it is necessary to set up a "Plant Sanctuary" to conserve the genetic resources of the area.

Biology and Potential Value: The plant is known to have a rather short flowering and fruiting period. At any given time, a single plant of this species has scarcely any (usually one or two) open flowers or ripe fruits. The species is of botanical and phytogeographical interest.

Cultivation: Not known in cultivation.

Description: Undershrubs. Leaves *ca* 5.0-16.0 × 3.0-5.0 cm, lanceolate-acuminate, minutely pubescent beneath, apex acuminate, ribs next to midrib-nerves; basal pair of nerves scarcely reaching half-way up the leaf. Inflorescence axillary or subradial bracteate cymes. Flowers pinkish. Perianth lobes broad-elliptic, acuminate. Stamens in single groups; filaments slender; connective produced in a triangular apiculus; anther lobes glabrous. Style lobes glabrous. Capsules 2.5-3.5 cm long, moniliform, glabrous. Seeds oblong, trigonous.

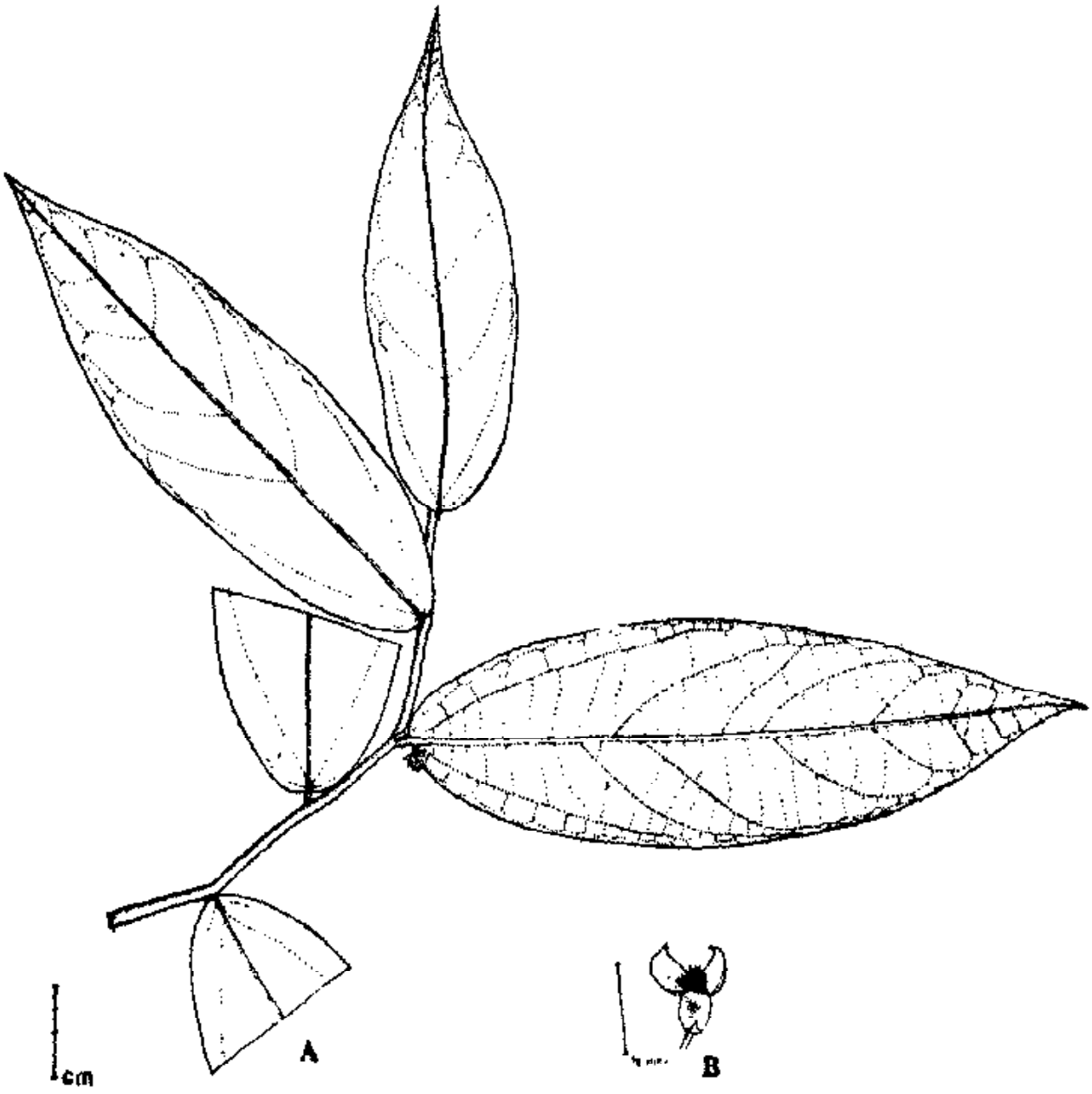
References:

1. Ding Hou (1981). Florae Malaesianae Precursores LXII. On the genus *Thottea* (Aristolochiaceae). *Blumea* 27 (2): 315.

2. Gamble, J. S. (1924). Decades Kewensis: CX. *Kew Bull.* 1924: 386.

3. Subramanyam, K. & Henry, A. N. (1972). Rare or little known plants from South India. *Bull. Bot. Surv. India* 12: 1-3.

The material for this sheet was supplied by M. P. Nayar and M. Ahmedullah, Botanical Survey of India, Calcutta.



Thottea barberi (Gamble) Ding Hou A. Flowering twig. B. Flower.

Status : Vulnerable (in India).

Distribution : In India the species is confined to North-Eastern Hilly region (Meghalaya); also reported from Nepal and Bangladesh. Sporadic collections made in 1931, 1944 and 1968 (ASSAM, CAL) from Khasi and Jaintia hills, Meghalaya, indicate its rarity in India. Its distribution habitats in India have undergone degradation due to jhum cultivation, etc.

Habitat and Ecology : Reported to be growing in open grasslands in the altitudes of 1500 to 2000 m.

Conservation Measures Taken : None.

Conservation Measures Proposed : Attempts should be made to recollect the species and it should be conserved in well-protected areas; uprooting of plants be prohibited.

Biology and Potential Value : A distinct twiner, reported flowering during July-September.

Description : Twiner with hairy stem, hairs in 1 or 2 rows. Leaves linear to lanceolate. Cymes few-flowered, pedunculate. Corolla upto 4 cm long; tube 15-29 mm long, base inflated; lobes 8-11 mm long, broad or elliptic-oblong, glabrous. Outer corona of 5 shortly bifid, hairy lobes; inner linear-subspathulate, erect.

References :

1. Ansari, M. Y. (1984). Asclepiadaceae : Genus—*Ceropegia*. *Fasc. Fl. India* 16 : 8. t. 2 (5); f. 1. Botanical Survey of India, Howrah.

2. Hooker, J. D. (1883). *Fl. Brit. India* 4 : 72.

3. Kanjilal, U. N., *et al.* (1939). *Fl. Assam* 3 : 308.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status : Endangered or possibly Extinct (?) in India. Its habitats in Meghalaya (Khasia Hills) have been much modified in the recent past.

Distribution : A South-East Asian species, its occurrence in India is based on the collections of *Clarke* (44470) and *Lobb s.n.* (K) from Khasia hills, Meghalaya State. Except for a single sheet bearing *Wallich* Cat. no. 8142 in vegetative state (CAL), there seems to be no other specimen available elsewhere in India. The species has not been collected from Meghalaya in the recent botanical explorations.

Habitat and Ecology : Not known.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Efforts should be made to relocate the species and should be conserved *in situ* or be grown in protected areas under similar ecological conditions; uprooting of the plants be prohibited; propagation through seeds be tried to multiply its populations and for reintroduction in its natural habitats.

Biology and Potential Value : Not known; flowers during September.

Description : Twiner with narrowly elliptic-lanceolate, short-petioled leaves. Cymes sessile or short peduncled, few to many-flowered. Corolla 2.7-5.4 cm long; tube 1.2-2.2 cm long, narrowly linear. Outer corona of 5 bifid lobes, inner erect.

References :

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India*, 16 : 9. Botanical Survey of India, Howrah.

2. Hooker, J. D. (1883). *Fl. Brit. India* 4 : 74.

3. Huber, H. (1957). Revision of the genus *Ceropegia*. *Mem. Soc. Broter.* 12 :52, t. 2, f. 18.

4. Kanjilal, U. N., *et al.* (1939). *Fl. Assam* 3 : 309.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status : Rare. The species is known from a few collections only. Factors responsible for its rarity are not known, although large areas of forests in its distribution range have been degraded which may have been a contributory factor.

Distribution : Kerala and Tamil Nadu; Sri Lanka (?). So far recorded from Anamalai hills and the Nilgiris in Tamil Nadu and Peermade, Thenmalai and Palghat forest divisions, Kerala State, along Western Ghats.

Habitat and Ecology : Reported to grow in open forest areas and in sholas in evergreen forests over 1000 m altitude.

Conservation Measures Taken : Certain areas of its distribution range are now included in the Nilgiri Biosphere Reserve.

Conservation Measures Proposed : Uprooting of the plants be prohibited, should be conserved *in situ* or be grown in protected areas under similar ecological conditions; propagation through seeds in botanic gardens be attempted.

Biology and Potential Value : Twiners with large showy flowers blooming during October to December and fruiting from November onwards. Often its identity has been confused with that of *C. metziana* Miq.

Cultivation : Not known.

Description : Twiners with lanceolate, elongate or elliptic-oblong leaves, sparsely hairy above. Cymes 4-8-flowered with peduncles usually longer than the pedicels, hairy. Corolla upto 7.5 cm long; tube 4 cm long, purple spotted, base inflated in the lower half with a ring of hairs at its mouth within; lobes 3.5 cm long, deltoid in the lower half, linear-spathulate, ciliate within at apex. Outer corona of 5 hairy lobes; inner erect, long, ligulate.

References :

1. Ansari, M. Y. (1984). Asclepiadaceae : Genus—*Ceropegia*. *Fasc. Fl. India* 16 : 13. t. 1(3) ; f. 6. Botanical Survey of India, Howrah.

2. Gamble, J. S. (1923). *Fl. Pres. Madras* 5 : 859.

3. Hooker, J. D. (1883). *Fl. Brit. India* 4 : 73.

4. Wight, R. (1848). *Ic. Pl. Ind. Orient.* 4 : t. 1259.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status : Endangered. Represented by very few old collections most of which date back to 19th century.

Distribution : India (Sikkim); Nepal; Tibet; endemic to Himalayas. An old collection made in 1909 from Zemu valley, Sikkim and another collection made in 1945 from Tibet are the only ones available in Indian herbaria.

Habitat and Ecology : Not known; however, it grows in areas ranging between 3000-4000 m altitude in the Himalayas, probably in alpine grassy meadows.

Conservation Measures Taken : None.

Conservation Measures Proposed : Uprooting of the plants be strictly prohibited, whenever and wherever located; should be conserved in protected areas under similar ecological conditions; propagation and multiplication of the plants be tried.

Biology and Potential Value : It is known to flower during June-July.

Description: Twiner or decumbent herb with hairy stem, hairs in 1 or 2 rows. Leaves ovate, acuminate, hairy above. Cymes few-flowered; peduncles hairy; pedicels glabrous. Corolla *ca* 2 cm long, dark purple; tube *ca* 12 mm long, lower half inflated with a thin ring of hairs in the middle inside; lobes *ca* 8 mm long, linear-subspathulate. Outer corona entire, hairy; inner linear, erect.

References :

1. Ansari, M. Y. (1984). Asclepiadaceae : Genus—*Ceropegia*. *Fasc. Fl. India* 16 : 17. t. 8. Botanical Survey of India, Howrah.

2. Hooker, J. D. (1883). *Fl. Brit. India* 4 : 73.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status : Rare. Its habitat, climatic conditions and niche preference appear to restrict its growth elsewhere, hence found rare in the wild.

Distribution : Endemic to Maharashtra. It was collected from Ambolighat in Sindhudurg district in 1977 and described as a new species in 1980. Though the Sahyadri range in general (in Maharashtra) and the region in particular, have been well explored, the species has not been collected from other parts so far. This shows its very restricted distribution and sparse populations.

Habitat and Ecology : Grows in the crevices of rocky beds along the banks of rivulets at *ca* 1000 m altitude in moist and cool climate.

Conservation Measures Taken : None.

Conservation Measures Proposed : Habitat should be protected from destruction for *in situ* conservation of the species.

Biology and Potential Value : A dwarf erect herb with tuberous roots embedded in the crevices of the rocks. It flowers during August.

Cultivation : One tuber was introduced in the Experimental garden, Botanical Survey of India, Pune, where it germinated and flowered; but in subsequent years it failed to grow.

Description : Erect, dwarf herb with elliptic or linear-elliptic, short petiolate leaves. Cymes single-flowered, peduncles short. Corolla 2 cm long, purplish-brown; tube 1 cm long with inflated base; lobes 1 cm long, linear-oblong from ovate-deltoid base which is hairy inside. Outer corona of 5 bidentate ciliate lobes ; inner erect, linear.

References :

1. Ansari, M. Y. (1984). Asclepiadaceae : Genus—*Ceropegia*. *Fasc. Fl. India* 16:18. t. 3(13). Botanical Survey of India, Howrah.

2. Ansari, M. Y. & Kulkarni, B. G. (1980). A new species of *Ceropegia* L. (Asclepiadaceae) from the Western ghats in Maharashtra State. *Bull. Bot. Surv. India* 22: 221-222. f. 1-4.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status : Endangered or possibly Extinct in India. There seems to be no collection of this species made in India in the present century.

Distribution : Its occurrence in India is based on *J. D. Hook. et Thomson* collection from Khasia hills (Meghalaya), *Keenan* from Cachar (Assam) (K) and *King* 2430 (CAL) from banks of the river Ryang, in Sikkim. All these collections were made in the nineteenth century only. *Wallich's* collection from Bangladesh and *King's* collection from Sikkim are available at CAL.

Habitat and Ecology : Not known.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Intensive search must be made; uprooting of plants be prohibited; should be conserved in protected areas, if located; propagation through seeds be tried in botanic gardens.

Biology and Potential Value : A twiner with beautiful flowers blooming during September to Novermber.

Cultivation : Not known.

Description : Twiners with ovate, oblong or lanceolate leaves and few-flowered cymes. Corolla *ca* 5 cm long; tube *ca* 2.5 cm long, inside a ring of hairs at the mouth of the inflated base; lobes *ca* 2.5 cm long, ciliate within the spathulate apex. Outer corona of 5 bifid, deltoid ciliate lobes; inner erect, linear-clavate.

References :

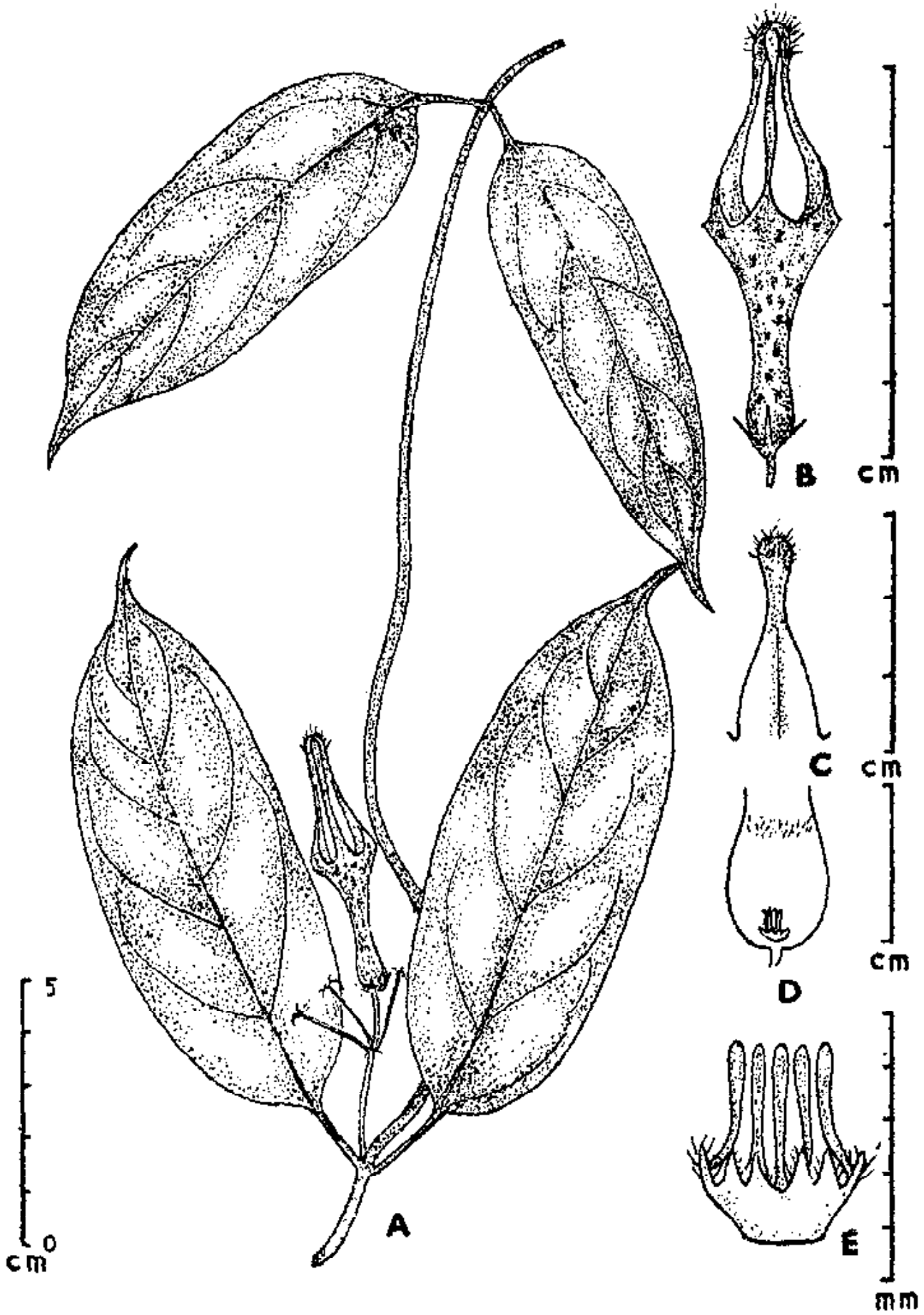
1. Ansari, M. Y. (1984). Asclepiadaceae : Genus—*Ceropegia. Fasc. Fl. India* 16:22. Botanical Survey of India, Howrah.

2. Hooker, J. D. (1883). *Fl. Brit. India* 4:73.

3. Kanjilal, U. N., *et al* (1939). *Fl. Assam* 3: 309.

4. Wallich, N. (1831). *Pl. Asiat. Rar.* 2: 33. t. 139.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia lucida Wall. A. Twiner. B. Flower. C. Lobe spread-ventral view. D. Inflated tube with corona at base. E. Corona.

Status: Endangered or possibly Extinct. There seems to be no record of its collection in India after 1905. Causes of its rarity are unknown.

Distribution: India: Tamil Nadu, Kerala; Sri Lanka. First reported by Beddome in 1864 from Anamalai hills, Tamil Nadu (India) and subsequently reported by Trimen in 1889 as *C. parviflora*, from Sri Lanka. There are only two collections available in India which can be referred to this species: *Barber* 7166 (MH) from Naduvengad, Travancore ghats (Kerala) in 1905 and *Beddome* 26 (CAL) from Anamalais (Tamil Nadu). No recent collections after 1905 are known so far. Very few old collections are the basis of its reported occurrence in Sri Lanka.

Habitat and Ecology: In hilly areas at an altitude of *ca* 1000 m ; no other details are known. Reported to be growing in dry areas in Sri Lanka.

Conservation Measures Taken: None.

Conservation Measures Proposed: If traced in the wild, uprooting of the plants be prohibited for *in situ* conservation of the species in protected areas with similar ecological conditions. Propagation and multiplication through seeds and other techniques be tried.

Biology and Potential Value: Reported to be flowering from June to February, perhaps under the influence of S. W. and N. E. monsoons in its distribution range.

Cultivation: Not known.

Description: Slender glabrous twiners with fibrous roots. Leaves ovate, shortly acuminate. Cymes few-flowered; peduncles *ca* 2 cm long ; pedicels 1.0-1.5 cm long. Corolla upto 2 cm long, tube 1.3-1.5 cm long, base inflated with a thin ring of hairs at its mouth inside; lobes 3-5 mm long, oblong or oblong-lanceloate, hairy. Outer corona of 5 lobes, hairy near the base, about as long as 5 inner erect processes. Follicles 10-20 cm long.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16: 23. Botanical Survey of India, Howrah.

2. Beddome, R. H. (1884). *Madras Journ. Lit. Sci. Ser.* 3(1) : 52.

3. Trimen, H. (1889). *Journ. Bot.* 27: 164. t. 63.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status: Rare; consumption of its tubers by natives and destruction of its habitats are the apparent causes of its rarity.

Distribution: Endemic to Maharashtra State. So far known from Pune and Raigadh districts. It is likely to occur on hill tops and slopes in the neighbouring districts.

Habitat and Ecology: Grows in open areas on hill tops and slopes among grasses.

Conservation Measures Taken: None.

Conservation Measures Proposed: It should be conserved *in situ*; multiplication by means of seeds be attempted; unrestricted collection of its tubers be prohibited.

Biology and Potential Value: Tall herb with small flowers (the corolla lobes being the smallest in the genus in India), blooms during July-August. This species is often mistaken for *C. lawii* Hook. f.

Cultivation: Though a few tubers were introduced in the experimental plots of Botanical Survey of India at Pune for study, where it flowered for 2-3 years, but the species subsequently failed to grow and did not survive.

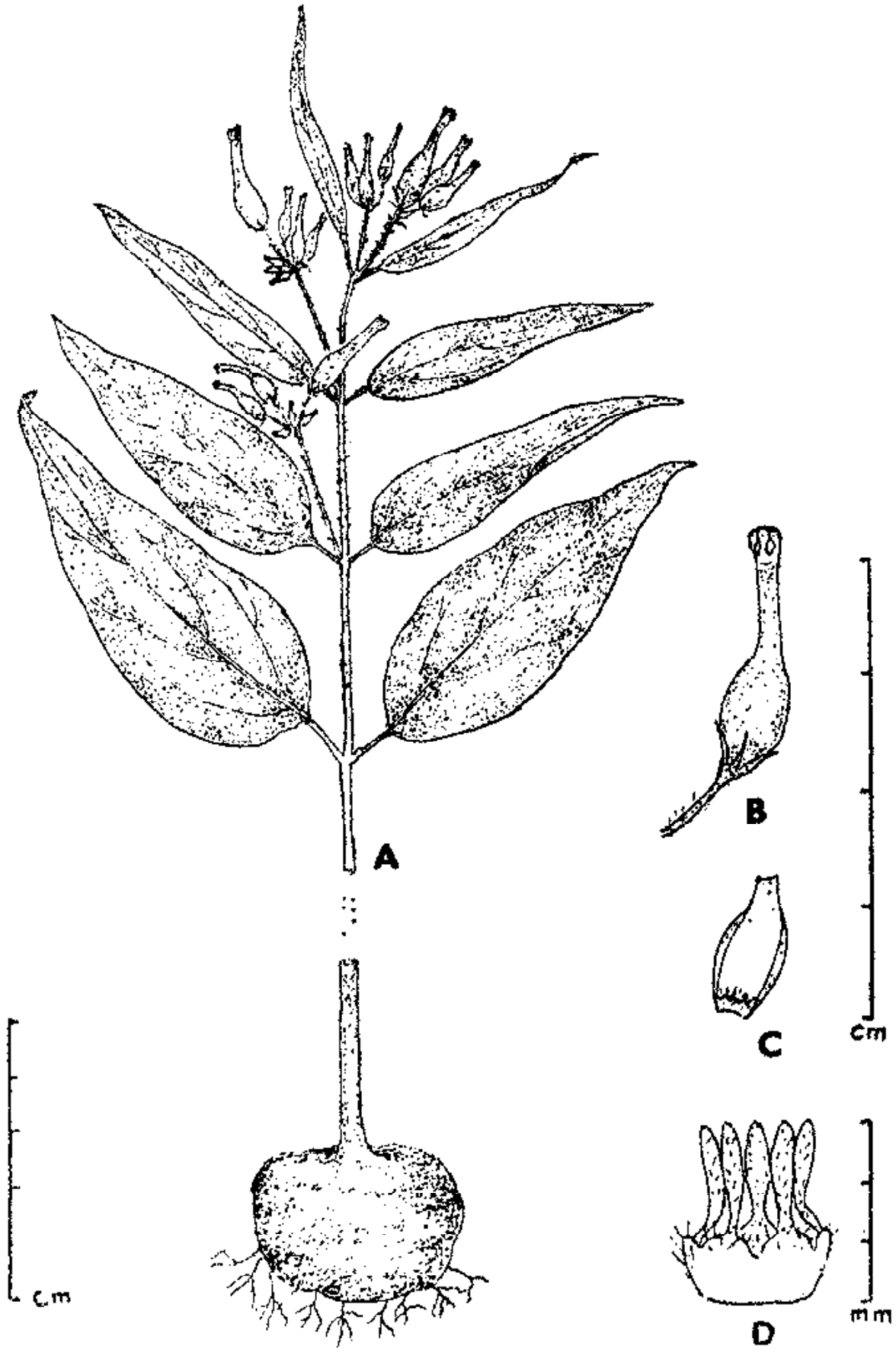
Description: Tall, erect herbs with ovate to lanceolate leaves. Cymes few to many flowered with peduncles and pedicels hirsute. Corolla 1.7-2.3 cm long; tube 1.5-2.0 cm long, base largely inflated with a ring of hairs at the bottom within, above narrow cylindrical; lobes 2-3×2 mm, obovate, apex acute, glabrous. Outer corona of 5 shortly bifid hairy lobes; inner sub-spathulate, hairy.

References:

1. Ansari, M. Y. (1980). *Ceropegia maccannii* Ansari—A new species. *Bull. Bot. Surv. India* 22(1-4): 227-229. f. 1-4.

2. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:22. t. 3(16). Botanical Survey of India, Howrah.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia meccannii Anseri. A. Plant with tuber. B. Flower. C. Inflated flower base with a ring of hairs at base within. D. Corona.

Status: Endangered. Consumption of its tubers and absence of its collection from elsewhere in Western Ghats, other than known locality, indicate its present status.

Distribution: Endemic to Maharashtra State. Known only from a few collections and reported as new on the basis of collections from Ralegaon hills and Bhivade Khurd hill in Junnar Taluka, Pune district, made in 1965 & 1968. This indicates its very localised distribution along the Sahyadri range.

Habitat and Ecology: Grows on steep exposed slopes of the hills among grasses, at an altitude of about 1000 m, 10-24 km West of Junnar.

Conservation Measures Taken: None.

Conservation Measures Proposed: Uprooting of plants be prohibited; it should be conserved in protected areas; propagation through seeds be tried.

Biology and Potential Value: An erect species with elegant looking large flowers blooming during August to September.

Cultivation: 2 or 3 tubers of the species were introduced in the experimental plots of Botanical Survey of India, Pune where the plants were studied in detail. During subsequent years, the plants did not survive.

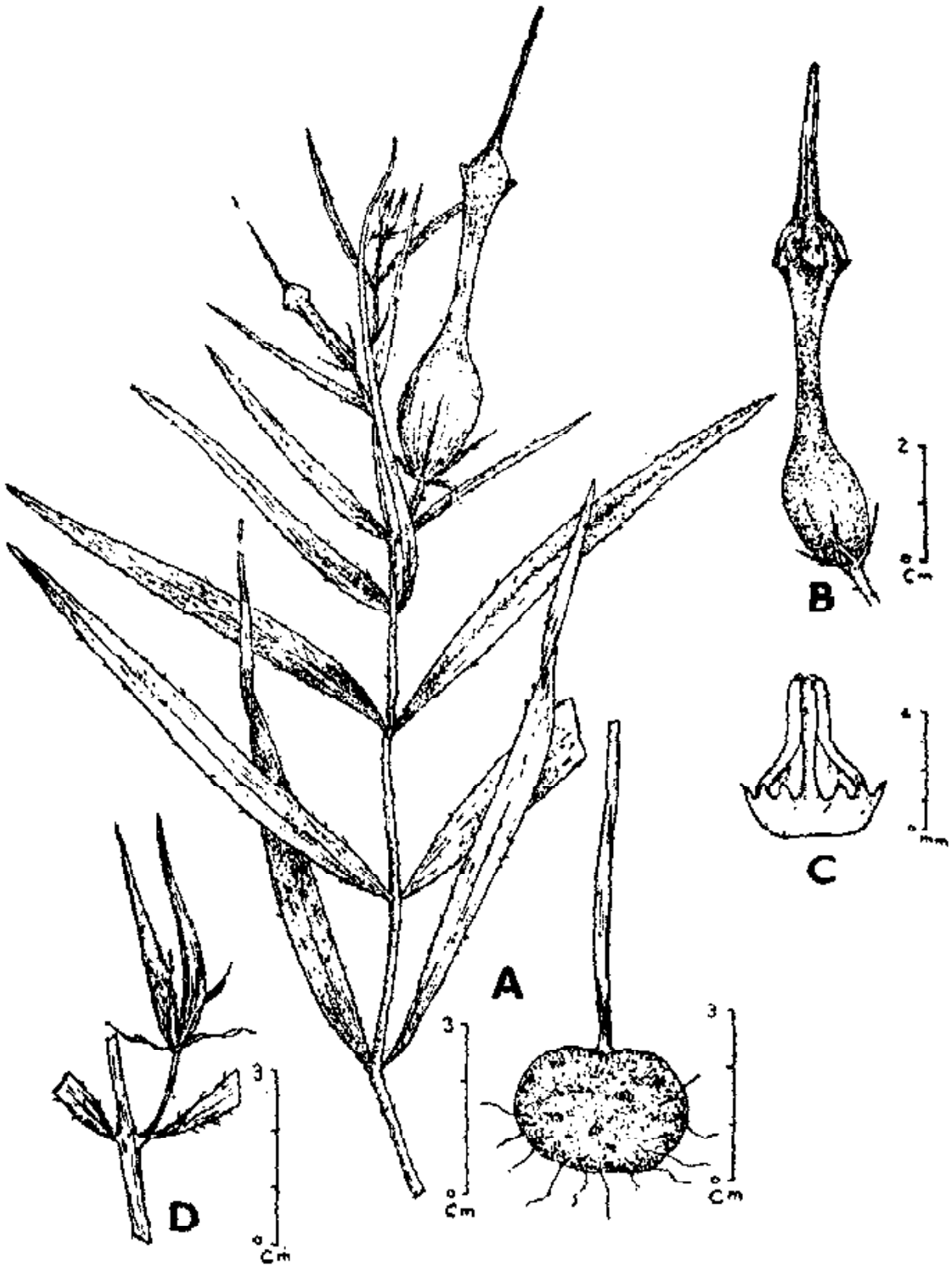
Description: Erect herbs with pubesent stem and linear-lanceolate subsessile leaves. Corolla 5.5-10.0 cm long; tube 3.75-6.5 cm long with largely inflated base and a narrow neck enlarging towards mouth; lobes 1.75-3.5 long, linear, elongated above from ovate-deltoid base, connate at tips to form a beaked crown. Outer corona of 5 bidentate glabrous lobes; inner linear, erect.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16 : 24. t. 3(17). Botanical Survey of India, Howrah.

2. Hemadri, K. & Ansari, M. Y. (1971). *Ceropegia mahabalei*—A new species of Asclepiadaceae from Sahyadri range, W. Ghats (Maharashtra State). *Ind. For.* 97(2): 105-108. t. 1(b); f. 1-4.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia mahabalei Hemadri *et* Ansari A. Plant & tuber. B. Flower. C. Corona. D. Follicles.

Status: Rare. Probable cause of its rarity appears to be the destruction of its habitats. It was first reported from Mercara (Kanara Coast) in Karnataka (1852), but not known to have been collected again from this State. However, there are a few gatherings of this species available in Indian herbaria from Pulney and Nilgiri hills in Tamil Nadu and Palghat and Quilon districts in Kerala, and reported as 'not common' or 'rare'

Distribution: Karnataka, Kerala, Tamil Nadu; Sri Lanka (?).

Habitat and Ecology: Occurs in evergreen forests along the Western Ghats on slopes between 1200-2000 m altitude.

Conservation Measures Taken: None.

Conservation Measures Proposed: Uprooting of the plants be prohibited; should be conserved *in situ* or be grown in protected areas under similar ecological conditions; propagation through seeds and tissue culture be tried.

Biology and Potential Value: Reported to flower from September to December and fruiting October onwards. Its identity has been confused with *C. decaisneana* Wt.

Description: Twiners, with ovate, ovate-oblong leaves with short adpressed hairs on the upper surface. Cymes few-flowered; peduncles hairy on one side. Corolla 4.0-7.7 cm long, base largely inflated, with a ring of hairs at its mouth within, narrowed above in the neck, funnel-shaped above; lobes 2-4 cm long, ovate-deltoid towards base, linear-subspathulate above, acute at apex. Outer corona of 5 deltoid-bifid hairy lobes; inner longer, ligulate, glabrous.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:25. t. 1(4); f. 14. Botanical Survey of India, Howrah.

2. Miquel, F. A. G. (1852). *Analecta Bot. Ind.* 3:11.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status: Rare; probably due to habitat destruction because of widening of ghat roads etc. First collected in 1969 and reported as a new species (1972) from Wai-Panchgani ghat in Satara district. This area has been frequently visited by many botanists since long. Subsequent efforts to relocate it again from the same belt and elsewhere in the adjoining region have been unsuccessful.

Distribution: Endemic to Maharashtra State.

Habitat and Ecology: Found along the ghat slopes with grasses and other herbs in well-drained rocky-gravelly soil over 1000 m altitude. Requires cool, misty, moist climate. Being a small herb it grows among tall grasses during peak monsoon season. Land slides and risky habitat make its collection more hazardous.

Conservation Measures Taken : None.

Conservation Measures Proposed: It should be conserved *in situ* or be grown in protected areas under similar ecological conditions. Uprooting of the plants be prohibited. Propagation through seed and tissue culture be tried.

Biology and Potential Value: It flowers during July-August in peak monsoon season.

Cultivation: It develops twining habit, as most of the other erect species do, due to abnormal conditions under cultivation.

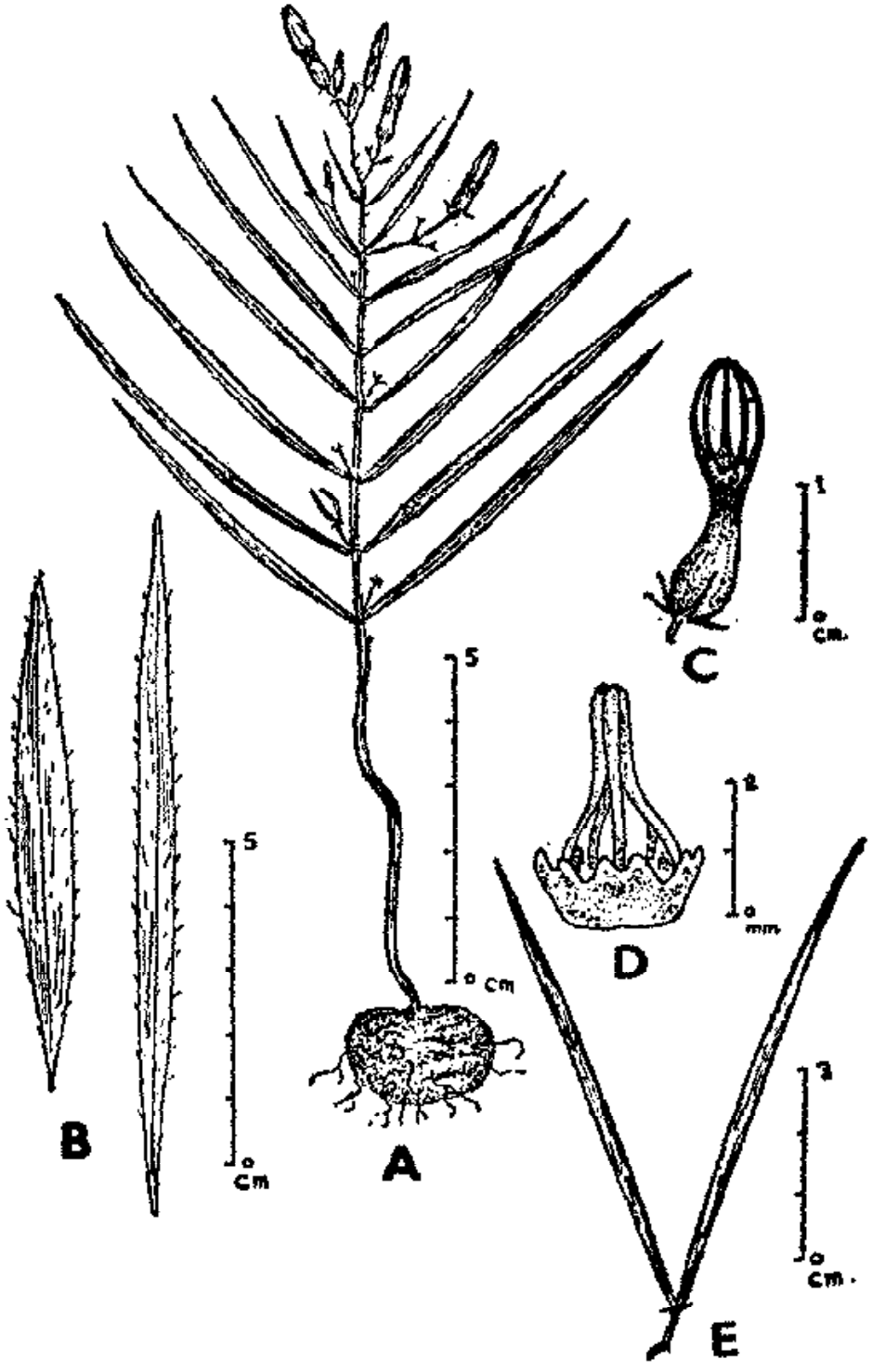
Description: Erect herbs, 15-40 cm high. Leaves linear to lanceolate, 7-9 × 0.3-1.5 cm. Flowers usually 3, in axillary umbellate cymes. Corolla sightly curved, glabrous; tube 1.2-1.4 cm long, subcylindric, base inflated, glabrous inside; lobes 9-13 mm long, linear-oblong above from ovate-deltoid base. Outer corona of 5 obtusely bifid or emarginate lobes; inner erect, linear-subclavate.

References:

1. Ansari, M. Y. (1972). A new *Ceropegia* L. (Asclepiadaceae) from Sahyadri range in Maharashtra State. *Journ. Bom. Nat. Hist. Soc.* 69 (1): 249-252. f. 1-5.

2. Ansari, M. Y. (1982). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:31. t. 4(9). Botanical Survey of India, Howrah.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia noorjahaniae Ansari A. Plant with tuber. B. Leaves. C. Flower. D. Corona. E. Follicles.

Status: Rare. Consumption of its tubers by the natives appears to be one of the causes of its rarity in the wild.

Distribution: Endemic to Maharashtra State. So far known from Harishchandragad hill and Dhak and Durga Khillas in Junnar Taluka, Pune district only. It has not been collected from elsewhere along the Sahyadri range which denotes its very localised distribution.

Habitat and Ecology: Reported growing in exposed areas on hill-tops and slopes among grasses at an altitude of *ca* 1300 m.

Conservation Measures Taken : None.

Conservation Measures Proposed: To be conserved *in situ* or be grown in protected areas having similar habitat and ecological conditions. Consumption of tubers and its uprooting be stopped. Propagation through seeds and other techniques be tried.

Biology and Potential Value: A distinct species which was earlier treated under *C. lawii* Hook. f. It flowers in August-September and sets fruits in October.

Cultivation: Introduced in the experimental plots of Botanical Survey of India, Pune for critical studies where it grew for 2 seasons only.

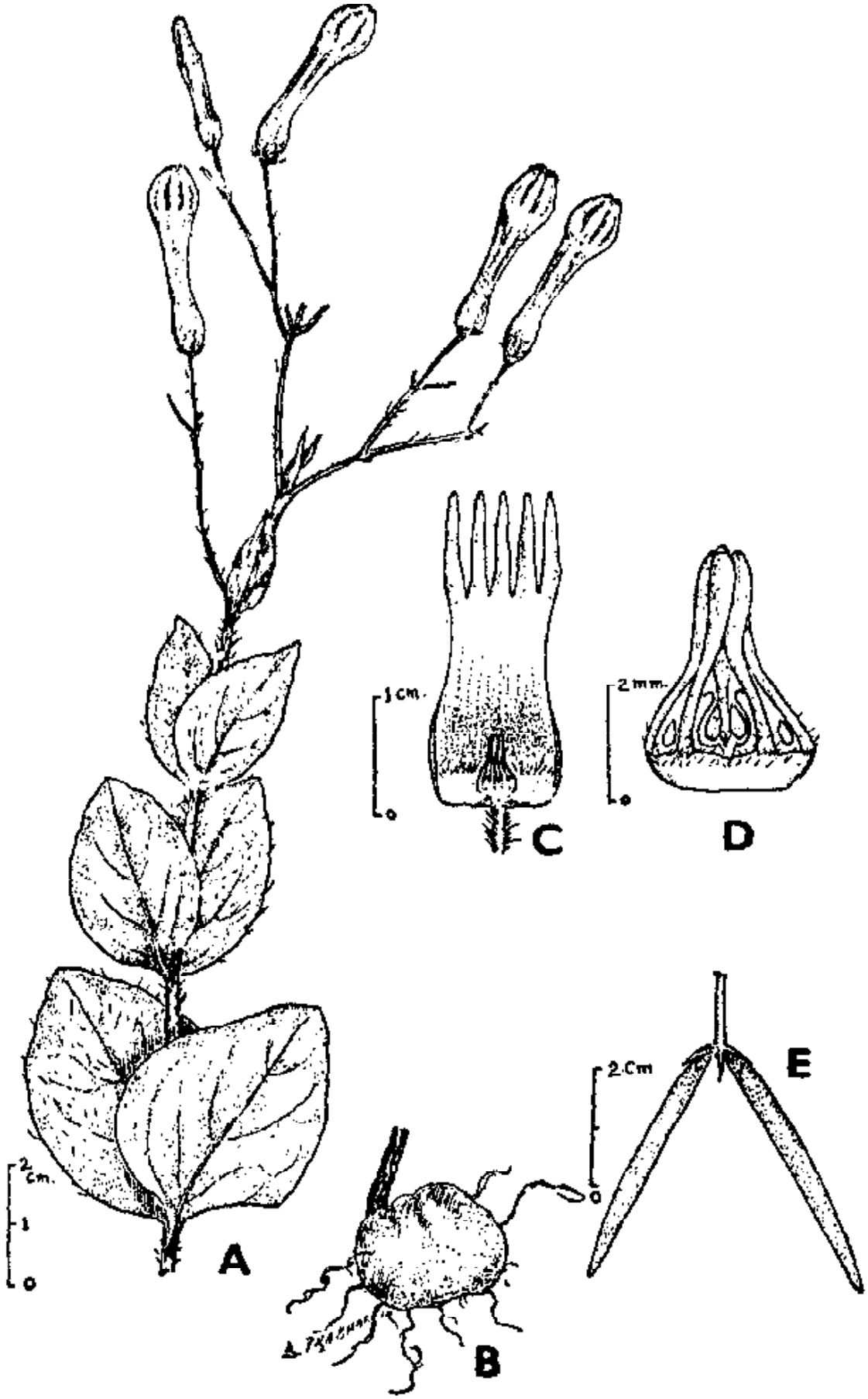
Description: Tall, erect herbs with pubescent stems. Leaves ovate, puberulous above. Cymes sub-axillary and terminal, many-flowered with peduncles and pedicels hirsute. Corolla 2.3-3.5 cm long ; tube 1.5-2.5 cm long, base slightly inflated, inside a ring of hairs at its bottom only; lobes 8-13 × 2.5 mm, linear-oblong, glabrous. Outer corona of 5 short, entire or notched lobes, ciliate; inner erect, sub-clavate.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:29. t. 4(23). Botanical Survey of India, Howrah.

2. Hemadri, K. (1968). A new *Ceropegia* L. (Asclepiadaceae) from Western Ghats, Maharashtra. *Bull. Bot. Surv. India* 10(2): 123-125. t. 1, f. 2A *et* f. 1-6.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia rollae Hemadri A. Flowering stem. B. Tuber, C. Flower split open. D. Corona. E. Follicles.

Status: Rare. Consumption of its tubers and destruction of its habitats due to frequent land slides in monsoon and due to road constructions etc. along the ghats account for its rarity.

Distribution: Endemic to Maharashtra State. It was discovered as new in 1968 from Mahad ghat in Satara district. Subsequently traced only twice from other adjoining hill slopes in the same district, but never known to occur in large numbers. Seems to be very localised in distribution.

Habitat and Ecology: Grows on precipitous hill slopes along the ghat ranges among grasses on gravelly soil, at times completely covered by the grasses and other herbs, at altitudes ranging from 1000—1200 m with misty, humid climate which provide ideal conditions for its growth.

Conservation Measures Taken: None.

Conservation Measures Proposed: Destruction of its habitat to be checked; consumption of its tubers to be checked; to be conserved *in situ* as far as possible or grown in protected areas under similar conditions of habitat and climate; propagation through seeds and other techniques be attempted.

Biology and Potential Value: It flowers during August—September and sets fruits from September to October.

Cultivation: Cultivated through its tubers at Botanical Survey of India, Pune for study where it survived for one season only.

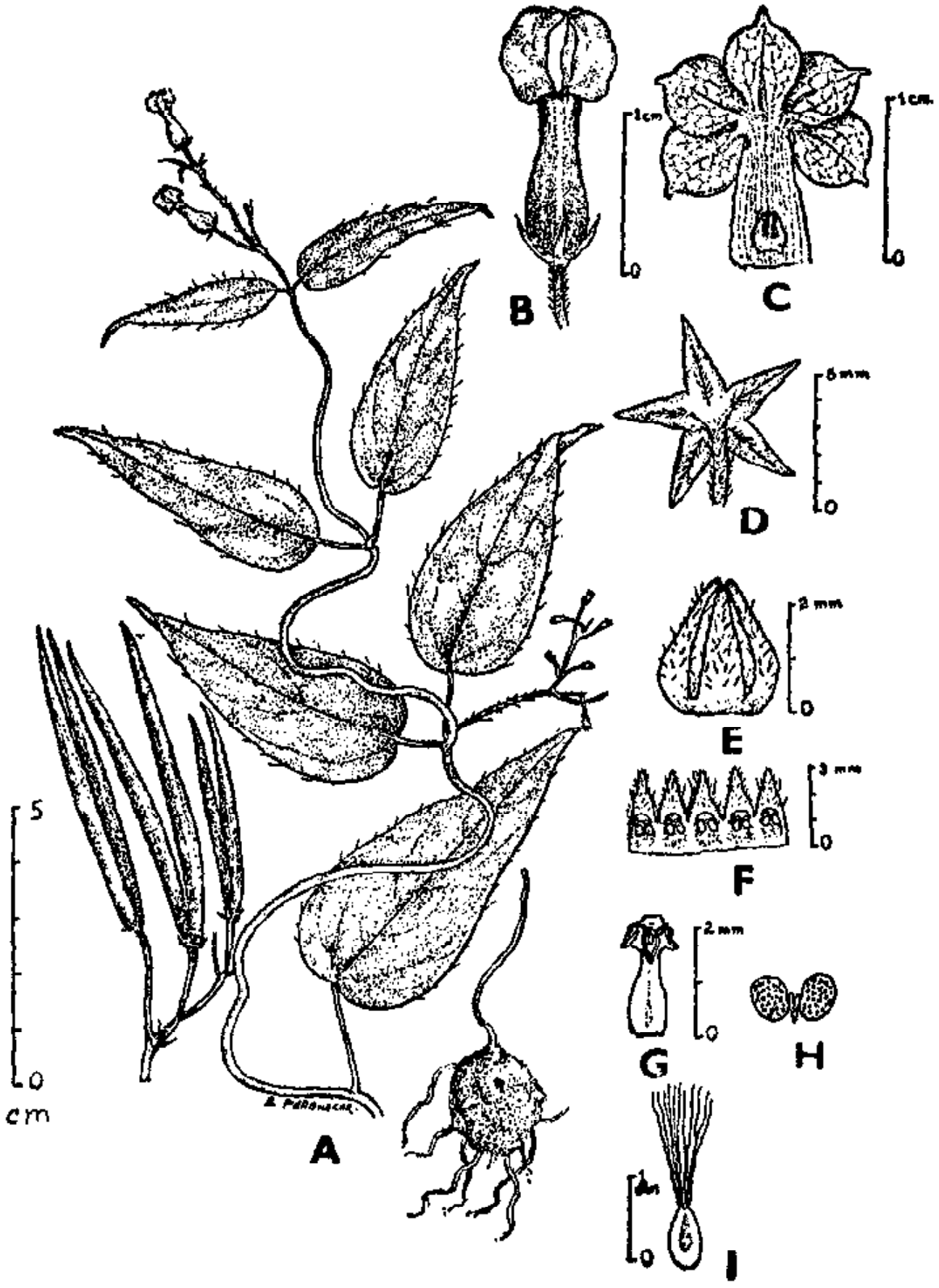
Description: Twiners with glabrous stems. Leaves ovate to lanceolate. Cymes few to many flowered with hairy peduncles and pedicels. Corolla upto 1.5 cm long; tube 1 cm long, base inflated; lobes 5 mm long, orbicular. Corona uni-seriate, inner of 5 erect, elongated conical processes, hairy outside, convergent at tips.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:30. t. 4(25); f. 17. Botanical Survey of India, Howrah.

2. Wadhwa, B. M. & Ansari, M. Y. (1968). A new species of *Ceropegia* L. (Asclepiadaceae) from Western Ghats, Maharashtra. *Bull. Bot. Surv. India* 10(1): 95-97. f. 1-9.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Ceropegia santapaui Wadhwa *et* Ansari A. Twiner & tuber. B. Flower. C. Dissected flower with lobes & corona at base. D. Calyx. E. Corona-lateral view. F. Inner view of dissected corona. G. Gynostegium. H. Pollinia. I. Seed with Coma.

Status: Vulnerable due to habitat loss. Known from a few old gatherings made during 1898, 1905, and 1937 and the latest in 1966.

Description: India: Kerala, Tamil Nadu; and Sri Lanka. It is reported from Kodaikanal (Tamil Nadu) and Munnar ghats and Devicolum (Kerala). It is also reported to be very rare in Sri Lanka (based on old collections) where no recent collections seem to have been made.

Habitat and Ecology: It is known to occur in sholas and evergreen belts at higher altitudes in S. India and in moist low country (Sri Lanka).

Conservation Measures Taken: None.

Conservation Measures Proposed: Efforts should be made to conserve the species *in situ* or in protected areas with similar habitat and climate conditions and multiplication through seeds and other techniques for *ex situ* conservation.

Biology and Potential Value: Generally the species blooms during May-June, (at times reported during December) and bears fruits subsequently.

Cultivation: Not known.

Description: Glabrous twiners with ovate to lanceolate leaves. Cymes few-flowered, pedunculate. Corolla 3-6 cm long; tube 1.2-4.2 cm long, with a ring of hairs at the mouth of the largely inflated base within, neck cylindrical, elongated in the middle, funnel shaped above; lobes 1.2-1.8 cm long, ovate-oblong. Outer corona of 5 elongated, bifid, deltoid hairy lobes; inner longer, erect, linear, spathulate.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Indie* 16 :30. Botanical Survey of India, Howrah.

2. Gamble, J. S. (1923). *Fl. Pres. Madras* 5 :856.

3 Hooker, J. D., *et al* (1883). *Fl. Brit. India* 4 : 71.

4. Hooker, W. J. (1854). *Bot. Mag.* t. 4758.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.

Status: Rare. Consumption of its tubers and destruction of habitats appear to have caused its rarity.

Distribution: Endemic to Maharashtra State. Though reported from Bombay, Thane, Raigadh, Pune, Satara and Ratnagiri districts along the Sahyadri range, the frequency of its occurrence is depleting and thus warrants conservation.

Habitat and Ecology: In open forests, twining on shrubs and undergrowths, and on slopes at altitudes ranging between 500—1500 m. It also requires a moist, cool and misty climate with well-leached soils.

Conservation Measures Taken: None.

Conservation Measures Proposed: Destruction of habitats to be checked; consumption of its tubers by the natives be discouraged; to be conserved *in situ* or in protected areas having similar habitat and climatic conditions; propagation and multiplication through seeds and other techniques be taken up.

Biology and Potential Value: Its flowers are large and attractive, blooming during August-September and fruiting from September onwards. The colour of the flowers changes with variations in rainfall and altitude.

Cultivation: It was grown in Botanical Survey of India experimental garden at Pune where it survived for three seasons.

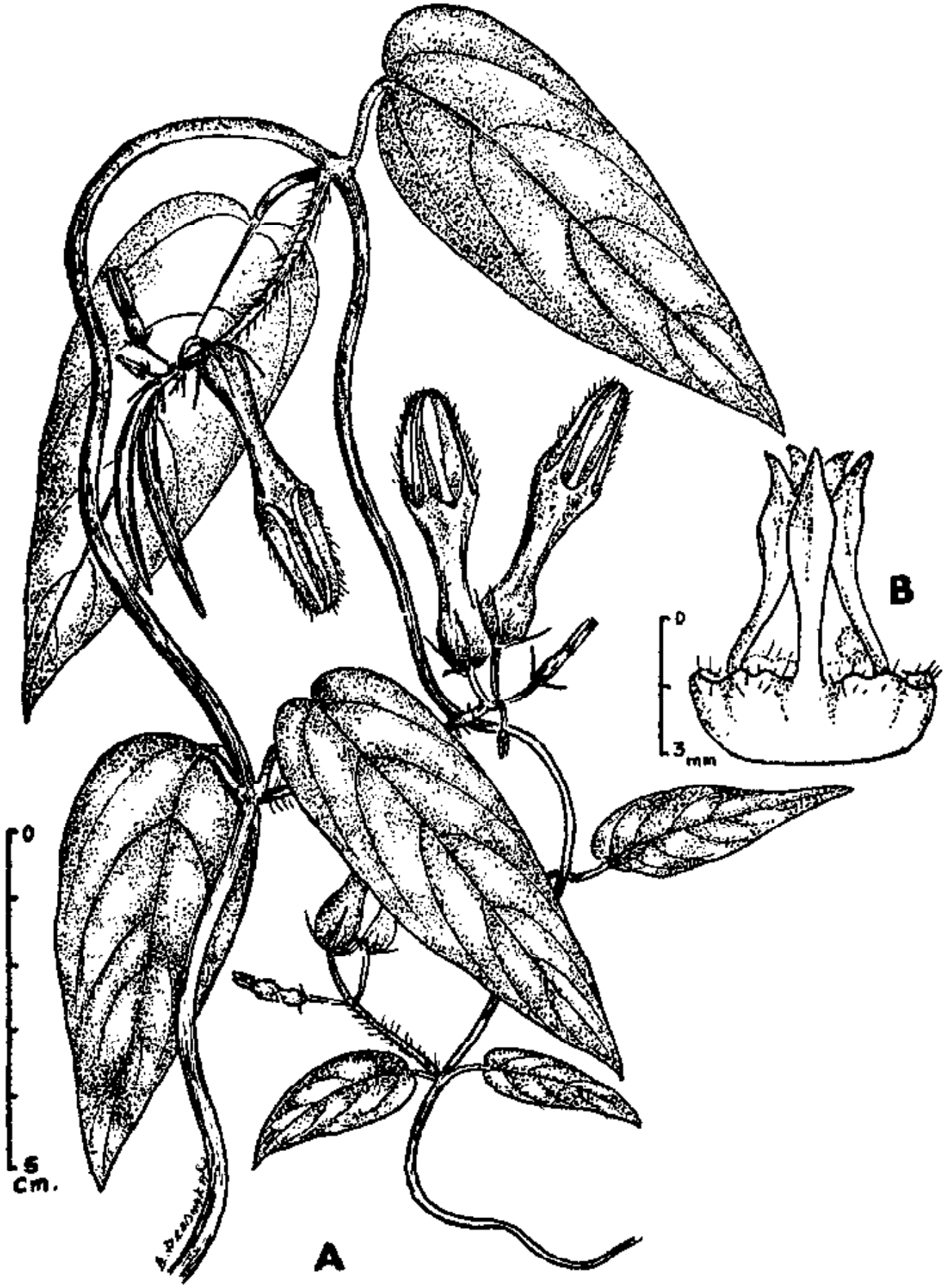
Description: Twiners with ovate, cordate, acuminate leaves. Cymes many-flowered. Corolla 3-8 cm long; tube 1.5-4.6 cm long, base globosely inflated, narrowed in the middle, funnel-shaped at mouth; lobes 1.5-3.5 cm long, linear-oblong above from ovate-deltoid base, pubescent inside and hairy along margins. Outer corona of 5 lobes, entire, emarginate or shortly bifid, hairy; inner ligulate, oblanceolate, glabrous.

References:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. India* 16:31. t. 4(26). Botanical Survey of India, Howrah.

2. Hooker, W. J. (1839). *Bot. Mag.* t. 3740, *emend.* Ansari, M. Y. *Bull. Bot. Surv. India* 13 (3 & 4): 187. 1971.

The material for this sheet was supplied by M. Y. Ansari Botanical Survey of India, Pune.



Ceropegia vincaefolia Hook. A. Twining branch. B. Corona.

Status: Rare. It has not been collected since 1976. Cause for its decline is destruction of the habitat for iron ore project where the forests were cleared to pave way for roads and creation of a township at Kalasa and Samse, Kudremukh.

Distribution: Endemic to a single locality in Chikmagalur district of Karnataka. All the known collections are from Yelnir forests near Samse from where both Yoganarasimhan and the author had collected it. It is often confused with *M. brunoniana* Wight & Arn., a closely allied species.

Habitat and Ecology: Along forest clearings and paths in evergreen forests, in shady areas. It prefers a humid climate and seen at 600 m.

Conservation Measures Taken: None.

Conservation Measures Proposed: Possibly this species might have become vulnerable in view of the drastic disturbance to the habitat. A thorough exploration of existing forests at Kalasa may result in rediscovery of this species. If rediscovered, the plants should be raised in experimental gardens.

Biology and Potential Value: Not much known.

Cultivation: None on record.

Description: Climbing, striate, glabrous shrubs with watery fluid. Leaves membranous, oblong, 8-15×3-7.5 cm, base rounded to cuneate, apex abruptly acuminate, 6-8 nerved. Flowers reddish-brown, 8-10 mm across, in 10-12-flowered, crowded, axillary unbranched corymbs; peduncles 5-15 mm long, fleshy, stout; pedicels 5-7 mm long, fleshy; bracts and bracteoles present. Calyx 5-lobed, almost free except at base, puberulous, lobes *ca* 6×3 mm, ovate-acute, margins ciliolate. Corolla urceolate, 5-lobed, puberulous, lobes ovate, *ca* 5×4 mm, reflexed. Staminal corona of 5, erect, fleshy lobes adnate to the staminal column, adpressed to back of anthers, free at apex, base with 2 short flaps. Gynostegium *ca* 5 mm long; anthers erect with a hyaline membranous appendage; pollinia erect, one in each anther loculus, translator equalling the dark brown, 2 mm long corpusculum. Ovary *ca* 4 mm, 2-carpelled, free; stigma bilobed, thimble shaped. Follicles 6-10 cm long, brown, stout; seeds brown with comose hairs.

Reference:

1. Yoganarsimhan, S. N. & Subramanyam, K. (1976). A new species of *Marsdenia* R. Br. (Asclepiadaceae) from South India. *Proc. Ind. Acad. Sci.* 83 (B) : 147-149.

The material for this sheet was supplied by R. S. Raghavan and B. D. Sharma, Botanical Survey of India, Pune.

Status : Rare. Forest clearance and habitat destruction appear to be the causes for its rarity.

Distribution : Apparently endemic to Maharashtra State. It was first collected in 1963 from Sinhagadh hill and then from Junnar hill in Pune district and described as a new taxon in 1971. Subsequently, it was traced in Gureghar Forest Nursery area, near Panchgani in Satara district and at Bhandardara in Ahmednagar district with a few plants in each place. It may also be occurring in the neighbouring districts under similar ecological conditions, but must be very rare and hence could not be located earlier, though Western ghats in Maharashtra and other states are fairly well-explored.

Habitat and Ecology : Generally grows in open situations on hill slopes of moist decidous forests in gravelly soil, twining on large shrubs at 1000 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : As far as possible, its habitats should be protected; should be grown in protected areas with similar ecological conditions in its distribution range; consumption of its fruits be discouraged.

Biology and Potential Value : A climber flowering with the onset of monsoon (June-July). Its immature, green fruits are consumed by natives, thus inhibiting its natural seed dispersal and germination.

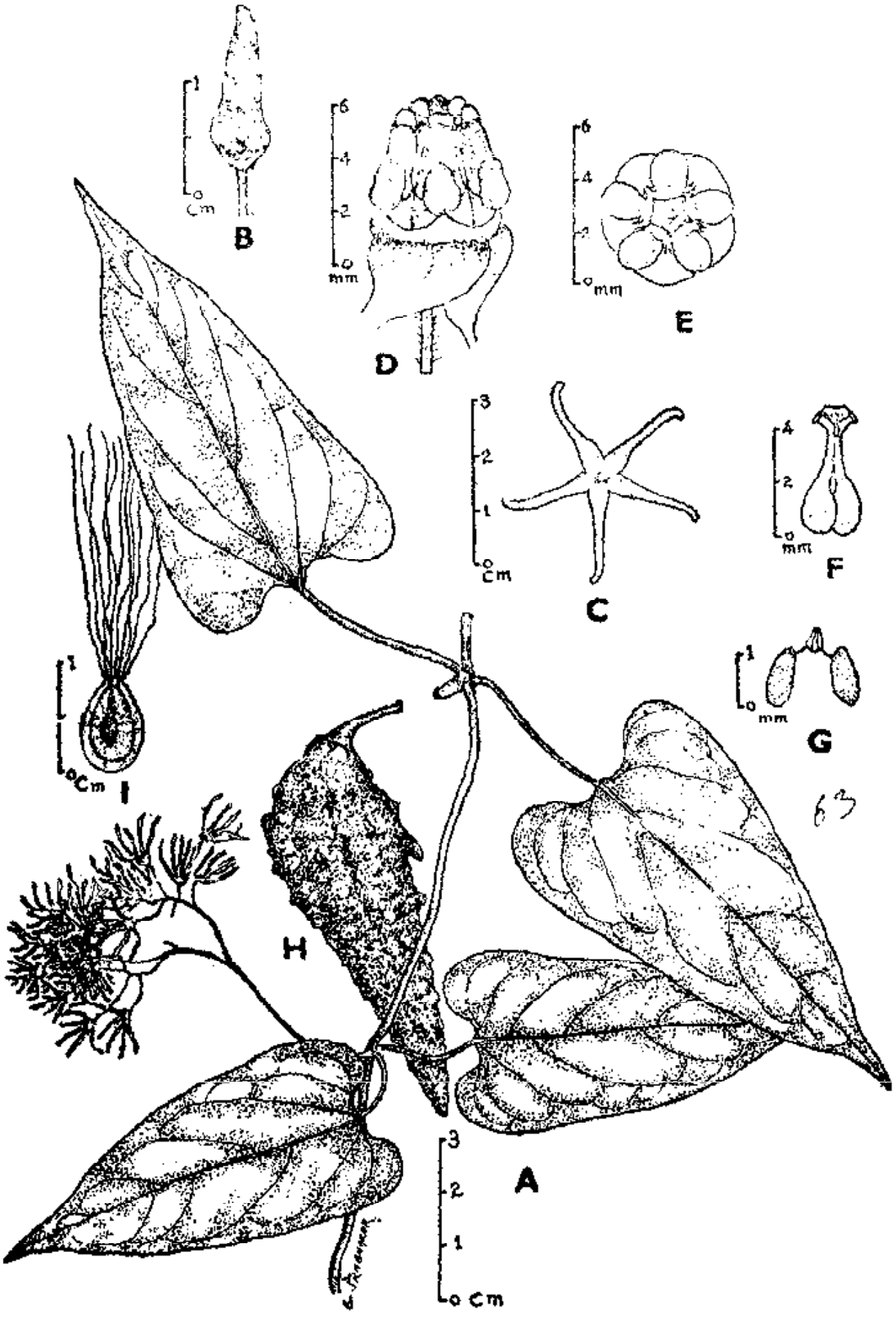
Cultivation : It was introduced in experimental plots of Botanical Survey of India, Pune, where it subsequently flowered after 3 to 4 years but never set the fruits.

Description : Perennial twiner with opposite, ovate-acuminate or ovate-oblong leaves. Cymes sub-umbellate, few to many-flowered. Corolla vinaceous-purple, divided near to the base, rotate. Outer corona cupular, 5-lobed, forming cavities at the base with the staminal column; the inner of 5 dilated, fleshy subglobose masses. Anthers 5 with white inflexed membranous tips. Gynostegium 0.5cm long. Carpels 2, glabrous. Follicles ovate-lanceolate, with warty protruberances outside. Seeds many, ovoid; coma white.

Reference :

1. Ansari, M. Y. & Hemadri, K. (1971). *Seshagiria* Ansari *et* Hemadri—A new genus of Asclepiadaceae from Sahyadri ranges, India. *Ind. For.* 97(3):126, f. 1-9.

The material for this sheet was supplied by M. Y. Ansari, Botanical Survey of India, Pune.



Sesbagiria sahyadrica Ansari *et* Hemadri A. Part of plant. B. Flower bud. C. Corolla spread open. D. Lateral view of Corona, staminal column and corolla lobes. E. Corona-apical view. F. Gynostegium. G. Pollinia. H. Follicle. I. Seed.

Status : Vulnerable. The main source of danger to this species is the destruction of its habitat.

Distribution : Endemic to Palghat hills of Malabar, Western Ghats (Type locality).

Habitat and Ecology : The species is found in moist deciduous forests near water sources, climbing on trees and shrubs.

Conservation Measures Taken: None for its natural populations. However, its habitats (Palghat hills) falling in the Silent Valley area are now declared as a protected area.

Conservation Measures Proposed : Protection of its habitats in its distribution range and introduction of the species in botanic gradens are needed to conserve the species.

Biology and Potential Value : In common with other species of Asclepiadaceae it may contain pharamacologically active substances but this requires investigation. An endemic species of botanical interest.

Description : Slender climbers on trees and shrubs. Young parts nearly black furfuraceously tomentose. Leaves smooth, elliptic-obovate, abruptly acuminate, nearly glabrous; main nerves 6-7 pairs. Flowers white with light brownish tinge inside, in axillary and prolonged terminal panicles. Corolla-lobes linear-oblong. Fruits of 2 divaricate follicular mericarps.

References :

1. Gamble, J. S. (1922). *Kew Bull.* 1922 : 119.

2. Gamble, J. S. (1957). *Fl. Pres. Madras* 2 :483. Botanical Survey of India, Calcutta. (*repr.* ed.)

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Rare. Rao and Deshpande (1968) reported this species as confined to semi-arid region of Gujarat State, particularly Kutch and N. Coast of Saurashtra, adjoining Kutch. Jain & Sastry (1980) and Kothari and Hajra (1983) have also supported earlier reports. The species is restricted to Gujarat with small scattered populations. The rarity is due to destruction of habitat by natural and biotic factors.

Distribution : Gujarat (Kutch, Saurashtra). Endemic.

Habitat and Ecology : Among grasses in slopes of rocky hillocks and river banks in semi-arid regions of Kutch and sandy-alkaline soil of Byet Island in coastal area of Saurashtra.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Protection of its natural habitat and the area like Barda hills in Saurashtra; *ex situ* conservation in Botanic/experimental gardens should be considered.

Biology and Potential Value : It flowers in August-September. Phyto-chemically, the whole plant contains 'Saponins' (Sabnis & Rao, 1983). Other species like *Helichrysum bracteatum* are ornamental plants having glistening, white flower heads. *H. cutchicum* can also be introduced in gardens for ornamental purposes.

Cultivation : None so far.

Description : Diffuse herbs, about 40 cm high; stem covered with white cottony hairs. Leaves sessile, oblanceolate or linear, white-tomentose beneath, 2-5 × 0.1-1.8 cm. Flowers white, glistening, heterogamous, in multiple terminal or rarely axillary heads; involucral bracts many, scarious, irregularly toothed at tip; female florets papillate, fertile, few on perifery only; bisexual florets papillate, more in number at the centre only; stamens 5, syngenecious, anthers sagittate; stigma 2-armed. Achenes oblong, verrucose, pappus hairs uniseriate, barbellate.

References :

1. Clarke, C. B. (1881). Compositae. *In :* Hooker, J. D., *Fl. Brit. India* 3:284. (as *Anaphalis cutchica* C. B. Cl.).

2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India—A State-of-the-Art Report*. B. S. I., Howrah. p. 46.

3. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. B. S. I., Howrah. p. 46.

4. Rao, R. S. & Deshpande, U. R. (1968). *Bull. Bot. Surv. India* 10:225-227, t. 1. ff. 1-11.

5. Sabnis, S. D. & Rao, K. S. S. (1983). *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. B. S. I., Howrah. p. 73.

6. Shah, G. L. (1978). *Fl. Gujarat State* 1 :368 S. P. University Press, Vallabh-Vidyanagar.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Vulnerable. Natural populations of the species are getting depleted due to indiscriminate collections of the plants for its medicinal value and loss of habitats in its distribution range.

Distribution : In the hills of Jammu & Kashmir State.

Habitat and Ecology : In natural habitats this species grows in open temperate grassy hill slopes in altitudes of 3000-3500 m.

Conservation Measures Taken : None for the wild populations or its habitats. The species is cultivated in the Lahul valley of Himachal Pradesh.

Conservation Measures Proposed : (i) Baseline data on the distribution and ecological status, population density, competition between associates, etc. are to be collected. (ii) Production of seed and percentage of seed germination should be studied. (iii) Rehabilitation in the depleting habitat or ecologically akin to natural habitat is necessary. (iv) Steps should be taken to check the possible removal from the natural populations.

Biology and Potential Value : 'Manukut' is the vernacular name of this plant and is used as a substitute of 'Kuth' plant (*Saussurea costus*). The cost per bag of 40 kg roots varies from Rs. 600 to Rs. 800 and is a valuable foreign exchange earner. Fresh roots are aromatic and in Kashmir it is known as 'Poshkar'. The roots yield inulin and an essential oil containing alantolactone (*Wealth of India* 5:236. 1959).

Description : A stout herb, 0.5-2.0 m high. Leaves are thick and scabrid above, tomentose beneath. Basal leaves are long petioled, elliptic-lanceolate; cauline leaves are almost stem-clasping i.e. 1/2 amplexicaule, oblong. Heads are large, *ca* 5.0 cm in diam., many, yellow. The fruits are compressed, glabrous, about 5.0 mm long.

References :

1. Clarke, C. B. (1876). *Comp. India*, p. 118.

2. Hooker, J. D. (1881). *Fl. Brit. India* 3:292.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.

Status: Rare. It is of rare occurrence on the way to Khar Dung Pass, Ladak and is known from a few scattered populations only.

Distribution : In India the species occurs in Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh in the high altitudes of 3500-5500 m. It is also reported from Pakistan and Central Asia.

Habitat and Ecology : In rock-crevices with species of *Carex, Primula, Pedicularis,* etc., in alpine region in the altitudinal range of 3500-5500 m.

Conservation Measures Taken : None for the natural populations.

Conservation Measures Proposed : Habitats should be protected for *in situ* preservation of the populations.

Biology and Potential Value : Flowers during July-September, and it is of botanical interest.

Cultivation : Not known.

Description : Herbs, 7.5-35.0 cm tall, very stout, scaberulous, simple. Basal leaves 7.0-10.0×1.5-2.5 cm, linear-lanceolate or narrowly elliptic, acute, coarsely toothed, narrowed into a short petiole; upper sessile, half-amplexicaule, acuminate. Floral bracts 2.5-5.0 cm long, often as broad and purplish, cymbiform enclosing solitary large sessile sub-silky head. Heads 1.5-2.0 cm across. Peduncles short, stout, densely woolly. Involucral bracts blackish, lanceolate-acuminate. Corolla *ca* 1.2 cm long. Anther-tails short, woolly. Achenes glabrous. Pappus white. Outer bristles scabrid.

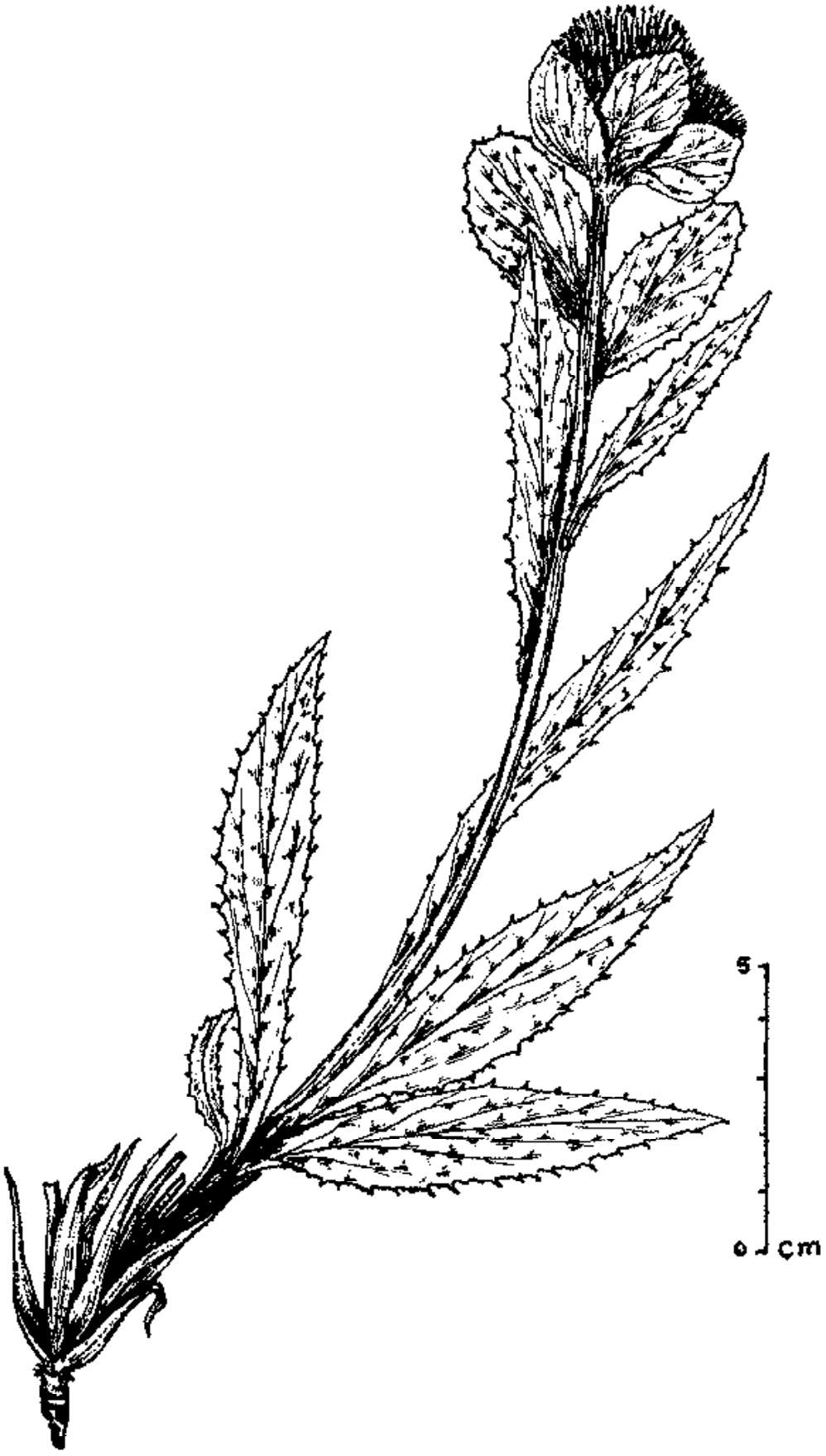
References :

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India—A State-of-the-Art Report.* Botanical Survey of India. p. 37.

2. Polunin, A. & Stainton, O. (1984). *Flowers of Himalayas,* p. 207.

3. Naithani, B. D. (1984). *Fl. Chamoli District* 1 : 340.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Saussurea bracteata Decne. Flowering plant.

Status : Endangered, due to indiscriminate collection and loss of its habitat.

Distribution : Jammu & Kashmir, Himachal Pradesh (Chamba), Uttar Pradesh (cultivated) ; Pakistan.

Habitat and Ecology : In sub-alpine Himalayas, on open hill-slopes, in the attitudes of 3200-3800 m.

Conservation Measures Taken : None for the wild populations or its habitats, however, the species is now included in the Appendix-I of the CITES. It is being cultivated on a small scale in the Himalayas.

Conservation Measures Proposed : Baseline data on the distribution and ecological status, population density, etc.; rehabilitation in its depleting habitats or ecologically akin to natural habitats in its distribution range; protection of natural habitats.

Biology and Potential Value : 'Kuth' is cultivated for its roots used in perfume industry. The dry root is commercially known as 'costus' root which is strongly scented and yields an aromatic oil. It is also used to make insecticides. The root contains an alkaloid known as Saussurine which has medicinal properties and is good for stomach ailments. It is an antiseptic and is also used in chronic skin-diseases, asthma, high blood pressure, etc.

Cultivation : The species is cultivated in Lahul valley of Himachal Pradesh and occassionally in Garhwal region of Uttar Pradesh.

Description : Root stout, often upto 60 cm long and 30 cm in thickness, carrot-like, sometimes a number of roots jointed together at the collar zone, greyish to dull brown in colour and possess a characteristic odour which can be smelt from a distance. The plant is robust, perennial, pubescent or hairy, 1.0-2.5 m high, with basal and stem-leaves. Basal leaves with 60-90 cm long, winged stalk (petiole) and with a terminal lobe, scaberulous above and glabrous beneath, margin irregularly toothed. Stem-leaves (cauline) clasping the stem (half-amplexicaule), with or without a stalk. Flowers in a head which is usually 2.5-5.0 cm in diam., rounded and in terminal clusters of 2-5, dark-purple, stalkless. Bracts surrounding the heads many, egg-lance-shaped, long-pointed, rigid, bent back, hairless. Corolla dark blue-purple or almost black. Stamens free; anther-tails fringed. Fruits (achene) *ca* 8 mm long, curved, compressed. Pappus hairs brown, all feathery.

References :

1. Anonymous (1972). *Wealth of India* 9 :240-243. New Delhi.

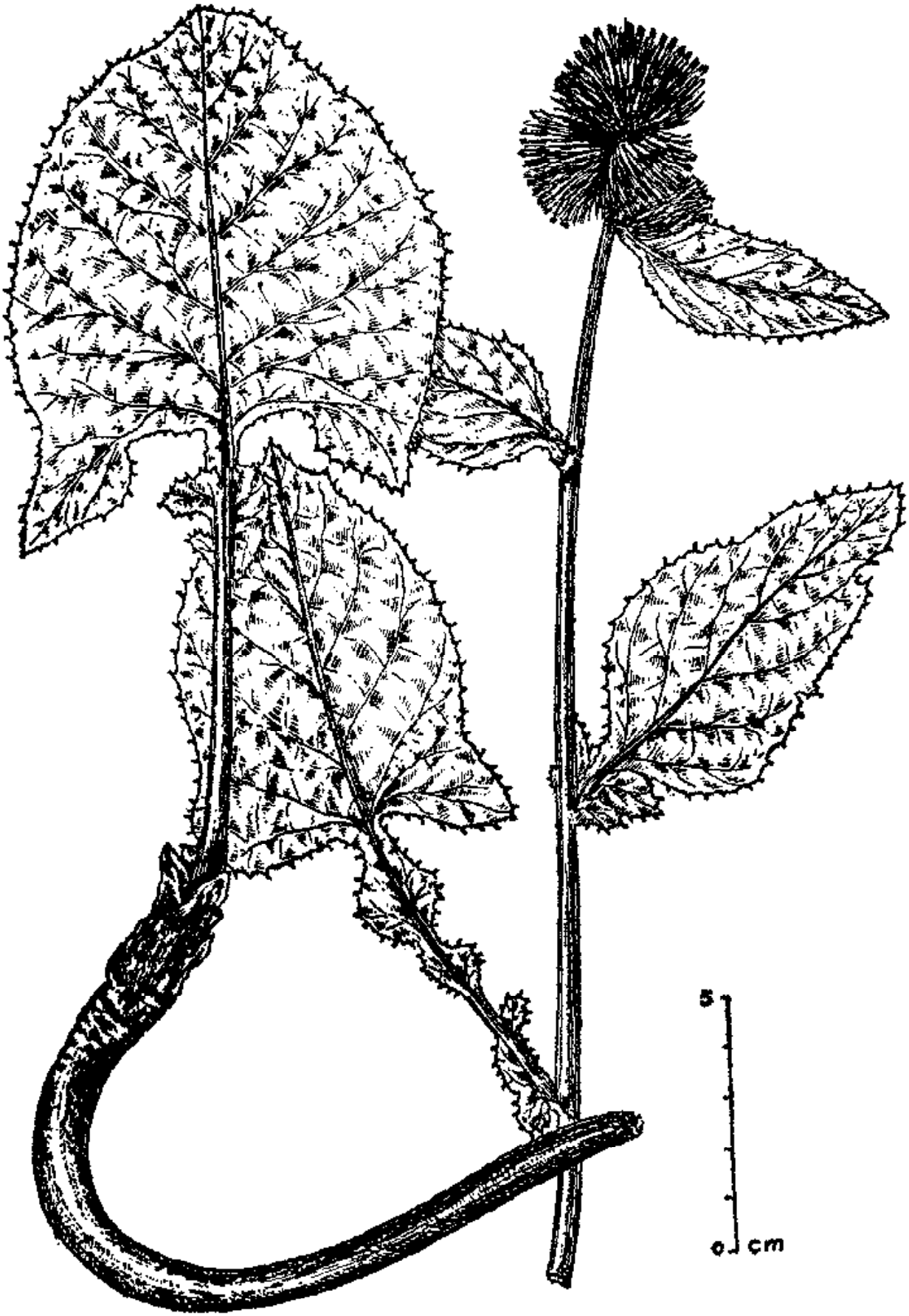
2. Blatter, E. (1927). *Beautiful Flowers of Kashmir* 1 :185, t. 33, fig. 1. London.

3. Coventry, B. D. (1923). *Wild Flowers of Kashmir* 1 :51, t. 26. London.

4. Dhar, U. & Kachroo, P. (1983). *Alp. Fl. Kashmir Himal.* : 223. Jodhpur.

5. Lipschitz, S. (1979). *Rod. Saussurea*, Leningrad.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Saussurea costus (Falc.) Lipschitz. Plant with woody root-stock and flower.

Status : A rare root parasite. Recently recorded from the proposed Namdapha Biosphere Reserve in Tirap district of Arunachal Pradesh, India. Main causes of rarity are loss of its host plants and suitable ecological niches.

Distribution : In India it occurs in Khasia hills of Meghalaya, Tirap district of Arunachal Pradesh, Sikkim in Eastern Himalayas. It is also reported from Java.

Habitat and Ecology : It grows in diffused sunlight in dense evergreen virgin forest floors either solitarily or in clusters on roots of the members of Vitaceae. It is a perennial herb, blooms in winter.

Conservation Measures Taken : None on record. However, its distributional localities in Arunachal Pradesh fall within the proposed Namdapha Biosphere Reserve.

Conservation Measures Proposed : Protected being a part of the proposed Namdapha Biosphere Reserve in Tirap district of Arunachal Pradesh.

Biology and Potential Value : A very striking large, fleshy root parasite of the family Balanophoraceae of botanical interest. The only species of this genus growing in North-eastern India in the specific ecological niches. Flowers in December.

Cultivation : Being a root parasite, it would be rather difficult to grow this species *ex situ*.

Description : A very stout, dioecious and glabrous root parasite of perennial nature; sheaths at the base of peduncles, *ca* 1-2.4 cm in diameter. Peduncles *ca* 2-10 cm long, cylindric, pale, brown; the female inflorescence is very large, fleshy *ca* 25 cm tall and 10-15 cm in circumference, ovoid to oblong, brown to rusty brown, style reflexed. Male flowers with the staminal column *ca* 1-1.6 cm long, filaments velvety.

References :

1. Hooker, J. D. (1886). *Fl. Brit. India* 5:239.

2. Joseph, J. & Chauhan, A. S. (1983). *In:* Jain, S. K. & Sastry, A. R. K. (ed.). *Botany of some tiger habitats in India.* Botanical Survey of India, Howrah. p. 26-29.

3. Jungh. (1814). *Nov. Act. Acad. Nat. Cur.* 18(1): 233.

4. Kanjilal, U.N., *et al* (1949). *Fl. Assam* 4:133.

The material for this sheet was supplied by A. S. Chauhan, Botanical Survey of India, Shillong.

Status : Endangered. Reported only from the Nilgiri Hills, Tamil Nadu in 1931 by E. Barnes and subsequently in 1970 by J. L. Ellis.

Distribution : Endemic to the Nilgiri Hills in the Western Ghats of Tamil Nadu.

Habitat and Ecology : Epiphytic herb growing in wet sholas on moss covered tree trunks with pendulous leaves and flowers. Recorded from Kundahs at an altitude of 2300 m and from Devabetta at an altitude of 2250 m from the Nilgiri Hills.

Conservation Measures Taken : Its habitats in the Nilgiri Biosphere Reserve are protected.

Conservation Measures Proposed : Detailed surveys of similar areas to be taken in the Western Ghats so that more such nitches can be identified and conserved.

Biology and Potential Value : This species is botanically interesting besides being a narrow endemic.

Description : Delicate bulbous herbs, acaulescent, pendulous. Leaves 1-2 per plant, ovate or elliptic-ovate, 2-8 × 1.3-3.6 cm, acute or subacute at apex, rounded at base, unequal-sided, rarely denticulate at margins, membranous; primary nerves 3, ascending, sparsely pilose above and glabrous below; petiole 2-4 cm long, delicate, glabrous. Scapes 4-5 cm long, glabrous, few-flowered; bracts lanceolate or ovate, subacute; pedicels *ca* 1.5 cm long. Flowers 2-2.5 cm long, white with yellowish wings; sepals 5 mm long, ovate-falcate; vexillum 1-1.2 cm long, ovate-oblong or suborbicular, rotund, base shortly saccate; petals delicate; wings 1.5-2.3 cm long, 2-lobed; lower lobes *ca* 7 mm long, oblong, obtuse; distal lobe *ca* 1.5 cm long, oblong-lanceolate, obtuse, shortly emarginate; labellum 7-9 mm long and 1-1.2 cm broad, oblate broad. Capsules *ca* 8 mm long, ellipsoid, acute.

References :

1. Fischer, C.E.C. (1930). *Kew Bull.* 1930 : 330.

2. Gamble, J. S. (1957). *Fl. Pres. Madras* 3 : 1294. (repr. ed.).

3. Fyson, P. F. (1932). *The Flora of South Indian Hill Stations* 1 : 86, t. 62.

4. Shetty, B. V. & Vivekananthan, K. (1981). *Bull. Bot. Surv. India* 23 (3 & 4) : 255.

5. Vajravelu, E. (1983). *In :* Henry, A. N., *et al, Fl. Tamil Nadu,* Ser. 1., *Analysis* 1 (1) : 55.

The material for this sheet was supplied by K. Ramamurthy, Botanical Survey of India, Coimbatore.

Status : Endemic and Endangered. Known only from the Nilgiri District, Tamil Nadu. E. Barnes collected it from the Nilgiris in 1931. It has not been collected or reported afterwards from anywhere.

Distribution : Nilgiri Hills in the Western Ghats of Tamil Nadu.

Habitat and Ecology : Terrestrial herb growing among grasses and on rocks, at an altitude of about 2800 m in the Nilgiri Hills.

Conservation Measures Taken : The Nilgiri area has been recently declared as a Biosphere Reserve.

Conservation Measures Proposed : Detailed surveys of similar areas to be taken in Western Ghats so that more such nitches can be identified and suitable measures taken.

Biology and Potential Value : This species is botanically interesting and more details on potential value are yet to be known.

Description : Erect, acaulescent herb; bulbs small, globose. Leaves 1-2, radical, fleshy; suborbicular, 2.5-4 cm across, cordate at base; distinctly apiculate-crenate; primary nerves 7-9; petioles 3-9 cm long, purplish. Scape 1-2, *ca* 20 cm long, purplish, 4—10-flowered; bracts *ca* 6 mm long, broadly ovate or suborbicular, concave; pedicels *ca* 1 cm long, purplish, becoming longer in fruits, reflexed, slightly thickened at apex. Flowers purplish; sepals *ca* 4 mm long, ovate-falcate, obtuse, slightly cordate at base; vexillum *ca* 1 cm long; subacute; spur short, broadly obtuse; wings *ca* 2 cm long, 3-lobed, base of the lower 2 lobes pilose within; lower lobe 5-6 mm long, broadly obovate, oblique, retuse; middle lobe *ca* 8 mm long, obovate-oblong, narrower, apex rounded; distant lobes further narrow, often smaller, oblong, obtuse; labellum 1 cm long, broadly oblate, cucullate, base subacute. Capsules 1-2 cm long, ellipsoid; seeds ovate-oblong, minute, compressed, glabrous.

References :

1. Fischer, C. E. C. (1931). *Kew Bull.* 1931 : 341.

2. Gamble, J. S. (1957) *Fl. Pres. Madras* 3 : 1294. (repr. ed.)

3. Fyson, P. F. (1932). *The Flora of South Indian Hill Stations* 1 : 84. t. 60.

4. Vajravelu, E. (1983). *In:* Henry, A. N., *et al., Fl. Tamil Nadu,* Ser. 1. *Analysis* 1 (1) : 55.

5. Shetty, B. V. & Vivekananthan, K. (1981). *Bull. Bot. Surv. Indie* 23 (3 & 4) : 255-256.

The material for this sheet was supplied by K. Ramamurthy, Botanical Survey of India, Coimbatore.

Status: Rare. The species has not been collected in the recent years although its distributional localities have been well botanized.

Distribution: Satara Distt., Mahabaleshwar, Maharashtra. Endemic.

Habitat and Ecology: On red lateritic earth banks along road sides on way to Lodwick point.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: Type locality and neighbouring areas should be searched thoroughly. If the species is located, the rhizomes or seeds should be planted in suitable ecological niches at Mahabaleshwar in protected areas or in the experimental gardens.

Biology and Potential Value: Not known. However, several species of *Begonia* are horticultural favourites.

Cultivation: None on record.

Description: Rhizomatous, succulent herbs upto 40 cm; stems upto 1 cm tall, simple, glabrous when young, soft-scaly or hairy when old; leaves broadly ovate or almost rounded, upto 10×24 cm, apex subacuminate, base deeply cordate, young leaves densely covered with stout bristles; petioles of radical leaves upto 26 cm long, flesh-coloured. Flowers rose coloured, unisexual, in dichotomous cymes, terminal one male, lateral female; in males sepals 2, orbicular, concave, petals 2, broadly ovate ; in female flowers perianth segments 5, 2 outer subpetaloid, broadly ovate or orbicular, inner-3 smaller. Capsules 3-winged, trigonous, hispid.

Reference:

1. Blatter, E. & McCann, C. (1931). New Indian species of *Begonia*. *J. Ind. Bot. Soc.* 10: 27—28.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status: Rare. Endemic.

Distribution: Simla, Himachal Pradesh.

Habitat and Ecology: In open dry places on hill slopes.

Conservation Measures Taken: None so far, not even listed in the threatened plants catalogues so far published.

Conservation Measures Proposed: As there is no record of this species from other localities, field surveys should be undertaken to locate this species in its type locality and other parts in Himachal Pradesh. The area should be declared as protected for *in situ* conservation of this species. As the hill ecosystems are fragile, *ex situ* conservation should also be undertaken by introducing this species into experimental gardens.

Biology and Potential Value: The species like other species of *Berberis* may be of some medicinal value.

Cultivation: Not cultivated; but immediate efforts should be made to study the ecological requirements of the species.

Description: Shrubs. Stem yellow, subterete. Spines 3-fid. Leaves upto 23×6 mm, narrowly obovate, rounded, mucronate, margins 2-3 spinulose. Inflorescence subumbellate, 5-8-flowered. Prophylls yellow. Outer sepals 5×3 mm, elliptic; inner 8×5.5 mm, obovate. Petals 6.5×3.75 mm, entire, base clawed; glands oblanceolate. Stamens 5 mm, connective produced, apiculate. Ovules 5-7, stipitate.

Reference:

1. Ahrendt, L. W. A. (1961). *Berberis and Mahonia*—A Taxonomic Revision. *J. Linn. Soc. London* 57: 1-410.

The material for this sheet was supplied by R.R. Rao and B.P. Uniyal, Botanical Survey of India, Dehra Dun.

Status: Rare. So far known from two localities in Gujarat and Rajasthan only. Clarke (1) and Cooke (2) reported this plant from Sind only. In foot-note Cooke further mentions that he has not seen any specimen from Sind, and those in herbarium at Kew to be from Beluchistan. No further report on this species from Rajasthan after Macadam in 1890(5). In Kutch it is reported only from a solitary locality. However, there are two specimens in CAL from Dalzell's herbarium, Bombay without precise locality, number or date. The rarity of the species is due to the loss of its habitats.

Distribution: Gujarat (Kutch, Mundra-Mandvi); Rajasthan (Jodhpur); Maharashtra; W. Pakistan (Beluchistan).

Habitat and Ecology: On sandy soils in arid regions of Kutch and Rajasthan.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: Protection of natural habitats from biotic factors; fresh collection and introduction in Botanic/experimental gardens.

Biology and Potential Value: The plant is of scientific interest.

Cultivation: None so far.

Description: Herbs, woody at base. Leaves elliptic or obovate, obtuse or sub-acute, petiolate, hairy on both surfaces. Flowers 1-ranked, solitary or geminate, in ebracteate spikes; calyx densely hairy, segments sub-equal; style very short, nutlets 4, ovate, sub-acute, covered with silvery hairs.

References:

1. Clarke, C. B. (1885). *In :* Hooker, J.D., *Fl. Brit. India* 4: 150.

2. Cooke, T. (1958). *Fl. Pres. Bombay* 2: 277. (repr. ed.)

3. Jain, S. K. & Deshpande, U. R. (1960). *Bull. Bot. Surv. India* 2(3 & 4): 188.

4. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 46.

5. Macadam, M (1890). *A list of trees and plants of Jodhpur.*

6. Stocks, J. E. (1852). *J. Bot.* 4:174.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Extremely rare and known from type locality only.

Distribution : Himachal Pradesh (Kinnaur). Probably Endemic.

Habitat and Ecology : Not known.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : The species should be thoroughly searched in its type locality and adjascent areas for more detailed study, so that suitable conservation measures can be suggested.

Biology and Potential Value : Nothing is known about this extremely rare species ; further collections may only throw light on these aspects.

Description : Perennial, erect herbs. Petals 2-3 mm broad. Style 2-2.5 mm long, slightly thickened with capitate, sub-bilobed stigma. Siliquae usually elongated, 60-90×2 mm, many seeded. Seeds large, 2.5-3×1mm, slightly winged towards the apex.

References :

1. Jafri, S. M. H., (1973). *In :* Nasir & Ali, A., *Fasc. Fl. West Pakistan* 55 :239. f. 32.

2. Hooker. J. D. (1861). *J. Linn. Soc. Bot.* 5 :165.

3. Hooker, J. D. & Anderson, T. (1872). *In :* Hook. f., *Fl. Brit. India* 1 :154.

The material for this sheet was supplied by H. J. Chowdhery, Botanical Survey of India, Dehra Dun.

Status : Rare; after the first collection (probably in 1820) and further collections made upto 1919, no record exists as to its collection for about 46 years. Representation of this species in the herbaria is very few. However, since 1965 when B. V. Shetty recorded its existence from Anaimudi peak, further collections have been made from the Nilgiris (B. V. Shetty, 1970) and Western Ghats (Vartak, 1983).

Distribution : India; endemic to South India being disjunctly distributed in the Nilgiris and Palany Hills and Western Ghats.

Habitat and Ecology : It occurs on hills of South India between 2050—2695 metres altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : (i) Further explorations to locate wild populations; study of its biology and ecology. (ii) Efforts to conserve *in situ* or in similar habitats along with other endangered plants (iii) Anamalai Hills to be preservsed as a biosphere reserve.

Biology and Potential Value : *Its potential as a horticultural plant needs to be tried.*

Cultivation : No record.

Description : Perennial, decumbent, simple or few branched, 6.0-18.5 cm tall herbs, glabrous towards the base and pilose above. Leaves alternate, sessile, elliptic to oblanceolate, repand-dentate, 3-14 mm × 1.0-4.5 mm in size. Flowers blue to violet, pedicillate, solitary. Corolla lobed for about half of its length, 9-11 mm long and 8-10mm broad at throat. Capsules broadly subglobose, dehiscing through 3 basal pores, 3-4 mm in diameter.

References :

1. de Candolle, A. P. (1830). *Monographie des Campanulees*, p. 294.

2. Vartak, V. D. (1983). *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. B.S.I., Howrah. p.174.

3 Wight. R. (1848). *Icon. Plant. Ind. Orient.* 4: 1177.

The material for this sheet was supplied by V. K. Haridasan and P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Rare; since the first collection of the species by Brandis in 1864 from Shali and subsequent collections upto 1900, the long gap of about 77 years passed away before its relocation by Nair (2) and Chowdhury and Wadhwa (1). Still the herbaria are not well represented by this taxon.

Distribution : India; endemic to Himalaya in Himachal Pradesh and Uttar Pradesh.

Habitat and Ecology : On rocks above nullah tracts etc. at elevations between 2200-3900 metres.

Conservation Measures Taken : None.

Conservation Measures Proposed : (i) Further explorations of wild populations to identify threats, if any. (ii) Evaluation of prospects for *ex situ* or *in situ* conservation.

Biology and Potential Value : Potential for horticulture as an ornamental plant.

Cultivation : No record available.

Description : Perennial, suberect to ascending, pilose to woolly hairy, 13-40 cm tall herbs. Leaves crowded above, ovate-elliptic to lanceolate, densely pubescent. Flowers solitary, pedicillate, terminal, corolla blue, subrotate, cleft to 1/2 the length. Capsules ovoid to obconoid, dehiscing through 3 basal pores; 4-5 mm long and as broad.

References :

1. Chowdhury, H. J. & Wadhwa, B. M. (1984) *Fl. Himachal Pradesh* 2 : 429-434. Botanical Survey of India, Calcutta.

2. Nair, N. C. (1977). *Fl. Bashahr Himalayas,* p. 170.

3. Nayar, M. P. & Babu, C. R. (1970). *Campanula wattiana* Nayar & Babu (Campanulaceae)—A new species from N. W. Himalaya. *Jour. Ind. Bot. Soc.* 49 : 183-185.

The material for this sheet was supplied by V. K. Haridasan and P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Rare; after J. D. Hooker's collection in 1849 and the subsequent collections upto 1909 from various parts of Sikkim, 57 years lapsed before it was relocated by Hara (1).

Distribution : India; endemic to Darjeeling and Sikkim Himalaya.

Habitat and Ecology : In temperate Himalaya at elevations between 1830-3335 m.

Conservation Measures Taken : None.

Conservation Measures Proposed : (i) To locate the plants in further wild states. (ii) To remove threats to the habitats, if any. (iii) To conserve *in situ* and *ex situ*.

Biology and Potential Value : Not fully explored; of botanical interest in having the smallest flowers in Indian species of *Codonopsis*.

Cultivation : No report.

Description : Twining, branched, glabrous to puberulous herbs. Leaves alternate or opposite, petiolate, ovate to ovate-lanceolate, dentate or subentire, pubescent on the upper surface and villous on the lower surface, 1.2-7.6 × 0.5-4.6 cm. Flowers green with purple or red marks, pedicillate, leaf-opposed to terminal. Corolla broadly cylindric or campanulate, cleft for less than 1/2 the length, 9-11.5 mm. Capsules subglobose, 8.5-11.5 mm long and 9-12 mm broad.

References :

1, Hara, H. (1966). *Fl Eastern Himalaya. Report* 1. University of Tokyo. p. 326.

2. Hooker, J. D. & Thomson, T. (1858). *J. Linn. Soc. Bot.* 2 : 4-29.

The material for this sheet was supplied by V. K. Haridasan and P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status : Rare; since the first report and stray collections that were made upto 1883, it was not collected for long and the subsequent collections are very few.

Distribution: India; endemic to Kumaon—Tehri Garhwal Himalayas.

Habitat and Ecology: On moist rocks in temperate and alpine zones amidst *Rhododendron* species, etc. at elevations between 2800-4000 m.

Conservation Measures Taken: Proposed biosphere reserve in Nanda Devi would help *in situ* preservation of the species.

Conservation Measures Proposed: (i) Explorations to locate further wild populations, study of biology and ecology and (ii) conservation trials at locations of its occurrence or in nearby biosphere reserves.

Biology and Potential Value: Of horticultural importance for its flowers.

Cultivation: Cultivated in English rock gardens at Corrour and Wisely (1); no report available for India.

Description: Perennial, decumbent, 6.5-37 cm tall plants. Leaves alternate, subsessile to petiolate, broadly oblong to elliptic, subentire to crenate or at times recurved at margins, pilose on both the surfaces. Flowers deep blue, sessile to pedicillate. Corolla tubular or infundibular, sparsely pilose at throat, lobed for 1/4-1/3 of the length. Capsules ovoid-conoid or ovoid-campanulate, 14-17.5 mm long and 7.5-9 mm broad.

References:

1. Cowan, J. M. (1938). Concerning the genus *Cyananthus*. *New Flora et Silva*. 10: 108-115, 181-190.

2. Royle, J. F. (1836). *Illus. Bot. Himal*. 1 :309 t. 69.

The material for this sheet was supplied by V. K. Haridasan and P. K. Mukherjee, Botany Department, Calcutta University, Calcutta.

Status: Indeterminate. Except for the type collection by Kingdon Ward from Manipur-Burma border, it has not been recollected since 1948.

Distribution: Confined to North-eastern India in Manipur. Endemic and collected only from a single locality.

Habitat and Ecology: On open hill sides, at 1800 m.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Our knowledge of the species is limited to the solitary collection by F. Kingdon Ward from Khaiyang in Manipur. Efforts should be made to recollect this rare but distinct species, closely allied to *C. cataphyllosa* Jacobs, a Burmese species. This region is one of the centres of origin of *Capparis* in the Cataphyllosa-group and intensive explorations are likely to result in rediscovery of *C. cataphyllosa, C. cinerea* and *C. pachyphylla* besides other new taxa of this genus.

Biology and Potential Value: Nothing is known.

Description: Shrub, densely fulvous tomentose, armed with straight conical stipular thorns 1-2 mm long; cataphylls common at base. Leaves dull, coriaceous, glabrous, elliptic, 7-10×2.8-3.2 cm, dark green above, yellowish-green below, base obtuse, apex acute to acuminate, lateral nerves 7-8 pairs, puberulous along midrib and nerves. Umbels on stalks 1-2 cm long, axillary, lax and upto 5-flowered. Flowers white, tinged pink; bracts subulate, 1-2 mm; pedicels 1-2.2 cm long, filiform, puberulous. Sepals elliptic, 6×4 mm, ciliate. Petals obovate ±9×4 mm, tomentose on both sides. Stamens 30-35, exserted; filaments 2-2.5 cm long. Ovary glabrous, ellipsoid, 1.5×0.5 mm, on a glabrous gynophore 1.8-2.5 cm long; style indistinct, placentae 2. Fruits unknown.

Reference:

1. Jacobs, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12: 444-445.

The material for this sheet was supplied by R. S. Raghavan, Botanical Survey of India, Pune.

Status: Indeterminate. It has not been recollected from the wild since 1935 when F. Kingdon Ward and subsequently N. L. Bor had collected it from Assam-Nagaland regions bordering Burma.

Distribution: Endemic to North-eastern India, in Aka hills and Tuzu river gorge along Assam-Burma border.

Habitat: Kingdon Ward reported it to be common along steep cliffs and banks of gorge in dry windy places from 600-1200 m.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: This region is not easily accessible. Intensive exploration of the region is likely to result in the rediscovery of the species which is still imperfectly known as our present knowledge is based on scanty type collections only. The Manipur-Naga hills-Burma border region is one of the centres of origin of *Capparis* (besides Peninsular India) and atleast 3 imperfectly known endemic species occur here. This region is likely to yield many new taxa which would help in the understanding of speciation and evolution in *Capparis* L.

Biology and Potential Value: Not known.

Description: Shrub to small armed tree with scrambling branches having cataphylls at base. Leaves elliptic-oblong, 8-13×4-5.5 cm, glabrous, dark green above, light green below, apex rounded or obtuse, lateral nerves 5-6 pairs, reticulation obscure. Flowers white or purple, 6-8 together, in racemose bundles on an axillary or lateral short stalk 2-3 cm long, sometimes arranged as a pancile. Pedicels filiform, 10-18 mm long. Sepals subequal, 5-6×2-3 mm, sparsely puberulous and margins ciliate. Petals 6-7×2 mm, puberulous, margins fringed with long hairs. Stamens 30-35. Ovary glabrous; placentae 2. Fruits unknown.

Reference:

1. Jacobs, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12: 476-477.

The material for this sheet was supplied by R. S. Raghavan, Botanical Survey of India, Pune.

Status: Indeterminate. It has not been recollected from India since Venkoba Rao had recorded it during the years 1913-1914, from Quilon and Shenkottah. A distinct species allied to *C. aspera* Koen. *et* DC. and *C. rutidosperma* DC.

Distribution: In India, it is restricted to Kerala and Tamil Nadu. The type, *Wight* No. 75 is from Peninsular India without precise locality but there is an excellent specimen at BM, collected by *Koeing s. n.* from Ramanathapuram district. According to Wight & Arnott, the distribution extends to Sri Lanka also but except for CP 1068 (MH) there are no recent or old collections from Sri Lanka. Burmann's drawing in *Thes. Zeyl.* t. 100. f. 1. 1737 is poor, no specimens exist in Hermann's herbarium at BM and the description of *Polanisia dodecandra* DC. partly reflects characters of *C. viscosa* only. The distribution extends to Indonesia as well for there exist collections by Horsfield during 1802-1819 (BM) and by C.A. Backer in 1915 from Java (L). However, it has not been recollected since then from Java either.

All recent reports of its occurrence in Peninsular India are misidentifications of either *C. rutidosperma* DC., a closely allied introduced species, now run wild in Kerala or *C. aspera* Koen. ex DC.

Habitat: Along roadsides, wastelands and cultivated fields.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Intensive efforts to relocate the species in its known distribution localities and possible measures for its *ex situ* conservation in gardens or habitats of similar ecological conditions.

Biology and Potential Value: Not known.

Cultivation: Not known.

Description: Annual erect herbs upto 50 cm tall, stems clothed with scattered prickly soft appendages. Leaves nearly as long as petiole; leaflets 3(5), subsessile, ovate-lanceolate or rhomboid, membranous. Flowers white or pink, solitary, axillary, 6-8 mm across. Stamens 6. Gynophore 1.5-2.0 mm long, elongating upto 6-7 mm in fruits. Capsules linear, beaked, terete, narrowed at both ends, 3.5-4.0×0.1-0,15 cm. Seeds 10-15, reniform, reddish-brown, without elaiosomes, *ca* 1.2 mm across, with concentric ribs and closed cleft.

References:

1. Babu, C. R. & Majumdar, N. C. (1974). Taxonomic notes on *Cleome aspera* Koen. *ex* DC., *C burmanni* Wt. & Arn. and *C. rutidosperma* DC. (CLEOMACEAE). *J. Bombay Nat. Hist. Soc.* 71(3) : 629-632.

2. Gamble, J. S. (1915). *Fl. Pres. Madras* 1 : 41. 1915. (repr. ed. 1 : 29. 1957).

3. Raghavan, R. S. (1984). On *Cleome burmanni* Wight & Arn. (CAPPARACEAE)-its identity and distribution. *J. Econ. Tax. Bot.* 5(2) : 463-466.

The material for this sheet was supplied by R. S. Raghavan, Botanical Survey of India, Pune.

Status: Rare. Not collected after J. F. Duthie's collections from Kumaon (1886), until Naithani (1984) collected it from Chamoli district in the Garhwal Himalaya. Recently Bocquet & Chater (4) have recorded its occurrence in Nepal also.

Distribution: Kumaon and Garhwal, Uttar Pradesh; Nepal. Endemic to Himalayas.

Habitat and Ecology: Amidst rocks in valleys in the altitude range of 2500-4000 m, growing along with *Arenaria ferruginea* Duthie ex Williams and other herbaceous species.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Explorations are necessary to search out the plant in the original habitat to assess the population and to find out causes of threat.

Biology and Potential Value: Not known.

Cultivation: Not cultivated.

Description: Subscandent herbs with ascending stems, 60-80 cm tall, branched, pubescent. Leaves acuminate, lower lanceolate, cauline broadly lanceolate to ovate-lanceolate, acuminate with undulate margins, 15-35 × 5-20 mm, bracts similar to leaves. Inflorescence cymose, long pedunculate with distant flowers, laxly subdichotomous. Bracteoles 3-4, mm. Calyx membranous, ovate, campanulate, umbilicate, 13-15 × 6-8 mm, scabrid-puberulous, teeth lanceolate, acute, ciliolate. Carpophore *ca* 3-4 mm. Petals greenish, narrow, bifid, lobes oblong, linear, *ca* 7 mm, exceeding the calyx. Styles 3. Capsules ovate, *ca* 8 × 6 mm. Seeds much tuberculate, back broadly convex, face hollow.

References:

1. Williams (1896). *J. Linn. Soc. Bot.* 32: 43.

2. Strachey, (1918). *Cat. Pl. Kumaon,* p. 18.

3. Naithani, B. D. (1984). *Fl. Chamoli* 1: 84.

4. Bocquet & Chater, (1979). *In :* Hara & Williams, *Enum. Fl. Pl. Nepal* 2: 56.

The material for this sheet was supplied by N. C. Majumdar, Botanical Survey of India, Howrah.

Silene kumaonensis Williams. Flowering branch.

Status: Rare. Known from very few collections.

Distribution: Kashmir, Himachal Pradesh; Pakistan.

Habitat and Ecology: Grows on rocks in the valleys at 2300-3300 m, in the Western Himalayas.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Intensive exploration for relocating the plant in original habitats and proper *in situ* and *ex situ* measures are to be taken.

Biology and Potential Value: Not known.

Cultivation: Not cultivated.

Description: Perennial herb with slender stems, puberulous or glabrous. Tufted branches from root stock usually prostrate. Flowering branches slender, 15-30 cm, usually glabrous above. Leaves grass-like, 15-30 mm long, 3-5 mm broad, narrowly spathulate or lanceolate, minutely pubescent on both surfaces, upper leaves gradually smaller. Inflorescence reduced to opposite pairs of flowers at nodes, looking like very lax racemes. Flowers few, nodding, pedicels slender, equal or longer than calyx. Calyx 9-12×3-4 mm, membranous, 10-ribbed, quite glabrous, teeth sometimes pubescent, cylindric or subclavate when young, clavate in fruit, base intruded, teeth short, obtuse, with scarious margins. Petals deeply bipartite, without auricles, scales 2, linear-oblong. Capsules ovoid, twice as long as gynophore. Seeds dorsally channelled, sides almost flat.

References:

1. Chowdhery, H. J. & Wadhwa, B. M. (1984) *Fl. Himachal Pradesh* 1: 97.

2. Hooker, J. D. (1874). *Fl. Brit. India* 1: 220.

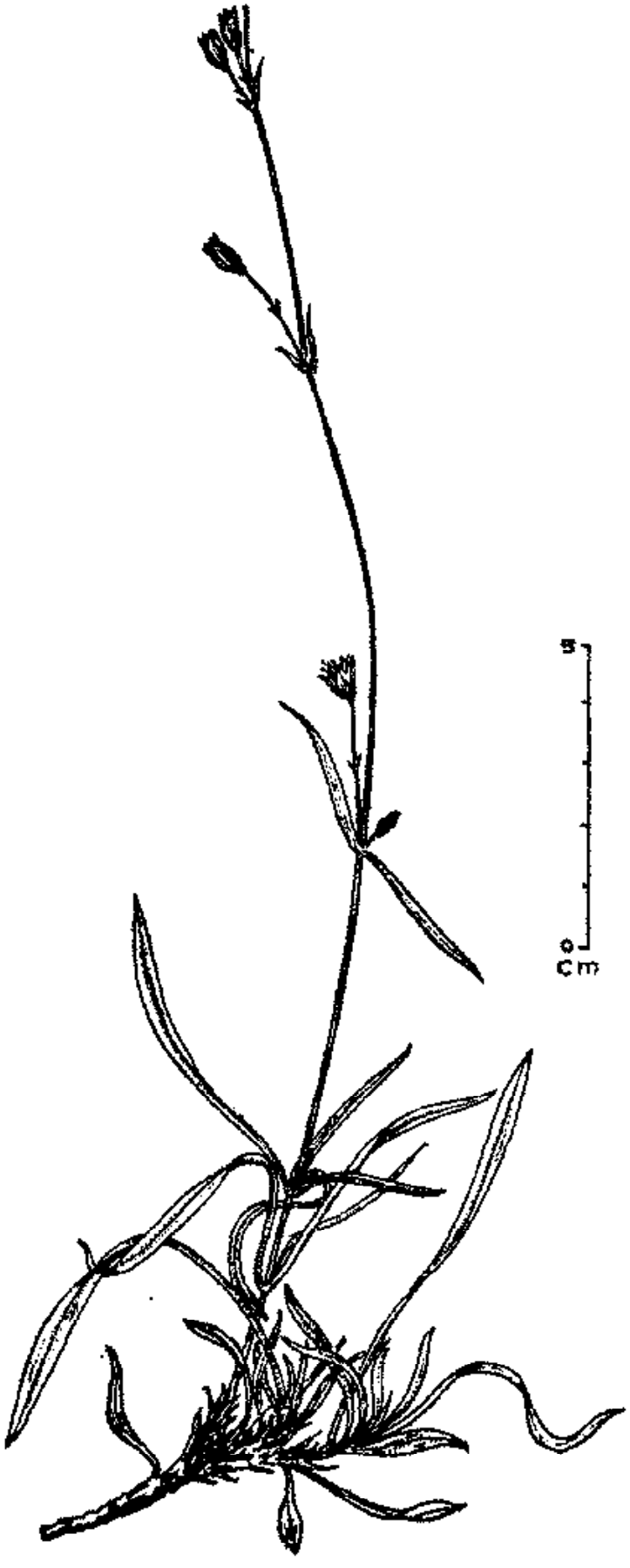
3. Nair, N. C. (1977). *Fl. Bashahr Himalaya*, p. 39.

4. Rau, M. A. (1975). *High Alt. Fl. Plants*, p. 79.

5. Rohrbach (1868). *Monogr. Silene*, p. 211.

6. Stewart, I. D. (1972). *Cat. Pl. W. Pak. & Kashmir*, p. 251.

The material for this sheet was supplied by N. C. Majumdar, Botanical Survey of India, Howrah.



Silene kunawarensis Royle. Habit.

Status : Rare, due to habitat destruction.

Distribution : Endemic to south India in Anamalai hills in Tamil Nadu and Palghat hills and other forest hill slopes in Kerala.

Habitat and Ecology : In moist deciduous forests of Western Ghats invariably near water sources.

Conservation Measures Taken : Some of the habitats of the species come under the Silent Valley National Park.

Conservation Measures Proposed : Habitats should be demarcated and protected with the help of State Forest Department. Seeds/seeldings should be introduced in Botanic Gardens.

Biology and Potential Value : Botanical interest only, its potential use in not known.

Description : Large climbing shrubs; branchlets lenticellate, twining at base. Leaves elliptic-oblong to ovate, coriaceous; main nerves regular, nearly horizontal. Flowers greenish-yellow. Calyx lobes fringed. Fruits indehiscent berries with coriaceous rind.

Reference :

1. Gamble, J. S. (1916). *Bull. Misc. Inform. Kew,* p. 133; *Fl. Pres. Madras,* p. 155. 1957 (repr. ed.).

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Indeterminate. The species is known only from a few old specimens. Even way back in 1908, Bourdillon had reported it as 'rare' (3). The plant is not known to have been collected so far in the present century.

Distribution : Endemic to Travancore hills in W. Ghats. Beddome first described it in his *Icones* (1874) as *Parinarium travancoricum* based on his own collection from Shendroni valley in Travancore hills (2). Later Bourdillon collected it from "near Ponmudi" and from Merchiston Estate in Colatoorpoly of Quilon district in April, 1891 and in December 1893 respectively. Lawson also collected it from Colatoorpolay in 1893. Hooker (1878) also reported it from "near Courtallum". No later-day collections or reports are known.

Habitat and Ecology : Evergreen hill forests at *ca* 600 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : The known range of distribution of this species has been fairly well botanised during the recent past and, as such, the likelihood of locating it is almost nil. Yet further intense search is required for suggesting suitable conservation measures.

Biology and Potential Value : Flowering period as per old records is Novermber-December. The plant is of botanical and phytogeographical interest. The wood of an allied species (*P. corymbosus*) is reportedly resistant to marine borers and is used in ship building; the seeds yield fatty oils.

Cultivation : Not known in cultivation or wild at present.

Description : Small trees. Younger parts clothed with silky-grey pubescence. Leaves 10.0-12.5 × 2.5-3.0 cm, lanceolate, glabrous, midrib with silky hairs beneath. Inflorescence *ca* 5 cm long, axillary, slender, drooping, silky-villous. Calyx campanulate or funnel-shaped. Corolla pink. Stamens 10-12, exserted. Carpels free, hairy, 2-loculed with 1 ovule in each. Drupe *ca* 3.8-2.5 cm, 1-seeded.

References :

1. Anon. (1966). *The Wealth of India : Raw Materials* 7 : 263.

2. Beddome, R. H. (1874). *Icon. Pl. Ind. Orient.* 1 : 43 t. 169.

3. Bourdillon, T. F. (1908). *Forest Trees of Travancore,* p. 164.

4. Hooker, J. D. (1878). *Fl. Brit. India* 2 : 311.

5. Kostermans, A. J. K. H. (1969) *Atuna* Rafin. versus *Cyclandrophora* Hassk. (Rosaceae—Chrysobalanaceae). *Reinwardtia* 7 : 421-422.

The material for this sheet was supplied by M. P. Nayar and M. Ahmedullah, Botanical Survey of India, Calcutta.

Atuna travancorica (Bedd.) Kosterm. Flowering twig.

Status : Rare. Duthie collected this taxon from Rajasthan in 1903. Blatter & Hallberg (2) and Bhandari (1) described it as endemic to Rajasthan only. Based on earlier reports and field study, Pandey *et al* (6) and Kothari and Hajra (5) consider this species as very rare and restricted to Gujarat, Rajasthan and Punjab.

Distribution : Gujarat, (Ahmedabad), Rajasthan (Ajmer, Jodhpur, Pati, Udaipur), Punjab. Endemic to North Western India.

Habitat and Ecology : It grows near river banks and on sandy-gravelly soils in arid regions of Gujarat, Rajasthan and Punjab in plains or at low altitudes of about 305 m.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : (i) Protection of natural populations in wild. (ii) As it is a beautiful, large tree, may be introduced in gardens and planted on road-sides as an avenue tree.

Biology and Potential Value : It flowers during September-Novermber. Wood of *Anogeissus atifolia* Wall. is useful in making agricultural implements, carts etc. and yields 'gum'. Its bark, fruits, roots and leaves are used medicinally (4). Wood of *A. sericea* var. *nummularifolia* is also hard and may have utility as mentioned above. Being a large beautiful tree with typical orbicular leaves and winged fruits, it can be introduced in gardens on large scale for ornamental purposes.

Cultivation : None so far.

Description : Trees, about 10 m high, young parts cinereo-tomentose. Leaves alternate, many, elliptic-sub-orbicular, or orbicular, apex obtuse, emarginate or mucronate, silvery pubescent, upto 2 cm in diam. Flowers in globose, dense heads, *ca* 1.5 cm in diam, on axillary, solitary or sub-terminal peduncles; calyx tube compressed, 2-winged, attenuated above the ovary, limb long campanulate, pubescent; stamens exserted.

References :

1. Bhandari, M. M. (1978). *Flora of the Indian Desert*, p. 155, 156, f. 52. (Under *A. coronata* Stapf & *A. rotundifolia* Blatt. & Hallb.).

2. Blatter, E. & Hallberg, F. (1919). *J. Bombay Nat. Hist. Soc.* 26(2) : 525.

3. King, G. & Duthie, J. F. (1903). *Fl. Upp. Gangetic Plains* 1 : 340

4. Kirtikar, K. R. & Basu, B. D. (1933). *Indian Medicinal plants* 2 : 1035.

5. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p.45.

6. Pandey, R. P., Shetty, B. V. & Malhotra, (1983). *In:* Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. p.57.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Vulnerable, due to habitat destruction. The species is known only from the type collection of J. Joseph from Rini, North Bhalukpong, Kameng District of Arunachal Pradesh made in September, 1964. It has not been collected from other parts of E. Himalayas. All other Indian species hitherto included under the genus *Aneilema sensu lato* were transferred to *Murdannia* Royle, *Dictyospermum* Wight, *Rhopalephora* Hassk. and *Tricarpelema* Morton. This species deserves critical morphological study based on fresh collection.

Distribution : Possibly endemic to Arunachal Pradesh, at 1800 m alt.

Habitat and Ecology : This species grows along wet rocky slopes near river banks.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : *In situ* conservation by protecting its natural habitat; introduction to other ecologically suitable adjoining areas of Eastern India ; *ex situ* conservation in botanical gardens.

Biology and Potential Value : This species seems to be endemic to eastern Himalayan foot hills. It is of great phytogeographical, botanical and evolutionary interest. Very little information is available about its morphology and cytology. Flowers during August-September.

Cultivation : Not known.

Description : Branched trailing herb upto 1 m long, rooting at lower nodes. Leaves 3-7×1.5-2.5 cm, ovate-lanceolate, acute to acuminate, sparsely pubescent. Panicle 5-15 cm long, terminal, glandular-hairy all over; cymes 3-5-flowered, bracteate and bracteolate, densely glandular; flowers shortly pedicellate; sepals 3, subequal, glandular-hairy outside; petals 3, free, blue, 2 larger, shortly clawed, others almost sessile. Stamens 6, 3 fertile, 2 with long filaments, others with short filaments, pubescent; staminodes 3, filaments short, naked. Capsule 0.5 cm long, beaked, 3-celled, cells 2-seeded each, one cell rarely one-seeded. Seeds rugose, pitted.

References:

1. Joseph, J. & Rolla S. Rao (1968). *Aneilema glanduliferum* Joseph *et* Rolla Rao—A new species from NEFA. *J. Indian Bot. Soc.* 47 : 367-371.

2. Kammathy, R. V., (1983). Rare and Endemic species of Indian Commelinaceae. *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 213-221.

The material for this sheet was supplied by R. V. Kammathy, Botanical Survey of India, Calcutta.

Anelleme glanduliferum Joseph *et* Rolla Rao. Habit.

Status : Rare, due to urbanisation, farming activities and consequent disturbances in its habitats. After Wight's collection probably from Quilon, Kerala coast, in October, 1835, the species was subsequently collected by Dalzell from Bombay coast and others from several regions in Malabar coast. The present author has observed the species until 1970s in several areas south of Cochin coast, but surprisingly enough the species is not observed during the last two decades.

Distribution : Localised to western coastal regions of South India.

Habitat and Ecology : This species grows in the loose sandy soils without humus in the coastal regions.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : *In situ* conservation by protecting the habitats; introduction in conservatiories and ecologically suitable areas as an *ex situ* conservation measure.

Biology and Potential Value : The species is of evolutionary and phytogeographical interest. Flowers during August to November.

Cultivation : Seedlings from Kerala coast were grown in pots using soil from its natural habitat in the experimental garden of the Botanical Survey of India, Pune. The plants survived and flowered in the open.

Description : Small decumbent herbs 10-20 cm long, rooting at lower nodes. Root system profuse, slender, fibrous. Lateral branches glabrous or sparsely hirsute, often reddish-purple. Leaves succulent, 2.5-5 × 0.4-0.5 cm, sessile, linear-lanceolate, acute or acuminate, reddish-purple, base rounded, sheath short. Peduncles axillary and terminal, 3-5 cm long, slender, sparsely hirsute, bracts falcate, as long as or slightly shorter than the cymes; bracteoles 0.3-0.5 cm long, ovate, falcate, acute, ciliate. Sepals 3, greenish, connate below; petals 3, connate below, bluish-purple; stamens 6, all fertile; filaments bearded. Capsules upto 3 mm long, hairy at the tip, 3-celled, cells each 2-seeded. Seeds obscurely pitted.

References :

1. Wight, R. (1853). *Ic. Plant. Ind. Orient.* 6 : 34. t. 2089.

2. Kammathy, R.V. (1983). Rare and Endemic species of Indian Commelinaceae. *In :* Jain, S. K. & R. R. Rao, (ed.). *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. pp. 213-221.

The material for this sheet was supplied by R.V. Kammathy, Botanical Survey of India, Calcutta.

Cyanotis burmanniana Wight. Habit.

Status : Indeterminate. This species was collected by the author from Waverly Estate, Anamalai hills at 1000 m alt., in 1962 and was cultivated in the experimental garden, Botanical Survey of India, Pune. It flowered and was described as a new species from cultivated materials. No subsequent collection exists in our herbaria.

Distribution : Endemic to Waverly Estate, Anamalai Hills, Tamil Nadu, Western Ghats.

Habitat and Ecology : This species grows amidst grasses in wet rocky areas.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Efforts should be made for *in situ* conservation of the species in its natural habitat; introduction to other ecologically suitable niches in the adjoining areas and also *ex situ* cultivation in conservatories and botanical gardens.

Biology and Potential Value : Endemic species of phytogeographical significance. The plants with stout spreading stems, leaves and pinkish flowers can be effectively grown in green houses and shady areas of gardens with other species like *Tradescantia*, *Zebrina* etc. Flowers during August to October.

Cultivation : This species was successfully introduced in the experimental garden, Botanical Survey of India, Pune in 1962. The plants grew well and spread to large areas within a few months in moist places under shade.

Description : Stout spreading herb, 50-200 cm long, rooting at nodes. Stem upto 1 cm in diameter, green or dark maroon coloured with ashy coating, glabrous. Leaf-sheaths 1-1.25 cm long, glabrous with scattered hairs at the tip; leaves sessile, alternate, 3-8 × 1-0.3 cm, oblong to lanceolate, or ovate-lanceolate, acute, base broad, green, waxy smooth or with ashy coating, margins hairy. Inflorescence in axillary and terminal cymes of 8-15 flowers. Sepals 3, almost free; petals 3, fused below to form a tube 6 mm, bluish-violet. Stamens 6, filaments bearded, swollen at the tip. Capsules about 3 mm long, hairy at the tip, 3-celled, each cell 2-seeded. Seeds 1.5 mm long, irregularly pitted.

References :

1. Rolla, S. Rao & Kammathy, R. V. (1966). Notes on Indian Commelinaceae-V. *Journ. Linn. Soc. Bot.* 59 : 305-308.

2. Kammathy, R. V. (1983). Rare and Endemic species of Indian Commelinaceae. *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*, pp. *213-221*. Botanical Survey of India, Howrah.

The material for this sheet was supplied by R. V. Kammathy, Botanical Survey of India, Calcutta.

Status: Rare. First collected by Robert Wight from Courtallum in August 1835. Later workers considered this species conspecific to *Murdannia semiteres* (Dalz.) Santapau. The present author had collected this species from the type locality where a very few populations were observed in 1962. Morphological and cytological investigations reveal this to be a distinct species.

Distribution : Endemic to southern portions of Western Ghats especially in Thenmalai and adjoining hill ranges.

Habitat and Ecology : This species grows in most rock crevices and wet turfs.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : *In situ* conservation by protecting its natural habitat or introduction to other ecologically suitable niches in the adjoining areas in Western Ghats and *ex situ* conservation in suitable botanical gardens.

Biology and Potential Value : This species is endemic to southern parts of Western Ghats and is of phytogeographical and evolutionary significance. Cytological investigations reveal that this species has diploid chromosome number, n=12. Flowers during July to October.

Cultivation : The root-stocks of this species collected from Courtallum, Thenmalai forest ranges were grown in pots in the BSI experimental garden at Pune during 1962. The plants survived only for a short period.

Description : A perennial herb with thick bulbose root-stock formed by successive leaf bases, 10-20 mm high. First formed leaves 10-15 cm, filiform, narrowly linear or subulate, semiterete, acute and often apiculate; flowering scapes leafy, with smaller leaves; panicle branched, terminal, branches spreading, capillary, few-flowered; bracts minute, ochreate, persistent. Sepals 3, free, reddish-brown; petals 3, rosy-purple, free; stamens 3, fertile; staminodes 3, filaments naked. Capsules subglobose, smooth, shiny, 3-celled, cells 5-8-seeded each. Seeds minute, angular, smooth.

References :

1. Wight, R. (1858). *Ic. Pl. Ind. Orient.* 6: t. 2078, fig. 2.

2. Kammathy, R. V. (1983). Rare and Endemic species of Indian Commelinaceae. *In :* Jain, S. K. & Rao, R. R. (ed.), *An Assessment of Threatened Plants of India,* pp. 213-221 Botanical Survey of India, Howrah.

3. Kammathy, R. V. & Rolla S. Rao (1964). Notes on Indian Commelinaceae-V, cytological observations. *Bull. Bot. Surv. India* 6: 1-6.

The material for this sheet was supplied by R. V. Kammathy, Botanical Survey of India, Calcutta.

Status : Rare, due to grazing and clearing and consequent disturbances in its habitats. Heyne collected this species from Bababudan Hills, in September 1816. Subsequenty, this species was collected in several areas. This plant has become rare due to habitat loss. The plants of the same species growing on Panchgani plateau were described as *Aneilema siennea* by Blatter.

Distribution : Endemic to Deccan plateau-Sahyadri hills south-wards.

Habitat and Ecology : This species grows in wet grasslands in hilly areas at 1000-1500 m, in the open. The root-stock with tuberous roots help the species to perennate. The plants sprout soon after monsoon rains.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : . *In situ* conservation by protecting its natural habitats in selected areas; introduction to other ecologically suitable areas ; *ex situ* conservation in suitable botanical gardens.

Biology and Potential Value : Endemic to Deccan plateau and is of evolutionary and phytogeographical interest. Flowers during July to October.

Cultivation : Some root-stocks of this species from Panchgani plateau were grown in pots containing soil from its natural habitat in the experimental garden of the Botanical Survey of India at Pune during 1961. The plants grew well and flowered during August 1962.

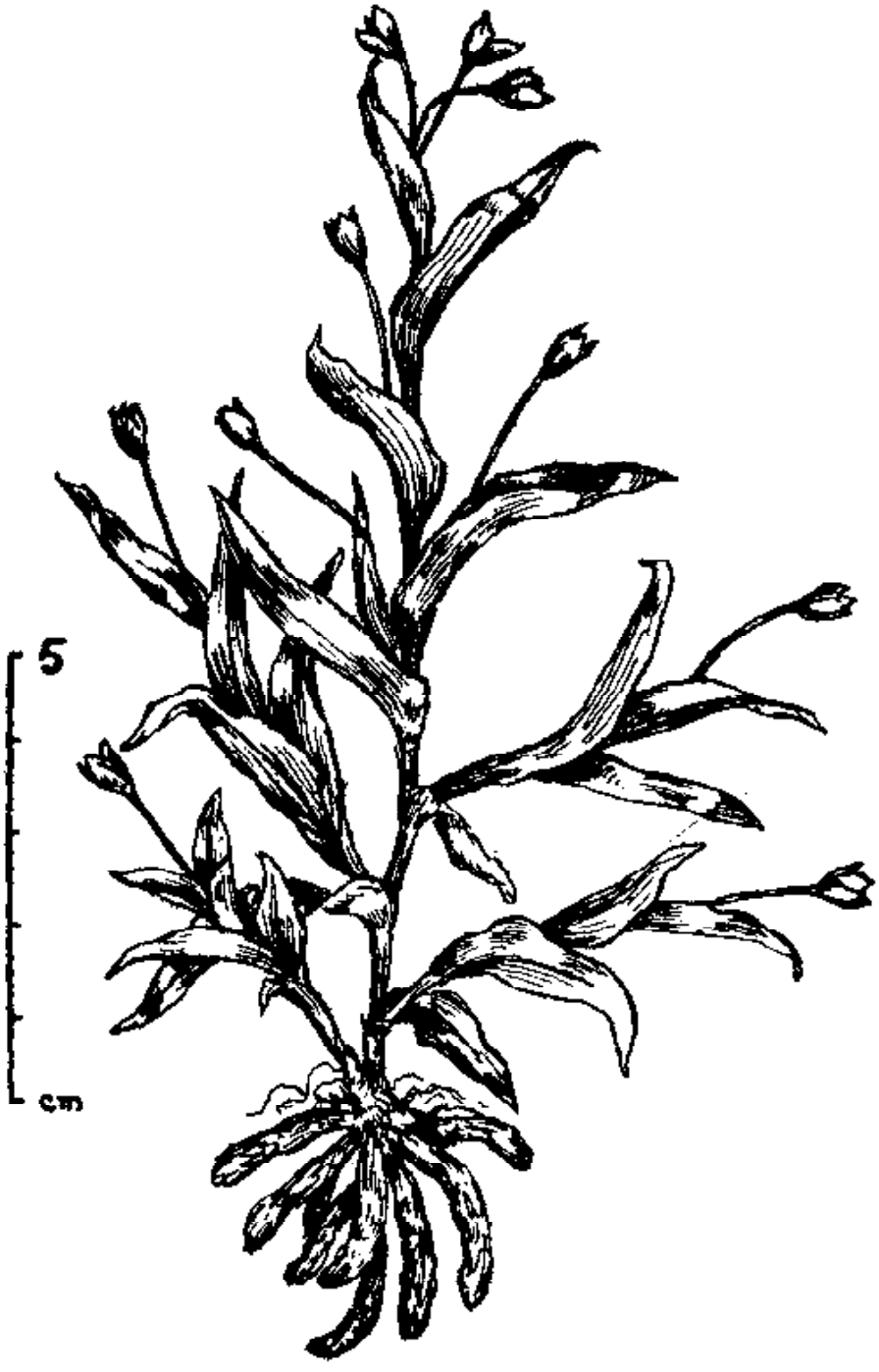
Description : Erect to decumbent herbs, 10-40 cm. Root-stock with 3-10 tubers of 3-6 cm long. Branches erect to spreading, rooting at lower nodes. Stems pubescent or nearly glabrous. Leaves sessile, 2.5-4 × 0.4-0.6 cm, linear to linear-lanceolate, finely acuminate, margins undulate. Flowers axillary, pedicels 1-3 from the upper leaf-sheaths, 1.5-3 cm long, jointed in the middle with 2 small scarious bracteoles at the joints, puberulous below the joint, glabrous above. Sepals 3, greenish; petals 3, free, 5-8 mm long, orange-yellow; stamens 6, 3 fertile, 3 sterile, filaments bearded, anthers dark-violet. Capsules about 0.8 cm long, oblong, trigonus, violet shiny, 3-celled; cells each 4-6 seeded. Seeds angular, smooth or obscurely pitted.

References :

1. Kammathy, R. V. (1983). Rare and Endemic species of Indian Commelinaceae. *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*, pp. 213-221. Botanical Survey of India, Howrah.

2. Blatter, E. (1928). New Commelinaceae from Western Ghats. *J. Bombay Nat. Hist. Soc.* 33: 73-77.

The material for this sheet was supplied by R. V. Kammathy, Botanical Survey of India, Calcutta.



Murdannia lanuginosa (Wall. ex Cl.) Bruckn. Habit.

Status : Indeterminate or possibly extinct. Known only from the type collection but thorough search of the adjacent areas is required.

Distribution : Tamil Nadu, Nilgiri hills. Endemic.

Habitat and Ecology : In mountainous regions at alt. 1524-2133 m, on grassy slopes.

Conservation Measures Taken : None so far, although its distributional localities fall within the Nilgiri-Wynad Biosphere Reserve.

Conservation Measures Proposed : Intensive search for this species in the type locality should be made and *in situ* conservation by protecting the habitat is proposed. Declaration and creation of the Nilgiri Biosphere Reserve would greatly help in conserving the species as well as several other threatened species reported from this region.

Biology and Potential Value : The species is of botanical interest due to its endemicity.

Cultivation : Not known so far.

Description : Stems 4.9-7.3 cm long. Leaves shorter, 2.9 mm broad. Inflorescence spicate, terminal spikelet linear-oblong, 12-13 mm long, 5-6-flowered. Female glumes broadly oblong, pale-ferrugineous, obtuse, margins hyaline, two only with female flowers. Stigmas 3.

References :

1. Boeckeler, O. (1890). *Centralbl.* 42: 134.

2. Kuekenthal, G. (1909). Cyperaceae-Caricoideae. *In :* Engler, A., *Das Pflanzenreich* IV(20). *Heft* 38: 1-824, ff. 1-128.

3. Fischer, C.E.C. (1931). *In :* Gamble, J. S., *Fl. Pres. Madras* pt. 9: 1620-1687.

The material for this sheet was supplied by Neelam Ghildyal, Botanical Survey of India, Dehra Dun.

Status : Indeterminate. Known from the type collection only from Pheedong, Sikkim. (Herb. King).

Distribution : Sikkim. *Endemic.*

Conservation Measures Taken : None so far.

Conservation Measures Proposed: Intensive search in the type locality should be made to relocate this species and *in situ* conservation by protecting the habitat is proposed.

Biology and Potential Value : The species is of botanical value.

Cultivation : So far not known.

Description : Spikelets 7-12, linear-cylindric, 2-4 cm long, androgynous, sublax, interrupted at base. Female glumes triangular at tip. Utricles oblong-ellipsoid, trigonous, 4-5 mm long, glabrous, hispid above. Stigmas 3.

Reference :

1. Clarke, C. B. (1908). New genera and species of Cyperaceae. *Kew Bull.* (*Add. Ser.*) 8: 1-196.

The material for this sheet was supplied by Neelam Ghildyal, Botanical Survey of India, Dehra Dun.

Status : Rare. This species is restricted to Gujarat and so far known only from a solitary locality. The holotype was collected by H. C. Dhruna in 1953 and deposited in Forest Herbarium, Dehra Dun. It has not been collected after the type collection. Its distributional localities in coastal areas are under stress due to human interference.

Distribution : Gujarat (Dwarka).

Habitat and Ecology : It grows in marshy places near sea coast.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Needs conservation of natural populations and control of biotic interferences especially by tourists, by demarcating its habitats as protected areas.

Biology and Potential Value : The species flowers in November. Culms of *Cyperus iria* are locally used for making mats and many *Cyperus* spp. are used as fodder. Similarly, *C. dwarkensis* also may have such uses.

Cultivation : None so far.

Description : Glabrous sedges with reddish-brown fibrous roots. Stems erect, dense, caespitose, grooved, 2-9 cm. Leaves linear, setaceous, 2-9 × 0.05 cm. Involucral bracts 2, foliose. Flowers in heads; spikelets 12-30-flowered, straw or reddish-brown; rechilla quadrangular; glumes rigid, ovate, orbicular, concave, 5-nerved, 2 mm long; stamens 1-2; style absent or very short; stigmas 2. Nuts oblong, punctulate, plano-convex, 1 × 0.5 mm.

References :

1. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K., & Sastry, A. R. K., *Materials for a Catalogue of Threatened Plants of India*. p. 39. Botanical Survey of India, Howrah.

2. Raghavan, R. S., Wadhwa, B. M., Ansari, M. Y. & Rao, R. S. (1981). *Rec. Bot. Surv. India* 21(2) :92. Botanical Survey of India. Howrah.

3. Sahni, K. C. & Naithani, H. B. (1976). *Ind. For.* 102 : 357-358. ff. A-E.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Vulnerable due to over-exploitation. It has been observed that it is being depleted rapidly due to excessive collection of its medicinal tubers without any attempt to replenish its natural populations in forest areas.

Distribution : Himalaya, Kashmir to Assam; Afghanistan; Indo-China; W. China. Rather sporadic.

Habitat and Ecology : Tropical-Temperate Himalaya, 1000-3500 m alt.

Conservation Measures Taken : Cultivation is attempted.

Conservation Measures Proposed : Conservation of natural habitat of the plant; its cultivation in Botanic gardens. Attempts should also be made to grow this plant under controlled conditions keeping its slow growth in view.

Biology and Potential Value : It grows usually in the sub-tropical conditions in wild but too slow growing. Fls. and Frts. : May-July. Tubers are not edible but are rich in saponin and are used for washing silk, wool and hair and in dyeing.

Cultivation : The species is very slow growing due to which all the attempts made so far for its commercial cultivation have not been successful.

Description : Glabrous twining climber with tuberous roots. Leaves alternate, 5-13 cm long, ovate, acuminate, base deeply cordate, lobes rounded, sometimes dilated outwards; petiole as long as the blade. Male spikes solitary, rarely in pairs, 8-35 cm long, very slender; perianth segments broadly oblong; flowers in small, distinct clusters; stamens 6. Female spikes 8-16 cm long, usually broader than long, solitary, flowers few, distinct. Capsule 1.5-2.5 × 2.5-5 cm, variable in shape. Seeds winged all round, sometimes only on one side.

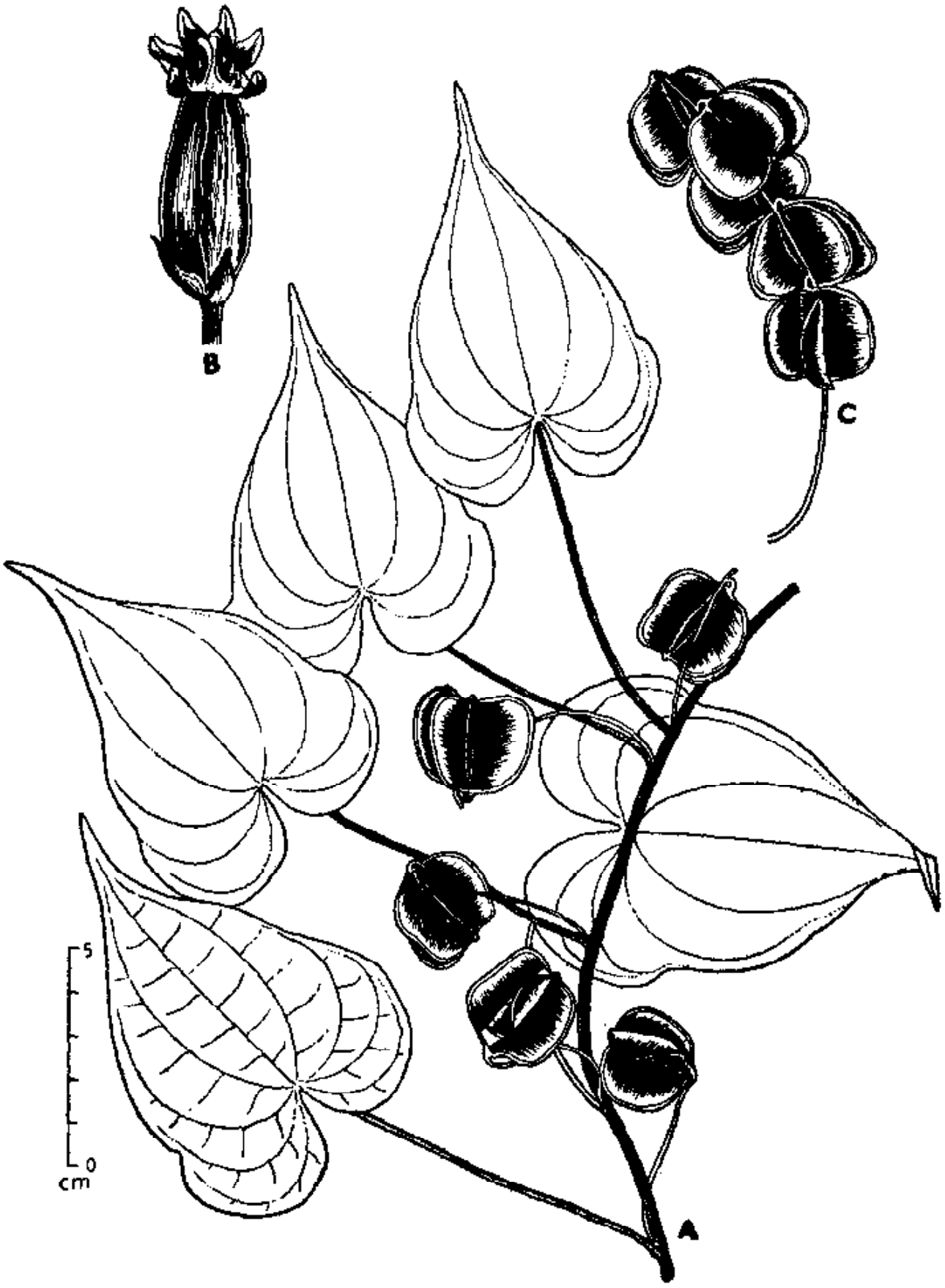
References :

1. Anon. (1952). *The Wealth of India—Raw materials* 3:72.

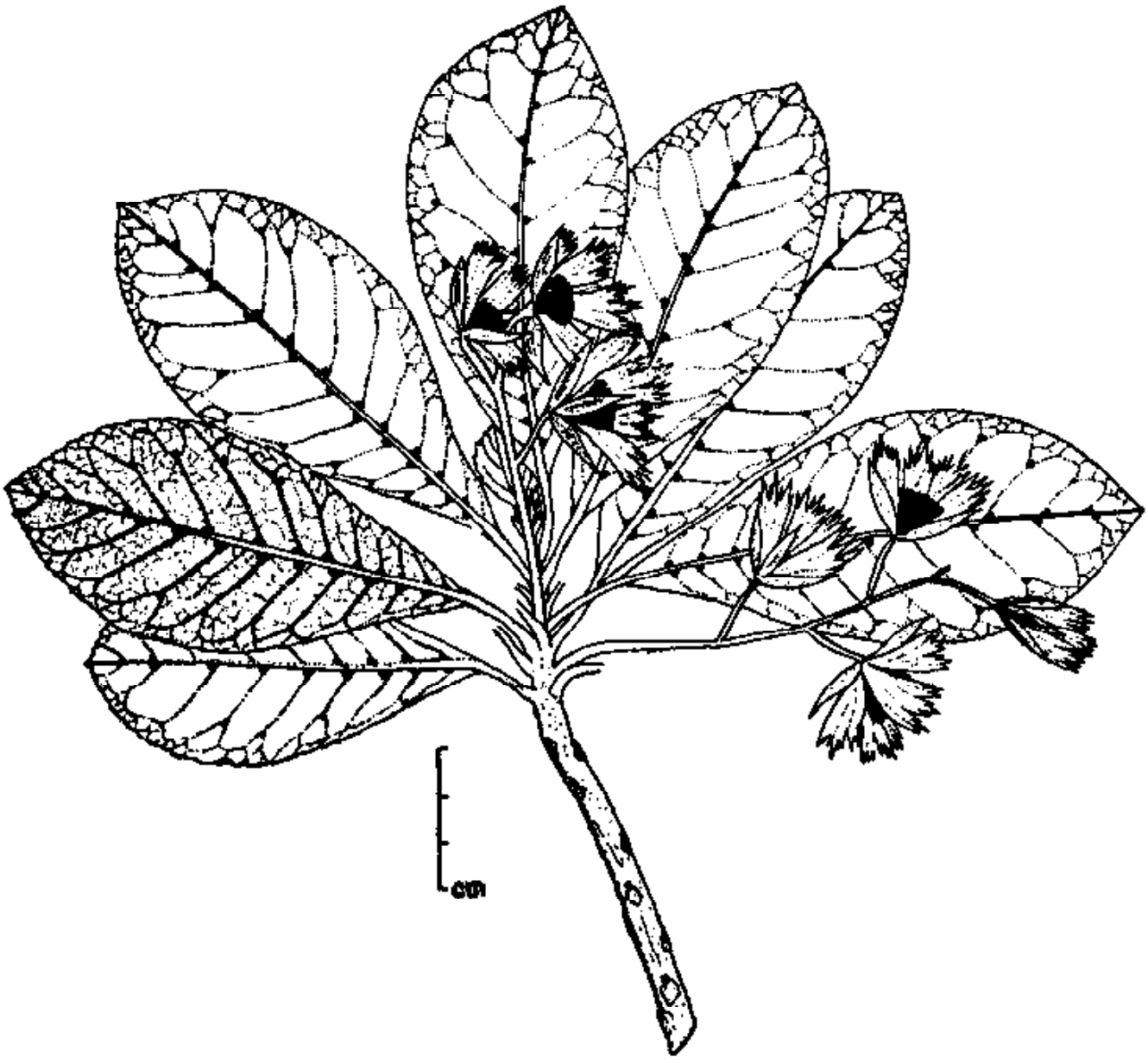
2. Atal, C. K. & Kapur, B. M. (ed.) (1982). *Cultivation and utilization of medicinal plants.*

3. Prain, D. & Burkill, I. H. (1936). *Ann. Roy. Bot. Gard. Calcutta* 14:25. t. 4.

The material for this sheet was supplied by H. J. Chowdhery, Botanical Survey of India, Dehra Dun.



Dioscorea deltoidea Wall. ex Griseb. (Female plant). A. Habit. B. Flower. C. Mature fruits.



Elaeocarpus venustus Bedd. Flowering twig.

Status : Rare. The species has been seldom collected and several areas of its distribution range have undergone much change resulting in loss of habitats for the species.

Distribution : Kolli and Palani hills, Tamil Nadu ; Suntikoppa, Kadagu, Karnataka. Endemic to S. India.

Habitat and Ecology : Found in hills upto 1900 m in semi-evergreen forests of Western Ghats. Flowering and fruiting during September-January.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : To protect some of the areas of its occurrence and to introduce it in botanic gardens; seeds should be collected and sown in its natural habitats and preserved in seed banks. It should be grown by seeds instead of plants.

Biology and Potential Value : Of botanical interest and economic importance It can be grown for green manure.

Cultivation : Not so far known.

Description : Erect velvety-tomentose shrubs. Leaves 5-7- foliolate ; stipules subulate, reflexed ; petioles long, stout. Leaflets thick, soft, 7×2.5 cm, obovate, apex obtuse, base cuneate. Flowers 12-20, yellow, in terminal and lateral racemes ; bracts lanceolate, recurved. Calyx glabrescent, 2 cm long. Corolla slightly exserted, glabrous. Pods 5-7 cm long, linear-oblong, cylindric, glabrous.

References:

1. Baker, J. G. (1876). *In :* Hook. f., *Fl. Brit. India* 2: 85.

2. Gamble, J. S. (1918). *Fl. Pres. Madras* 1: 301 (repr. ed. 1: 213, 1957. Calcutta).

3. Hooker, W. (1831). *Bot. Misc.* 2: 354 suppl. t. 16.

4. Wight, R. & Walker-Arnott, G. A. (1834) *Prodr. Fl. Penin. Ind. Orient.* p. 194.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status: Rare, possibly due to habitat destruction.

Distribution: Concan plain, Khandala. Maharashtra ; Bihar?; Bengal?. Endemic to India.

Habitat and Ecology: Grows among grasses. Flowering and fruiting: September-December.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: To search for the species in the wild and to introduce in botanic gardens. Attempts should be made to multiply the species and reintroduce in some of its original habitats through seeds.

Biology and Potential Value: Only of botanical interest.

Cultivation: Not so far known.

Description: Prostrate copiously branched, slender herbs, clothed with long coarse silky yellow-brown hairs. Leaves simple, alternate, membranous, 1-2.5×0.7-1 cm, obliquely cordate-oblong, apex obtuse or subacute, pale ; stipules 0. Flowers yellow, solitary or two in leaf-opposed or extra-axillary racemes, peduncles thread like, often with extra bracts in lower portion, longer than the leaf : bracts and bracteoles 1-3 mm long, linear or linear-lanceolate. Calyx 5-lobed, lobes linear, sparingly hairy. Corolla scarcely exserted ; vexillum 4-5 mm long, orbicular. Pods short-stalked, light brown, 0.6-1 cm long, oblong, glabrous. Seeds 6-8, dark-brown.

References:

1. Baker, J. G. (1876). *In :* Hook. f., *Fl. Brit. India* 2 : 67.

2. Cooke, T. (1902). *Fl. Pres. Bombay* 1 : 312 (repr. ed. 1 : 312. 1958. Calcutta)

3. Santapau, H. (1967). *Fl. Khandala,* p. 52. Calcutta. (ed. 3).

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status: Endangered. Causes for its decline may be due to large scale removal of forests for plantation crops and also due to forest fires. It was reported by Bourne in 1899 from the Palani hills, Madurai District. Since then it has not been collected. Only represented by the type specimen.

Distribution: Endemic to Palani hills in Madurai district, Tamil Nadu.

Habitat and Ecology: In open grasslands in the hills. Flowering and fruiting during March-September.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: To search for the taxon in its type locality and surrounding areas. If located the area should be protected and the plants should be introduced into the botanic gardens for multiplication and reintroduction in the original habitat through plants and seeds.

Biology and Potential Value: Only of botanical and phytogeographical interest.

Cultivation: Not known so far.

Description: Perennial, sparingly branched, prostrate herbs with woody root-stock. Leaves simple, alternate, subcoriaceous, 1-3.2×1.1-2 cm, ovate, orbicular-ovate or orbicular, apex acute, obtuse or rounded, rarely retuse, mucronate, base rounded, paler beneath, glabrous; petioles 1-2 mm long, swollen; stipules 1-2 mm long, linear or linear-lanceolate, spreading. Flowers bright yellow, in long terminal racemes; bracts ovate or ovate-lanceolate; bracteoles ovate. Calyx 5-lobed, obscurely 2-lipped, lanceolate or linear-lanceolate. Corolla exserted; vexillum *ca* 1.5×1.8 cm, orbicular, veins reddish-brown. Pods brown, glabrous, 1.5-2.8×0.5-0.8 cm, obovate-oblong or elliptic-oblong, cylindrical. Seeds brown or blackish, polished, 2-13, 2-4×2-3.5 mm, reniform.

Reference:

Gamble, J. S. (1918). *Fl. Pres. Madras* 1: 292. (repr. ed. 1: 207. 1957).

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status: Rare, due to destruction of habitats in its distribution range.

Distribution: Endemic to southern peninsular India in Nilgiri, Dindigul, Courtallum, Chengapalli and Vedicola hills, Tamil Nadu; Mysore, Karnataka

Habitat and Ecology: In hills among grassy sunny slopes.

Conservation Measures Taken: Some of its habitats in the Nilgiri hills are included in the Nilgiri-Wynaad Biosphere Reserve.

Conservation Measures Proposed: Total protection of the Nilgiri Biosphere Reserve to protect its habitats ; introduction of the species in botanic gardens.

Biology and Potential Value: Presently only of botanical interest due to endemicity.

Cultivation: Not so far known.

Description: Prostrate, much-branched, silky-hairy herbs. Leaves simple, alternate, subsessile, 0.9-1.5×0.7-1.3 cm, orbicular, apex rounded or obtuse, mucronulate, base subcordate or rounded, hairy on both the surfaces, more on lower, lateral veins prominent; stipules 0. Flowers yellow, 1-3, in leaf-opposed racemes; pedicels 2-2.5 mm long; bracts 1-1.5 mm long, setaceous; bracteoles above the middle of pedicels, very small. Calyx 4-5 lobed, lobes lanceolate or linear-lanceolate. Corolla slightly exserted; vexillum 5·5×4 mm, ovate-oblong. Pods brown, 8×5 mm, globose, pericarp hard, coriaceous, covered with scattered short stiff hairs. Seeds yellowish-brown, 4-5, 2×2 mm, reniform, variable in shape.

References:

1. Baker, J. G. (1876). *In :* Hook. f., *Fl. Brit. India* 2: 66.

2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1 : 206. (repr. ed., Calcutta).

3. Wight, R. & Walkar-Arnott, G. A. (1834). *Prod. Fl. Penin. Ind. Orient.* p. 190.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status : Rare.

Distribution : Restricted to North and South Kanara, Karwar in Karnataka and Malwan in Maharashtra. Endemic.

Habitat and Ecology : In coastal plains and low hills amongst tall grasses. Flowering and fruiting: October-January.

Conservation Measures Taken : None so far.

Conservation Measures Proposed : To search for it in the wild. If located, it should be introduced into botanic gardens, multiplied and reintroduced in its original habitats from seeds.

Biology and Potential Value : Of botanical and phytogeographical interest.

Cultivation : Not known so far.

Description : Erect sparingly branched glabrescent herbs or undershrubs upto 1m tall; branches terete or obscurely angled. Leaves membranous, subsessile, variable, 3.5-7.5×0.6-1.7 cm (rarely upto 15 cm long), linear, linear-lanceolate or elliptic-lanceolate, apex acute or acuminate, apiculate, base acute, paler beneath; stipules absent. Flowers distant, yellow, in long slender lax racemes; pedicels cernuous; bracts and bracteoles small, 1-2 mm long, hairy, persistent. Calyx lobes linear, long-acuminate, glabrous. Corolla exserted; vexillum 1.8 cm long, ovate-cordate or ovate-oblong, hairy on the back. Pods stalked, 3.2×0.8 cm, oblong, glabrous, brownish black; style persistent. Seeds numerous.

References :

1. Baker, J. G: (1876). *In* : Hooker, J. D., *Fl. Brit. India* 2 : 74.

2. Cooke, T. (1957). *Fl. Pres. Bombay* 1 : 318 (repr. ed.).

3. Dalzell, N. (1850). *J. Bot. Kew. Gard. Misc.* 2 : 34.

4. Gamble, J. S. (1957). *Fl. Pres. Madras* 1 : 207 (repr. ed.)

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Crotalaria lutescens Delz. Stem with flowers & pods.

Status : Indeterminate.

Distribution : Shibong, Nagaland.

Habitat and Ecology : In hills upto 900 m.

Conservation Measures Taken : Nil.

Conservation Measures Proposed: To search for the species in its type locality and to study it thoroughly; to collect live plants and seeds for *ex situ* propagation.

Biology and Potential Value : Of botanical interest due to its restricted and localised occurrence.

Cultivation : Not known.

Description : Perennial herb with woody base, upto 1.2 m tall; stems few, naked before flowering, softly hirsute, especially above. Leaves simple, alternate, chartaceous, very shortly petiolate, 4-6 cm long, narrowly oblong-linear, apex acute or obtuse, apiculate, base acute or obtuse, margins slightly revolute, upper surface glabrous execpting midrib, lower surface and margin with long sparse hairs; stipules linear deciduous. Flowers blue, subsessile, in dense racemes upto 50 cm long; bracteoles linear. Calyx lobes 1.3 cm long, linear-lanceolate, acute, densely long villous outside. Corolla scarcely longer than the calyx, ornamental with a curved white tomentose line at the base, sparsely sericeous outside at the apex. Pods sessile, glabrous, equal to the calyx.

Reference:

1. Dunn, S. T. (1912). *Bull. Misc. Inform. Kew* 7 : 340.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status : Indeterminate.

Distribution : Endemic to Khasia hills, Meghalaya.

Habitat and Ecology : In open grasslands along hill slopes.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : To search for the species in its original habitat. If located, the area should be protected and its populations should be studied for *ex situ* conservation through seeds and plants in botanic gardens and reintroduction into similar habitats in Khasia Hills, Meghalaya.

Biology and Potential Value : Of botanical interest, due to restricted distribution.

Cultivation : Not known.

Description : Plants with bulbous bases; stems generally simple. Leaves ascending, white-glaucous below. Flowers yellowish; vexillum with cheshnut coloured veins.

Reference:

1. Griffith, W. (1948). *Itin. Notes* (Posth. paper II) 26. No. 396.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status : Rare.

Distribution : Coimbatore, Kanyakumari, Salem and Tirunelveli (Agastyamalai Peak) in Tamil Nadu. Endemic.

Habitat and Ecology : In hills upto 1900 m.

Conservation Measures Taken : None so far.

Conservation Measures Proposed : To protect the areas of its distribution. Agastyamalai hills should be declared as a Biosphere Reserve to protect several endemic and rare plant species growing in the region.

Biology and Potential Value : Of Botanical and taxonomic interest.

Cultivation : Not known.

Description : Erect, branched shrubs; branches scabrous with strigose bulbous based hairs. Leaves sessile or sub-sessile, simple, alternate, thick, 2-3.5×1-1.5 cm, elliptic, apex obtuse or rarely subacute, base rotundate, margins prominently reflexed, strigose with bulbous based hairs on both surfaces, especially beneath; stipules absent. Flowers 3-4, yellow, in terminal racemes upto 10 cm long, densely ferruginous-villous; bracts and bracteoles 5-7 mm long, linear or lanceolate. Calyx lobes linear or lanceolate, densely rigidly sericeous-villous. Corolla slightly exserted; vexillum 1.5 cm across, orbicular. Pods shortly stalked, 3×1-1.5 cm, cylindrical, glabrous.

References :

1. Gamble, J. S. (1917). *Bull. Misc. Inform. Kew* 1 : 18.

2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1 : 208 (repr. ed.).

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status : Rare. It is confined only to certain pockets and there are very few and sporadic collections in the herbaria.

Distribution : Jamphalpade (Colaba district), Igatpuri and Mumbra, Maharashtra. Also perhaps in Helfer's collections from Tennasserim and Andaman Islands (1).

Habitat and Ecology : In open areas amidst grasses.

Conservation Measures Taken : Nil.

Conservation Measures Proposed : To introduce the plants and seeds in botanic gardens and to reintroduce them again in its wild habitats.

Biology and Potential Value : The species is of botanical interest. It is very peculiar in having a slender habit and bearing mostly 1, rarely 2-flowered leaf-opposed racemes.

Cultivation : Not known.

Description : Suberect, much branched, glabrescent annual herbs upto 30 cm tall. Leaves alternate, simple, membranous, minutely dotted, 0.9-2.1 × 0.3-0.5 cm, linear-oblong or oblong, apex obtuse or rounded, base obtuse, glabrous above, adpressed-puberulous beneath, margins sparsely cililate; petioles 1 mm long; stipules upto 1 mm long, subulate, spreading, caducous. Flowers yellow, solitary (rarely two) in leaf-opposed or terminal filiform recemes, bracts and bracteoles 0.5-1 mm long, subulate or linear. Calyx lobes pubescent. Corolla distinctly exserted; vexillum 2-3 mm long, obovate with few hairs on the back and very minute callositia. Pods brown or black, 6.5-10 × 1.5-3 mm, oblong or obovate-oblong, glabrous, shortly stalked. Seeds 12, 0.5 × 0.5 mm, reniform, light brown or black.

References :

1. Baker, J. G. (1876) *In :* Hooker, J. D., *Fl. Brit. India* 2 : 67.

2. Cooke, T. (1902). *Fl. Pres. Bombay* 1 : 313. (repr. ed.).

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.

Status : Rare. It is reported only from two localities, one in the Siruvani western slopes, Palghat district, Kerala and the other in the Sollekallu R. F., Chikmagalur district, Karnataka. This species is not considered to be under immediate threat but is likely to become vlunerable due to extensive habitat loss.

Distribution : Western Ghats in south Travancore, Tirunelveli hills; Tambracheri Ghat, Wynaad and also in Karnataka. Endemic.

Habitat and Ecology : In rocky forested hill slopes at 700-1000 m in evergreen forests.

Conservation Measures Taken : None.

Conservation Measures Proposed : This should be introduced in the botanic gardens and plantation of this tree is to be attempted by Forest Departments. The habitat may be protected with the help of state Forest Department.

Biology and Potential Value : Timber is useful; of botanical interest. Can be grown as an avenue tree.

Cultivation : Not known in cultivation.

Description : Tall trees 10-15 m. Leaflets 1-paired, lanceolate, falcate, acuminate, unequal sided, very thin and creamy pink in colour when young. Flowers rosy-white, 4-merous. Ovary reddish. Pod flat, semicircular, rugose, orange when dry.

References :

1. Beddome, R. H. (1873). *Fl. Sylv.* t. 316.

2. Baker, J. G. (1878). *In* : Hooker, J. D., *Fl. Brit. India* 2 : 267.

3. Gamble, J. S. (1957). *Fl. Pres. Madras* 2 : 293. (repr. ed.).

4. Krep van Meeuwen, M. S. (1970). The Indo-Malesian and Pacific Cynometreae. *Blumea* 18 : 29.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Rare; a spectacular alpine plant of the Western Himalayas, getting depleted mainly by destructive exploitation of its habitats due to grazing.

Distribution : Originally it was collected from Kishtwar (4000 m), Chenab valley (3500 m) in Kashmir and Lahul in Himachal Pradesh in 1848. After a lapse of about 85 years it was again collected from only two localities of Lahul in 1938 and 1941. There is no report of this plant (2) since then. Presumably the species occurs in Pakistan also.

Habitat and Ecology : On grassy and shady mountain slopes at 3500-4500 m alt.

Conservation Measures Taken : None for the wild plants and its habitats except that the species has been listed as threatened (2).

Conservation Measures Proposed : Efforts should be made to search its known localities and other likely areas to determine the status of its populations. The species should be brought into cultivation and propagated in botanic gardens.

Biology and Potential Value : Nothing is recorded of its biology. It may be of interest as an ornamental plant of higher altitudes and temperate parts.

Cultivation : Not known.

Description : Perennial, erect herbs, 20-60 cm high. Stems usually slender, silky-hairy. Stipules leaf-opposed, 1.0-1.2 cm long, densely white silky-pubescent. Leaves alternate, 10-20 cm long; leaflets 17-31, upper surface glabrous and with uniformly very minute gland-like dots, lateral veins obscure on both surfaces. Racemes 10-25 cm long, densely 10-30-flowered along the upper part of peduncles. Pedicels 3-5 mm long; bracts distinctly longer than the pedicel. Flowers 16-22 mm long, yellowish. Calyx 5-lobed, 6.0-9.5 mm long, teeth more or less unequal. Vexillum 15.5-18.0 × 6.0-7.5 mm, narrowly obovate, emarginate at apex, shorter than the keels but longer than the wings; wing-auricles 2.5-3.5 mm long, almost equalling the elongated claw. Pods (1-) 2-jointed, stipitate, both sutures apparently crisp winged.

References :

1 Ohashi, H. & Tateishi, Y. (1975). The genus *Hedysarum* (Leguminosae) in the Himalayas. *Bull. Univ. Mus. Univ. Tokyo* 8: 363-392, pl. 12a, fig. 56.

2. Pramanik, A. & Thothathri, K. (1983). Studies on rare and endemic legumes in the tribe *Hedysareae*. *In* : Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*, pp. 232-234. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. Pramanik, Botanical Survey of India, Howrah.

Status : Rare or possibly vulnerable due to impact of tourism and pilgrimage in its habitats. There are only 3 subsequent collections made in 1913, 1953 and 1966, after its type collection. None has apparently found the species since 1966 (3).

Distribution: Kashmir. It occurs in a few localities, and recorded from Baltal valley and Kolohoi valley (4000m) along north facing slopes ; Thajwas (3800m) and on the way to Amaranath at 3700m altitude in Kashmir. Also doubtfully in Pakistan.

Habitat and Ecology : On dry stony, shady mountain slopes at 3700-4000 m, more or less devoid of vegetation.

Conservation Measures Taken : No steps have been taken for *in situ* or *ex situ* conservation of the species; it is only listed in threatened plants lists of India. (1, 3).

Conservation Measures Proposed : Selection of areas for reserves in Kashmir should include sites where the species occurs; possible reintroduction of the species into conservation areas. Further search of the species in Kashmir and adjoining areas.

Biology and Potential Value : Nothing on record. This species is of scientific interest on account of its geographical isolation and could be of horticultural and botanical value as well, in higher altitudes.

Cultivation : Cultivation of this species probably has never been attempted.

Description : Perennial, erect herb, upto 35-60 cm high. Stipules leaf-opposed, upto 1.5 cm long. Leaves alternate, 7-13 cm long, pinnate with a terminal leaflet, leaflets in 10-13 pairs. Racemes axillary, upto 20 cm long, densely 30-40-flowered, in the upper part of the peduncles. Flowers patent or little pendulous; pedicels 2-3 mm long. Calyx upto 10 cm long, densely pubsecent, 5-lobed above the middle; upper lobe shorter than the others. Corolla purple-red; vexillum 24-26×7-8 mm, narrowly obovate, equalling or little longer than the other petals; wings almost as long as or a little shorter than the keels, claw about 7 mm long. Pods (1-) 2-3-jointed, upto 5.5 cm long, patent or pendulous, terminal, stipes 7-10mm long, surfaces distinctly reticulate, both sutures *ca* 1.0 mm broad, entire, winged; joints 1-2×1.0 cm.

References :

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the Art Report*. p. 24. Botanical Survey of India, Howrah.

2. Ohashi, H. & Tateishi, Y. (1975). The genus *Hedysarum* (Leguminosae) in the Himalayas. *Bull. Univ. Mus. Univ. Tokyo* 8 : 363-392. pl. 12d, fig. 57, 70a, 71a.

3. Pramanik, A. & Thothathri, K. (1983). Studies on rare and endemic legumes in the tribe *Hedysareae*. *In:* Jain, S. K. & R. R. Rao (ed.) *An Assessment of Threatened Plants of India*, pp. 232-234. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. Pramanik, Botanical Survey of India, Howrah.

Status : Vulnerable, due to destruction of its habitat by tourists and grazing by sheep. It is now known from about five localities (2) in the Western Himalaya from Kashmir to Upper Punjab but the populations are critically low.

Distribution : Originally the species was collected from Chenab Valley, Kashmir in 1852, and then from Lahul, Himachal Pradesh in 1860 and Garwhal in Uttar Pradesh 1864, 1877 and 1888. In the present century it was again collected from Simla and Kulu Valley, Himachal Pradesh in 1913, 1941 and 1954, and from Jamunotri in Uttar Pradesh in 1953. Incidentally, all the above areas are potential tourist sites. Also possibly in Pakistan (?).

Habitat and Ecology : The species is found on steep rocky wet places or on banks of streams in shade, between 3000 and 4800 m.

Conservation Measures Taken : None for the wild populations and its habitats; the species has been enlisted in threatened plant lists of India.

Conservation Measures Proposed : Protection should be provided for as many of the existing natural sites as possible. The species should, if possible, be brought into cultivation.

Biology and Potential Value : It is a very attractive, robust perennial mountain-herb with strikingly beautiful purple, purplish-red or crimson-purple flowers which would make it a worthwhile introduction as an ornamental plant in high altitude botanic gardens, besides being botanical interest.

Cultivation : Cultivation of this species was attempted sometimes in 1886 at Kew Garden, however, its identity is doubtful (1).

Description : Robust, erect herbs, upto 100 cm high, rhizome woody. Stipules 3-5 cm long, membrahaceous, sheathing, covering young leaves and inflorescences, connate along margin. Leaves 10-25 cm long, 3-5-whorled, pinnate with a terminal leaflet, consisting of 6-9 pairs. Racemes axillary, 5-20 cm long, terminal, 5-35-flowered. Bracteoles shorter than calyx-tube. Calyx 5-lobed, lateral and lower lobes nearly equal and longer than the upper ones. Corolla purple, purplish-red or crimson-purple; wings 12-15 mm long, shorter than the vexillum, auricles 2.5-3.5 mm long, slightly expanded at the apex, longer than or as long as the claw ; keels 14.5-18.0 mm long, longer than the vexillum. Pods (1-)2-3-jointed with entire wings along the margin-sutures, reticulately nerved on both surfaces; joints 8-18 × 5-9 mm, elliptic.

References :

1. Ohashi, H. & Tateishi, Y. (1975). The genus *Hedysarum* (Leguminosae) in the Himalayas. *Bull. Univ. Mus. Univ. Tokyo* 8 : 363-392. pl. 12c, f. 64. 70b.

2. Pramanik, A. & Thothathri, K. (1983). Studies on rare and endemic legumes in the tribe *Hedysareae. In:* Jain S. K. & R. R. Rao (ed.) *An Assessment of Threatened Plants of India*, pp 232-234. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. Pramanik, Botanical Survey of India, Howrah.

Status: Endangered; restricted to two localities in India and Sri Lanka. It was described in 1794 based on a single collection (3). It is reported to be abundant in Ambagmowa and Ratnapura districts in Sri Lanka (2) but known by only 2 collections from Western Ghats in India.

Distribution: Endemic to India (Kerala) and Sri Lanka (Ambagmowa and Ratnapura Districts). In India as well as in Sri Lanka no collections have been made after 1874 (1).

Habitat and Ecology : Grows along the banks of streams in shady places upto an altitude of 600 m. Flowers during January-April and fruits in May-June.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Adequate measures to be taken to study its distribution and density of the populations in the known as well as similar adjoining areas. Efforts should be made to procure seeds for introduction into gardens.

Biology and Potential Value: The species is curious and striking by its fistular internodes of branchlets which often house insects. The species may prove to be of potential horticultural value.

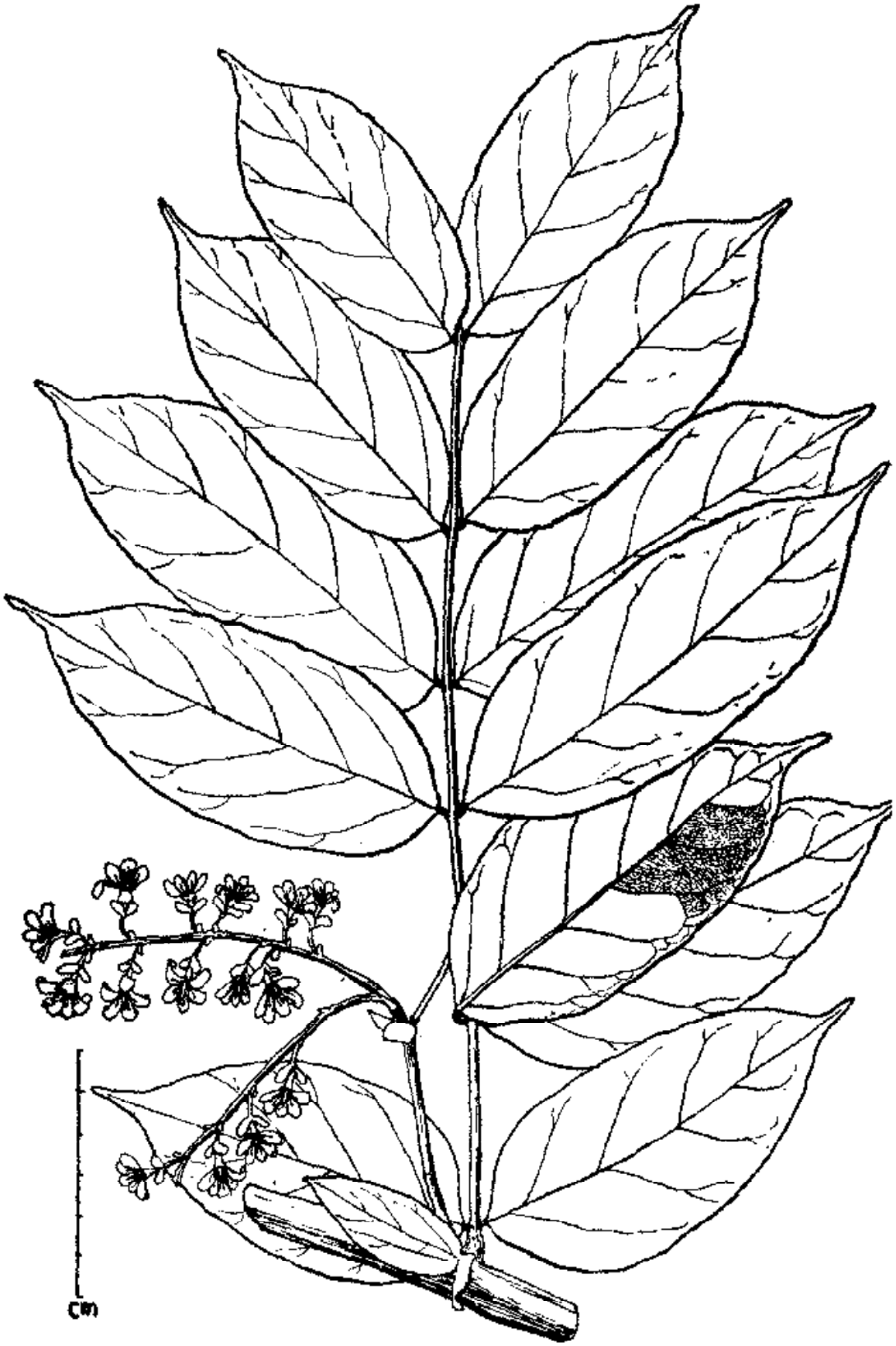
Cultivation: The species was introduced into Peradeniya Garden, Sri Lanka and experimental gardens in Malacca. There is no record of its continued cultivation and multiplication in these gardens.

Description: Shrubs or small trees, 4-6 m tall, branches drooping, internodes of the branchlets thickened upwards, obtusely quadrangular, or terete, glabrous, curiously fistular, often provided with perforations, the cavities are usually inhabited by ants. Leaves upto 30 cm long including infrajugal rachis of 5-6 mm long, 6-10 (-12)-foliolate, leaflets (7-)10-13×4-5 cm, ovate or elliptic, base oblique, abruptly caudate or cuspidate at apex, glabrous, prominently veined and depressed glandular beneath; stipules 2-4×1.3-1.7 cm, narrowly ovate, erect, parallel veined, glabrous; appendages 2-3×0.7 cm, reniform or falcate, acutely acuminate on one side. Racemes 10 cm long, axillary, sometimes 2-3 racemes clustered in an axil, sessile, erect; brown scabrous, many-flowered. Flowers 1.5-2 cm long, pink, honey scented; pedicels 5-6 mm long, finely brown pubescent; bracts 3-4 ×1.5 mm, ovate, acute, finely brown pubescent without with 1-2 glands, glabrous within, recurved, greenish, persistent; bracteoles 2, connate to the middle, 5-7×3 mm, obovate or ovate, rounded at apex, finely brown pubescent on both the surfaces, persistent. Calyx-tube 3-4 mm long, obconical, finely brown pubescent; lobes 4, pinkish (3 smaller and 1 larger), 6×2-3 mm, ovate, brown pubescent on both the surfaces. Petals 5, white or pink, 4-5×2.5 mm, clawed, glabrous. Stamens 5, filaments 1-1.5 cm long, glabrous; anthers 3 mm long. Ovary 5 mm long, linear, densely brown pubescent, upto 4-ovuled; style 10 mm long, filiform, pilose at base; stigma capitate. Pods 6-12×2-3.5 cm, compressed, veined, glabrous. Mature seeds not seen.

References:

1. Sanjappa, M. (1986). A revision of the genus *Humboldtia* Vahl (Fabaceae-Caesalpinioideae). *Blumea* 31 : 329-339.
2. Thwaites, G. H. K. (1864). *Enum. Plant. Zeylaniae*, p. 97. London.
3. Vahl, M. (1794). *Symb. Botanicae* 3 : 39. (sub *Batschia laurifolia* Vahl).
4. Wight, R. (1850). *Icon. Plant. Ind. Orient.* 4 : t. 1605.

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Humboldtia laurifolia Vahl

Status: Rare. The holotype of the species was collected from Dwarka, in Saurashtra in 1953. It was last collected from Hingolgadh in Gujarat in 1977. So far known with a restricted distribution in Gujarat and Rajasthan. It is becoming rare especially in coastal areas of Saurashtra due to biotic effects.

Distribution: Gujarat (Kutch : Bhadreswar ; Saurashtra), Rajasthan (Pali). Endemic.

Habitat and Ecology: On sandy soil in coastal areas of Saurashtra and hard sandy to gravelly soil in arid region of Kutch and Rajasthan.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: (i) It is suggested that along with habitat conservation, a few plants should be introduced into experimental/Botanic gardens. (ii) Control on tourist movements in its distributional sites in coastal areas of Saurashtra.

Biology and Potential Value: It flowers during October-November. Phyto-chemically, leaves and root-bark contain alkaloids while stem, leaves and stem-bark possess saponins. Other species like *Indigofera tinctoria* L. yield dye.

Cultivation: None so far.

Description: Erect undershrubs or shrubs, 90-150 cm high. Stems and branches argento-canescent. Leaves 7-9-foliolate: leaflets opposite, obovate or sub-orbicular, rounded or emarginate at apex, cuneate at base, glabrous above, white adpressed-pubescent beneath, terminal one larger than lateral ones. Flowers red, upto 50 in number, in axillary, lax racemes. Pods somewhat sickle-shaped, densely white pubescent, glabrous at length, 1-seeded. Seeds reniform, olive-green.

References:

1. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K., *Materials for a Catalogue of Threatened Plants of India*, p. 45. Botanical Survey of India. Howrah.

2. Sabnis, S. D. & Rao, K. S. S. (1983). *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*, p. 73. Botanical Survey of India. Howrah.

3. Santapau, H. (1952). *Proc. Nat. Inst. Sci.* 24B : 135. t. 2.

4. Santapau, H. (1962). *The flora of Saurashtra* 1 : 130. Saurashtra Research Society, Rajkot.

5. Sanjappa, M. (1984). Endemic species of Indian *Indigofera* L. (Fabaceae-Papilionaceae) and their distribution. *J. Econ. Tax. Bot.* 5 : 1030.

6. Shah, G. L. (1978). *The Flora of Gujarat State.* S. P. University Press, Vallabh-Vidyanagar.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status: Rare; restricted to a few localised pockets on hills or ghats. As far as is known there are only few populations all of which are small. In India the rarity of the species may be due to competition for survival with the gregariously spreading exotic *Eupatorium* sp.

Distribution: Endemic to India and Sri Lanka. In India it is confined to 5 localised habitats in Goa, Karnataka and Kerala; and Matale in Northern hill ranges of Sri Lanka. It was described based on gatherings from Sri Lanka in 1864 (1) and was not known to have been collected since then. In India the last collections were made in 1964.

Habitat and Ecology: In fully exposed areas on hill slopes. However, a collection has also been made from among undergrowth in moist deciduous forests.

Conservation Measures Taken: None so far

Conservation Measures Proposed: (a) Attempts should be made for a thorough assessment of the populations in known habitats. (b) To study the interaction of the species with *Eupatorium* sp. which possibly may help in planning conservation.

Biology and Potential Value: Not known.

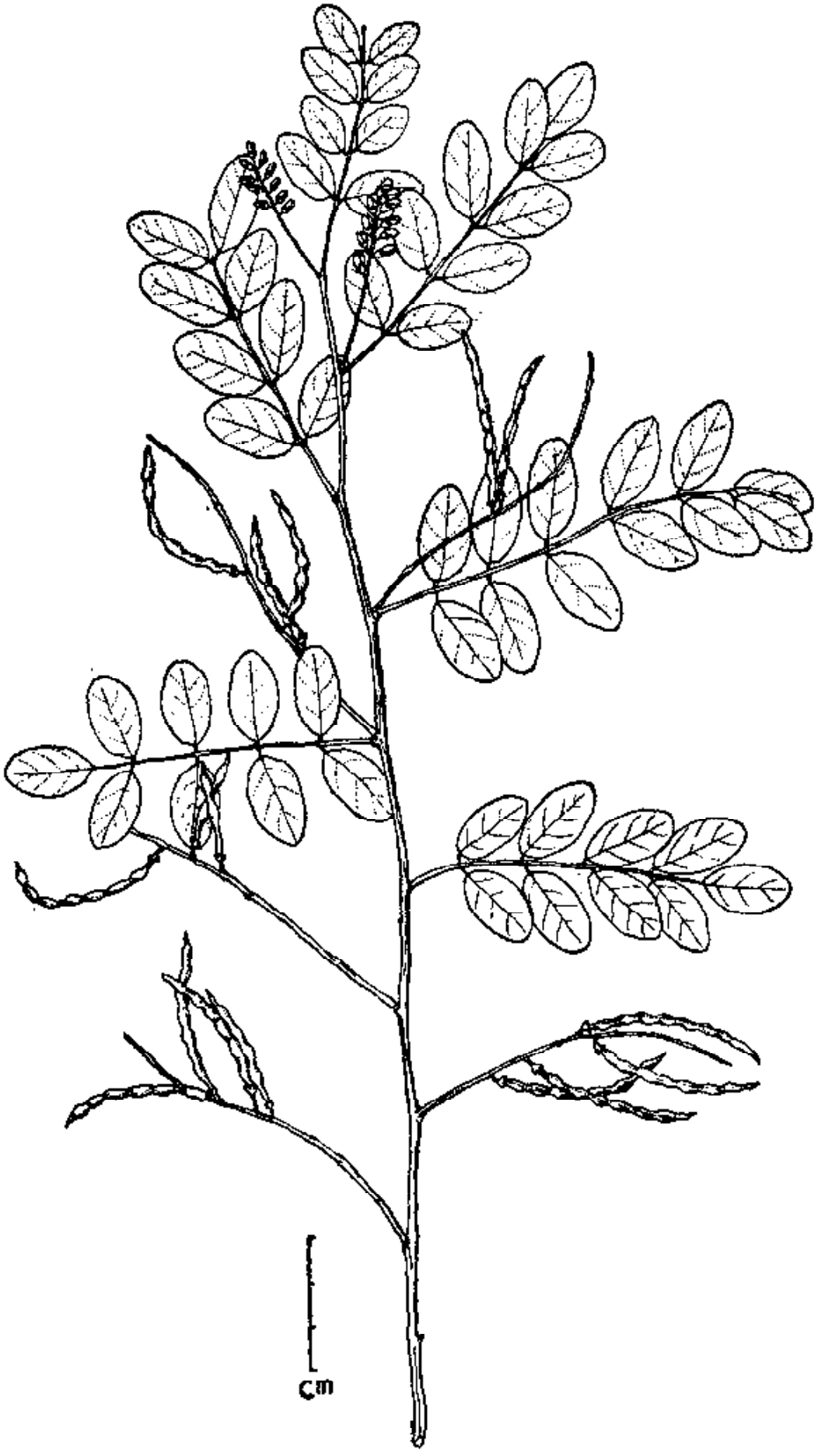
Cultivation: Not known to have been cultivated.

Description: Erect shrub, 60-125 cm tall; branches divaricate, angular, thinly scabrid. Leaves 7-12 cm long including 1-1.5 cm long petiole; stipules 1 mm long, subulate, pubescent without, caducous; rachis grooved above, scabrous, 7-11-foliolate; leaflets 2-2.7×1-1.2 cm, elliptic, obtuse at base and apex, mucronate, adpressed pubescent on both surfaces; petiolule 2 mm long. Racemes 5-8 cm long including 1-1.5 cm long peduncle, axillary; rachis angular, scabrous, many-flowered. Flowers 5-7 mm long, pink; pedicles 1.5 mm long, scabrous; bracts 1 mm long, caducous; calyx campanulate, 5-lobed, scabrous; lobes 1 mm long, linear, acute at apex; standard 5.5-7×3-4 mm, elliptic or obovate, obtuse and mucronulate at apex, strigulose without; wings 5-5.5 mm long, ciliate along margins; keels 5.5-7 mm long, obovate, attenuate at base, obtuse at apex, strigulose without, spurred on sides; stamens 9+1; filaments 7 mm long, anthers basifixed, pilose at base, apiculate; ovary 3.5-5 mm long, linear, thinly hairy, 6-8-ovuled; style 1-2 mm long, glabrous; stigma capitate. Pods upto 6 per rachis, always spreading laxly from above the middle, 3-5×0.2-0.3 cm, slightly curved, constricted between seeds, adpressed pubescent; seeds 4-8, 1.5×1.5 mm, ellipsoid, somewhat quadrangular, rounded at ends.

Reference:

1. Thwaites, G. H. K. (1864). *Enum. Plant. Zeylanicae.*

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Indigofera constricta (Thw.) Trimen

Status: Rare. The species is restricted to a very narrow range in the Eastern Ghats. Overgrazing by cattle appears to be one of the major threat factors.

Distribution: Endemic to Anantapur, Chittoor and Cuddapah districts in Eastern Ghats. It is so far known from Renukonda (Anantapur) and Kodur (Cuddapah) hills only by the solitary collections made by Beddome. Gamble reported it from Bellary, but no specimens from that area could be traced. Gamble collected it from Horseleykonda in Chittoor district in July 1884 and Fischer also collected it from the same locality in September 1918. Subba Rao located it in the vicinity of Jabala Theertham, Chittoor, in December 1975. Subsequently Raju and Ahmedullah located it in Tirumala hills in January 1983 and yet again in March 1985.

Habitat and Ecology: The species occurs in small gregarious patches widely scattered on the exposed dry rocky slopes and outcrops of the hills between 1000-1350 m altitude. It forms a component of the dry deciduous scrub forests of the Tirumala hills at *ca* 1050 m altitude. Apparently this species thrives in dry conditions.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Intensive surveys should be undertaken for the purpose of monitoring all the existing populations of this wild legume. The need for conserving the rich genetic diversity of the Tirumala hills has already been underlined before (1, 4, 5,). Establishment of a 'Plant Sanctuary' in the Tirumala hills is urgently warranted.

Biology and Potential Value: Phenological data is scant; it appears to flower and set fruit almost throughout the year. Other wild legumes of the same genus are known to be useful. *R. minima* is useful for soil enrichment by virtue of its bacterial nodules; it is used as a fodder plant while its seeds are reportedly toxic to fish. *R. cana*, *R. capitata* and *R. aurea* are used as green manure. The potential of *R. beddomei* in similar spheres of utility needs to be examined. The possibility of it being used for reclamation of semi-arid wastelands must also be looked into.

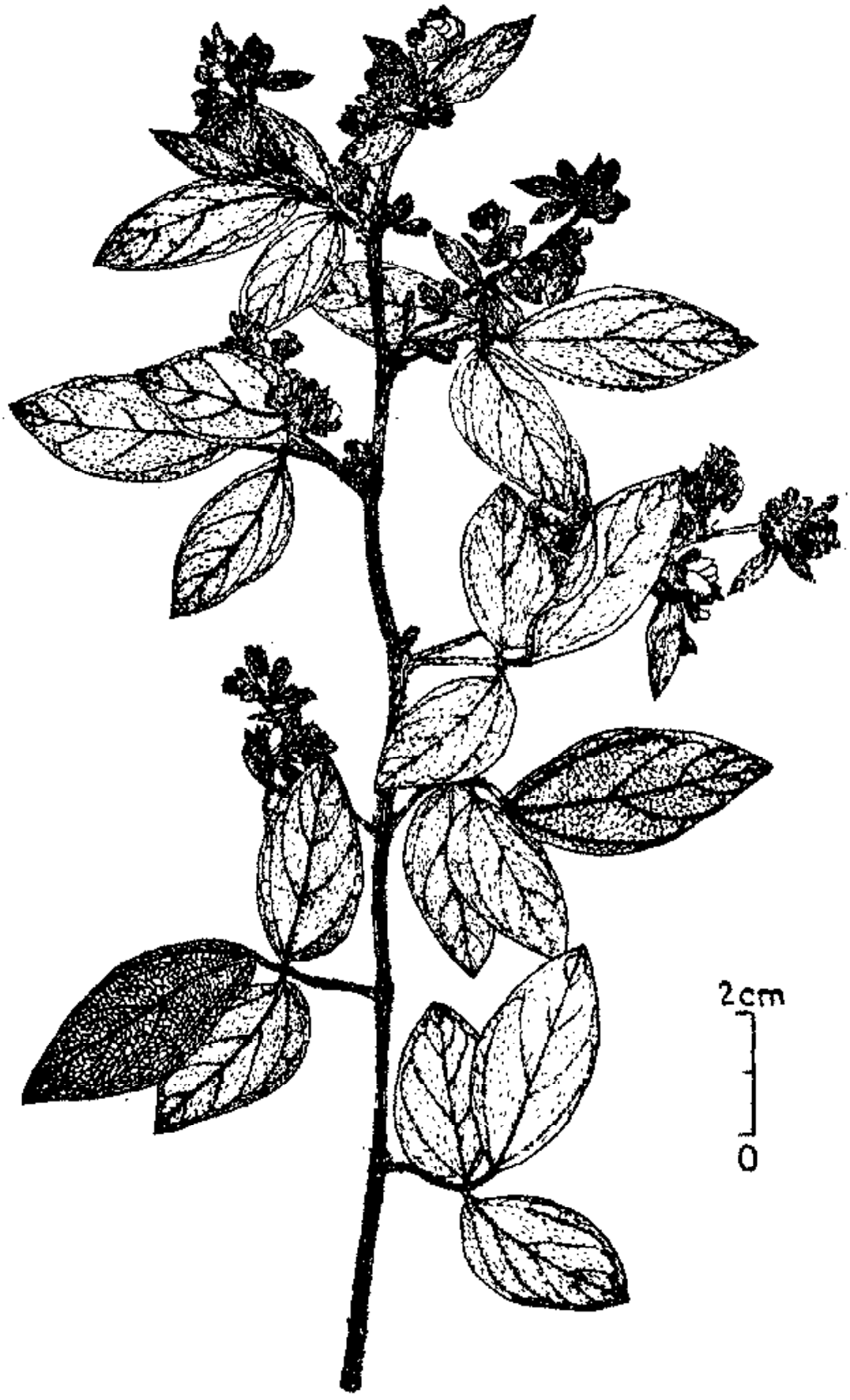
Cultivation: Not known.

Description: Undershrbs with white canescent branches. Leaves 3-foliate; leaflets 3.0-4.5×1.7-2.0 cm, ovate or lanceolate, apex acute, subcoriaceous, reticulate, silky white pubescent on both surfaces, densely so beneath. Flowers bright yellow, in short racemes. Calyx lobes oblong, obtuse, larger than the corolla, the lowest shortest. Pods suborbicular, 1-seeded.

References:

1. Ahmedullah, M. & Nayar, M. P. (1987). *Endemic plants of the Indian region* 1 : 101. Botanical Survey of India, Calcutta.
2. Baker, J. G. (1876). *In :* Hooker, J. D., *Fl. Brit. India* 2 : 222.
3. Gamble, J. S. (1957) *Fl. Pres. Madras* 1 : 264 (repr. ed.)
4. Nayar, M. P., Ahmedullah, M. & Raju, D. C. S. (1984). Endemic and rare plants of Eastern Ghats. *Ind. Journ. For.* 7 : 35-42.
5. Nayar, M. P., Ahmedullah, M. & Raju, D. C. S. (1986). The dwindling flora of Andhra Pradesh—A call for conservation. *Ibid.* 9(4) : 283-286.

The material for this sheet was supplied by M. P. Nayar, M. Ahmedullah and D. C. S. Raju, Botanical Survey of India, Calcutta.



Rhynchosia beddomei Baker. Habit.

Status: Vulnerable. The gradual shrinkage of its natural habitats being brought about by the growing pressures of urbanisation is the apparent cause of its rarity. No other specific threat factors are known as yet.

Distribution: Endemic to the eastern coast (Thanjavur, Tirunelveli ?, Kanniyakumari) of South India. The species is based on Wight's collection from Nagapattinam in Thanjavur district of Tamil Nadu. Baker reported it from the Nilgiri hills(2), but no representative specimen could be traced nor could fresh collections be made from that area in recent years. Gamble reported it from "Tanjore and Tinnevelly" (3). Subsequent to the type collection, it was collected "after a lapse of over 100 years" (4) by Henry from Vivekanandapuram, Kanniyakumari district, in January 1978.

Habitat and Ecology: The species forms a component of the coastal vegetation and is found growing "on sandy soil along the inland coast of Bay of Bengal"(4).

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Attempt must be made to locate the populations of this rare species along the eastern coast of South India. Specific threat factors must also be identified. Protection of coastal ecosystems along the Indian coastline in general is a prerequisite to the conservation of individual rare plant populations in coastal ecosystems.

Biology and Potential Value: Information on the biological aspects of the species is not available. Other species of the genus (e.g. *R. aurea, R. cana, R. capitata, R. minima, R. rufescens*) are known to have some uses (1). The potential uses of *R. velutina*, if any, are not yet known.

Cultivation: Not known.

Description: Trailing or climbing herbs. Leaves trifoliate; leaflets 2.5×3.0 cm, suborbicular, subcoriaceous, apex mucronate, cuneate or deltoid at base, minutely pubescent above, hoary grey-pubescent beneath. Flowers in axillary, 2-4-flowered short racemes. Pods 3.5×1.0 cm, much curved, attenuate at base, sparsely puberulous, 2-seeded. Seeds *ca* 5 cm in diameter, obreniform, smooth, brown.

References:

1. Anon. (1972). *The Wealth of India : Raw materials* 9 : 23-24. CSIR, New Delhi.

2. Baker, J. G. (1876). *In :* Hooker, J. D., *Fl. Brit. India* 2 : 224.

3. Gamble, J. S. (1957). *Fl. Pres. Madras* 1 : 264 (repr. ed).

4. Henry, A. N. & Swaminathan, M. S. (1979). Rediscovery of *Rhynchosia velutina* Wight & Arn. (Papilionaceae) and *Toxocarpus beddomei* Gamble (Asclepiadaceae). *Bull. Bot. Surv. India* 21 (1-4) : 227-228.

5. Wight, R. & Arnott, G. A. (1834). *Prodr. Fl. Penin. Ind. Orient.*, p. 238.

The material for this species was supplied by M. P. Nayar and M. Ahmedullah, Botanical Survey of India, Calcutta.

Status: Rare.

Distribution: Khandala, Mahabaleshwar, Amboli in Maharashtra. Endemic to Western Ghats, apparently in Maharashtra.

Habitat and Ecology: In open situations on rocky plains in the hills.

Conservation Measures Taken: None.

Conservation Measures Proposed: Propagation of this species in the experimental gardens and protection of some of its habitats should be attempted.

Biology and Potential Value: Not known.

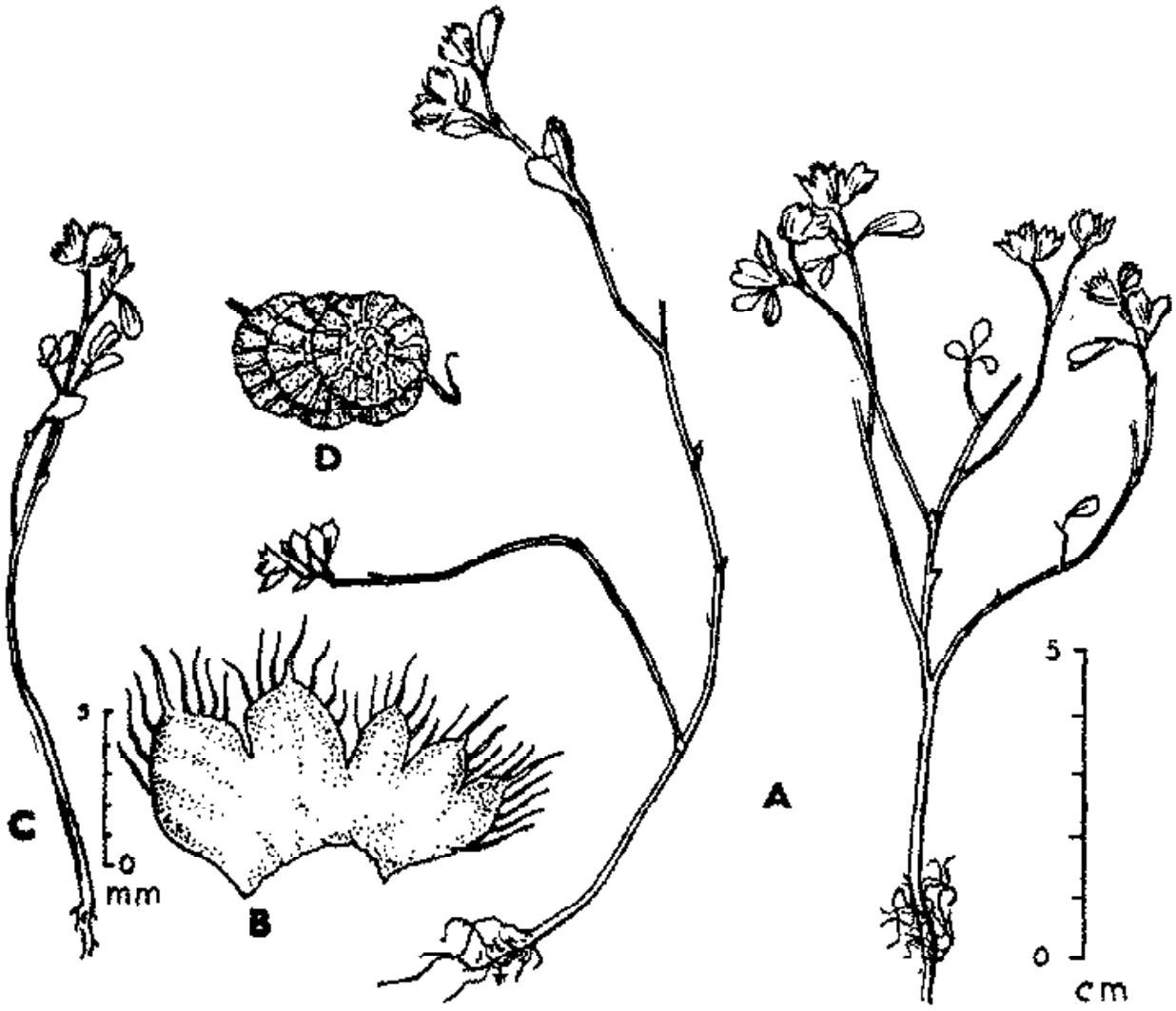
Cultivation: None on record.

Description: Erect or suberect annual herbs, 9-20 cm tall; stem dichotomously branched, bristly in the upper parts; leaflets (1-) 2-3 pairs, subsessile, 0.5-1.2 × 0.2-0.5 cm, oblong, obtuse, bristle-tipped at apex, narrowed at base. Inflorescence racemose, terminal or axillary; bracts ovate, scarious, bristle-tipped. Flowers yellow, 2-6, crowded; calyx 2-lipped, green, equal, anastomosely venied; petals 0.6-0.8 cm long, standard with 2 red spots. Pods 3-5-jointed, straw to brownish coloured when dry, joints folded and included in accrescent calyx, 0.3-0.5 cm across, orbicular, centre turgid, border ribbed. Seeds reinform, yellowish-brown, smooth.

Reference:

1. Hemadri, K. (1971). Two new species of Fabaceae from India. *Ind. For.* 97(1): 67-69. fig. 4-8.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.



Smithia agharkarii Hemadri. A. Habit. B. Bract. C. Fruiting plant. D. Pods.

Status: Rare. So far known from Gujarat from sporadic collections only. The holotype was collected at Rozi near Jamnagar in 1945. The species was last collected from Broach (S. Gujarat) in 1972. The rarity of the species is due to habitat destruction, grazing and other biotic effects.

Distribution: Gujarat (Jamnagar, Bhad-bhut, Broach, Udhna). Endemic.

Habitat and Ecology: It grows usually on sandy-loamy soil near river banks and occasionally in moist places near cultivated fields.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: (i) Efforts should be made to preserve the natural habitat (ii) Introduction of the species in Botanic Gardens.

Biology and Potential Value: Flowers during August-October. The plant is of scientific interest due to its endemicity; other species like *Tephrosia purpurea* (L.) Pers., are sometimes grown as green manure and as cover crop (3). Similarly, the present species may also have such utility.

Cultivation: None so far.

Description: Erect or sub-erect, hairy herbs, 20-40 cm high. Leaves simple, linear-lanceolate, apiculate at apex, sub-acute at base, densely silvery-pubescent beneath. Flowers purple, axillary, on densely hairy peduncles, single or in pairs. Pods compressed, densely grey-pubscent, apiculate at both ends, upto 20×5 mm; seeds 5-6, brownish, reniform.

References:

1. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K. (*ed.*) *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 45.

2. Santapau, H. (1958). *Proc. Nat. Sci. India* 24B : 133. t.1.

3. Santapau, H. (1962). *Fl. Saurashtra* 1 : 134. Saurashtra Research Society, Rajkot.

4. Santapau, H. & Henry, A. N. (1973). *Dictionary of flowering plants of India.* C. S. I. R., New Delhi. p. 169.

5. Shah, G. L. (1978). *The Flora of Gujarat State* 1 : 248. S. P. University Press, Vallabhvidyanagar.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Endangered due to destruction of habitat.

Distribution : So far known only from Hills of Visakhapatnam district, Andhra Pradesh.

Habitat and Ecology : Herbs on laterite and rocky soil at about 1300 m altitude.

Conservation Measures Taken : None known.

Conservation Measures Proposed : Protection of its habitats.

Biology and Potential Value : Endemic and of academic interest.

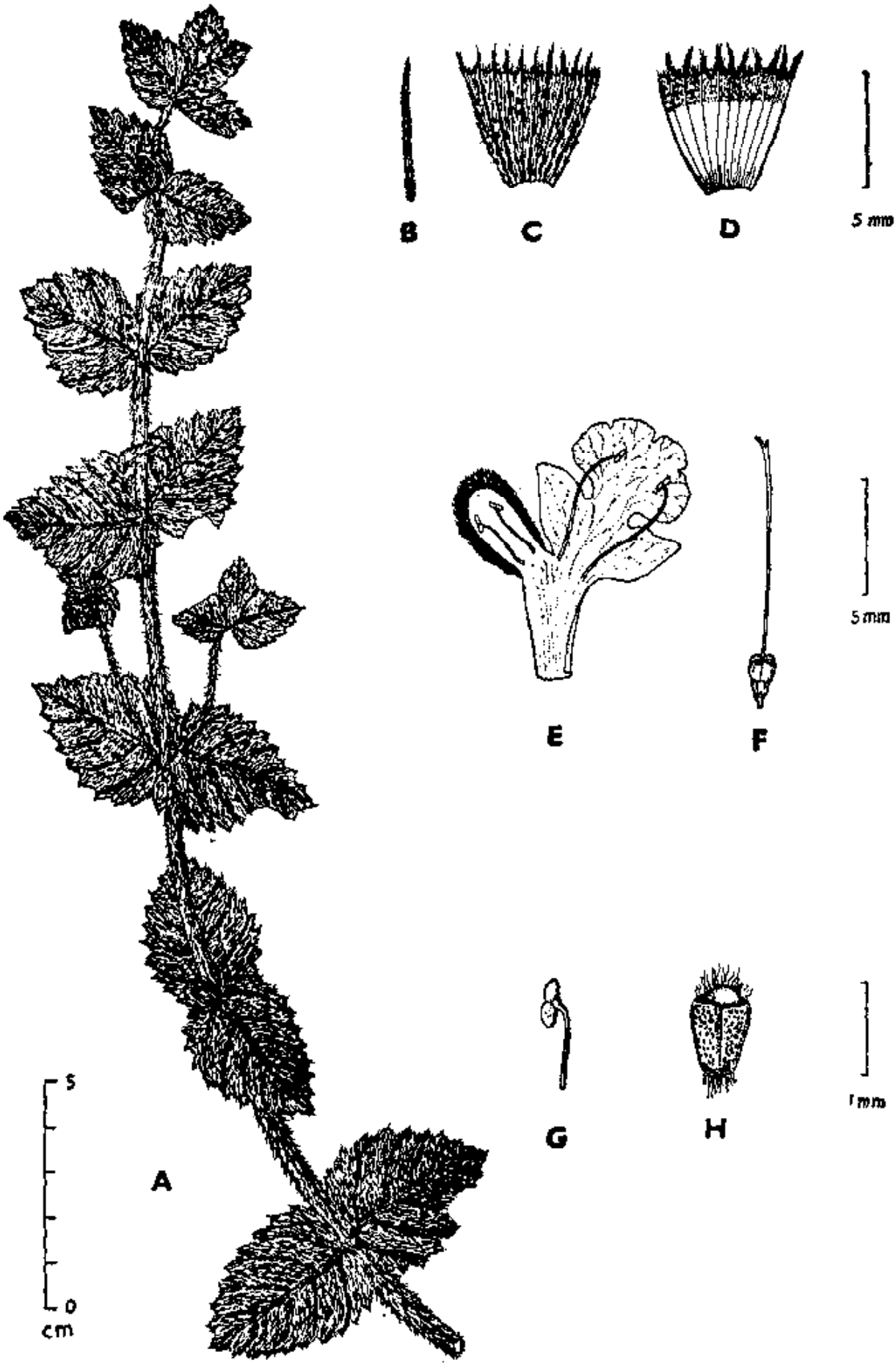
Cultivation : Not known.

Description : Decumbent herbs, *ca* 45 cm high; stems quandrangular, covered with white, deflexed, silky-villous hairs. Leaves sessile, opposite, decussate, upto 3.7 × 3.4 cm, thick, ovate, cordate, dentate, densely velvety on both sides. Inflorescence in whorls, axillary, few to many flowered. Bracts filiform, villous, often equalling calyx-tube. Calyx-tube 0.5 cm long, straight, prominently 10-nerved, villous without and at throat; teeth 10, filiform, ciliate, unequal, much longer than villi of throat. Corolla white, upto 1.1 cm long, tube naked within; upper lip concave, covered with white stiff hairs without, lower lip 3-lobed, middle lobe larger, emarginate. Stamens didynamous, upper pair shorter, ascending under upper lip. Disc 4-lobed, lobes equal. Ovary 4-lobed; style gynobasic, bifid, upper lobe minute. Nutlets 4, each upto 0.1 cm long, triquetrous, obovoid, grey, rugose, dull and hairy at top and base.

Reference :

1. Subba Rao, G. V. & Kumari, G. R. (1969). *Bull. Bot. Surv. India* 10 : 358-359.

The material for this sheet was supplied by G. V. Subba Rao and G. R. Kumari, Botanical Survey of India, Coimbatore.



Leucas mukerjiana Rao *et* Kumari. A. Habit. B. Bract. C. & D. Calyx-outer & inner sides. E. Corolla. F. Pistil. G. Stamen. H. Seed.

Status : Endangered. Known only from type collection made by Bourne in 1897 from shola forests of Kodaikanal in the Pulneys. No subsequent record of its occurrence is available. Possibly this endemic species might have already become extinct due to habitat loss.

Distribution : India, Tamil Nadu, Madurai district : Pulney hills, Kodaikanal. Endemic.

Habitat and Ecology : Evergreen shola forests at about 1800 m (4), in porous soil rich in organic matter.

Conservation Measures Taken : None.

Conservation Measures Proposed : Intensive search should be made in the type locality and neighbouring areas. If relocated efforts should be taken to protect the plant in its natural habitat.

Biology and Potential Value : This species is of botanical interest on account of its very narrow endemic distribution. Flowers in June and fruits subsequently.

Distribution : A small tree; branches, leaves and flowers fulvous-tomentose. Leaves 4 or 5, in whorls, 6-12×3-5 cm, elliptic-lanceolate, shortly acuminate at apex, cuneate at base. Inflorescence axillary or lateral. Male flowers in umbels; perianth short, 5-lobed, ovate, obtuse. Female flowers umbelled or subracemose on a short stout peduncle. Fruit ellipsoid, seated on the persistent much thickened sub-campanulate, entire perianth tube (2, 3, 4).

References :

1. Ahmedullah, M. & Nayar, M.P. (1987). *Endemic plants of the Indian Region* 1 : 64. BSI, Calcutta.

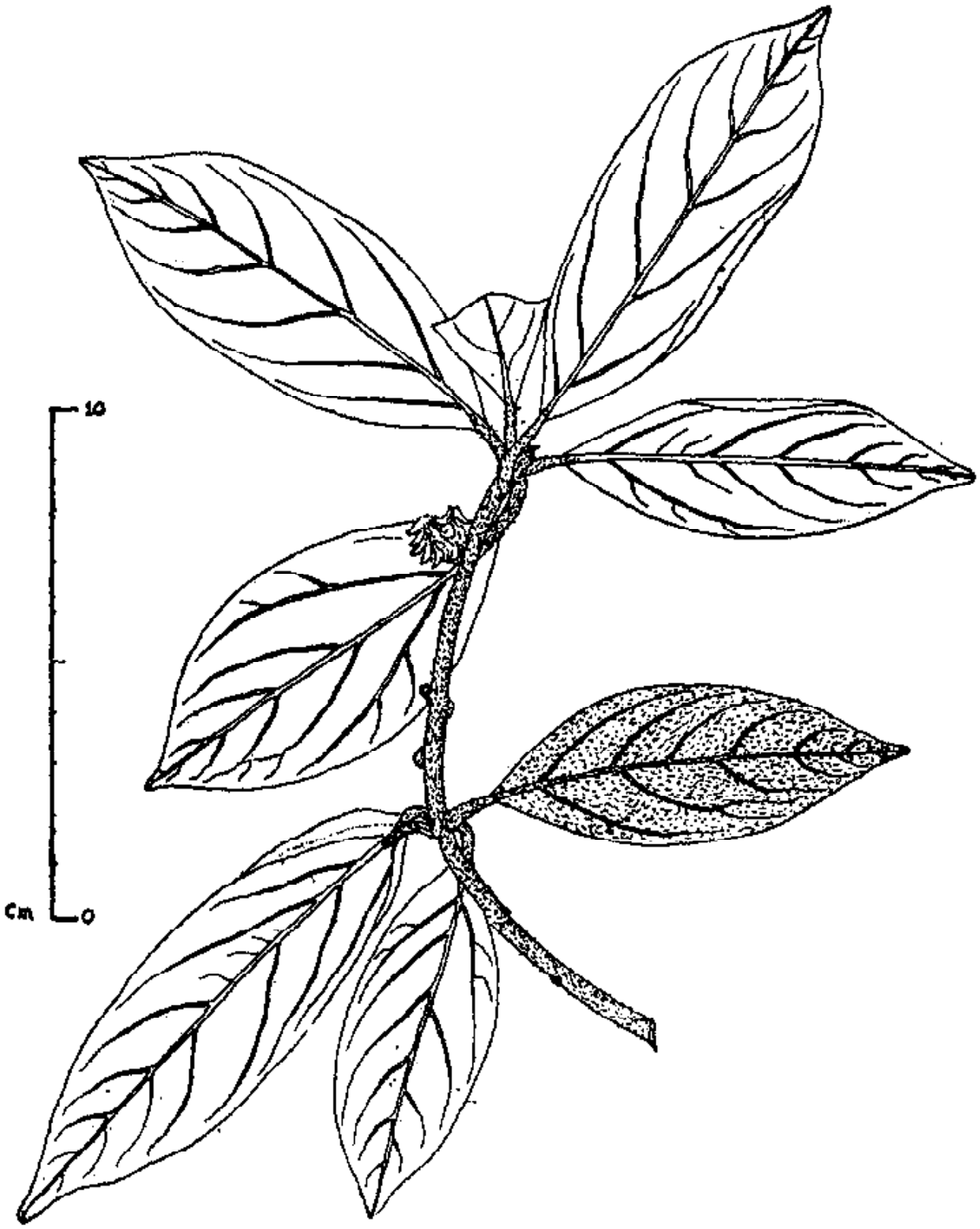
2. Fyson, P.F. (1932). *The Flora of the South Indian Hill Stations* 1 : 505.

3. Gamble, J.S. (1925). *Kew Bull.* 1925 : 128.

4. Gamble, J.S. (1957). *Fl. Pres. Madras* 2 : 861 (repr. ed.).

5. Vajravelu, E. & Daniel, P. (1983). *In:* Jain, S. K. & Sastry, A.R.K. (ed.). *Materials for a Catalogue of Threatened Plants of India.* BSI, Howrah. p. 33.

The material for this sheet was supplied by A. N. Henry and V. Chithra, Botanical Survey of India, Coimbatore.



Actinodaphne bournese Gamble

Status : Endangered. The original material was collected by Robert Wight from the Nilgiris; lastly observed in the same locality by J.S. Gamble in the year 1889. No subsequent record of its occurrence is available. This endemic species might have been lost due to destruction of habitat.

Distribution : India, Tamil Nadu : endemic to the Nilgiris. Meisner incorrectly reports this from "Ceylon" (4).

Habitat and Ecology : In shola forests from 1500 to 1800 m (2).

Conservation Measures Taken : The areas where this species occurs have been included in the Nilgiri Biosphere Reserve.

Conservation Measures Proposed : Intensive exploration should be conducted to relocate this species. If located steps must be taken to introduce it in other parts of the forest having similar habitat and in botanic gardens.

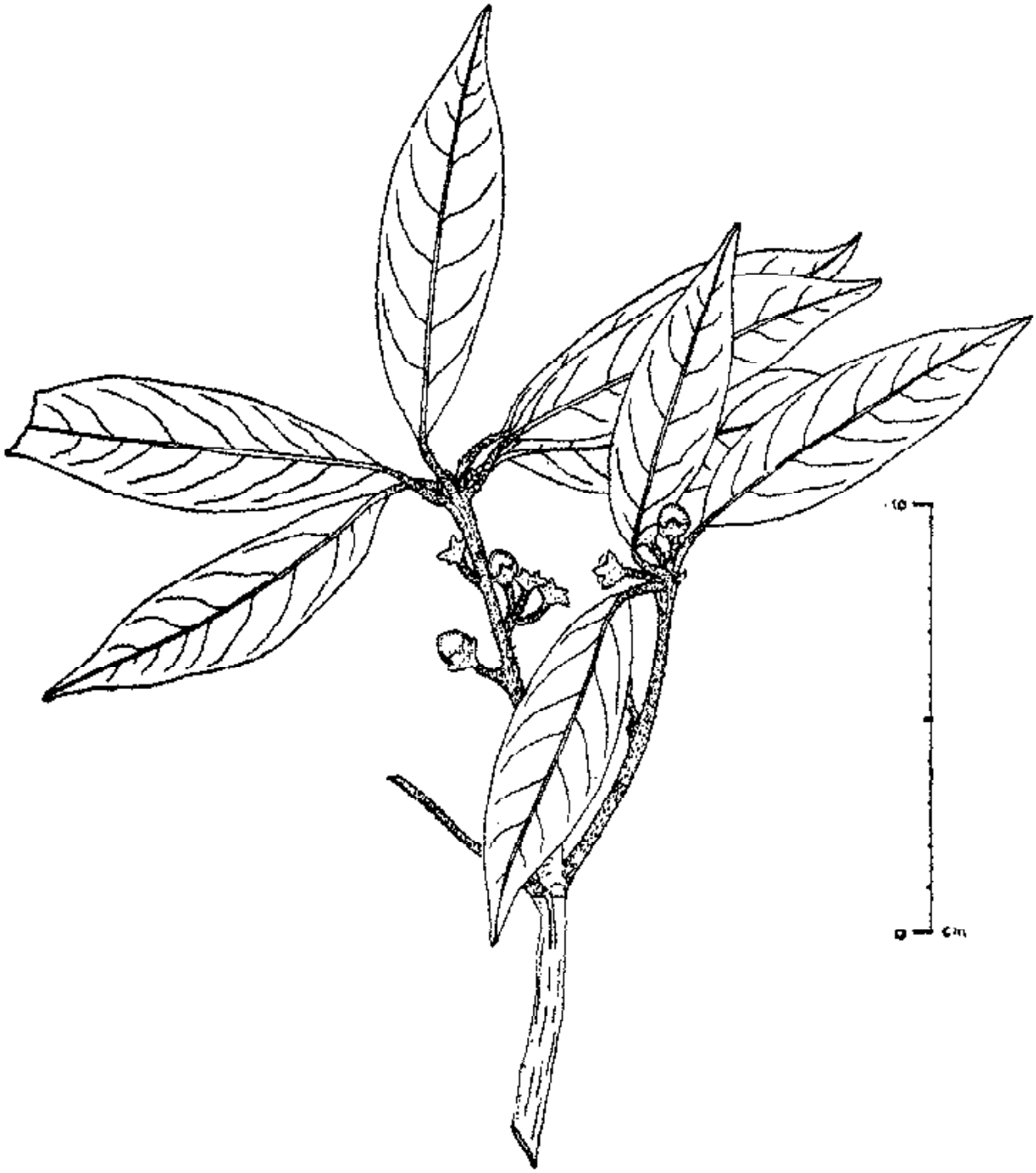
Biology and Potential Value : A species of scientific interest on account of its geographical isolation.

Description : An evergreen tree. Leaves 5-7, in whorls, 5.5-11.5×1.2-2.7 cm, lanceolate, acuminate, coriaceous, more or less glaucous beneath, young leaves rusty-tomentose. Female flowers in sessile umbels. Berries black, globose. Male flowers not yet known (2, 3).

References :

1. Ahmedullah, M. & Nayar, M.P. (1987). *Endemic Plants of the Indian Region* 1 : 64. BSI, Calcutta.
2. Brandis, D. (1921). *Indian Trees, p.* 534.
3. Gamble, J.S. (1957). *Fl. Pres. Madras* 2 : 861 (repr. ed).
4. Hooker, J.D. (1886). *Fl. Brit. India* 5 : 149.
5. Meisner, C.F. (1864). *In : DC, Prodr.* 15(1) : 218.
6. Sharma, B.D., *et. al.* (1977). *Biological Memoirs* 2(1&2) :.122.
7. Vajravelu, E. & Daniel, P. (1983). *In :* Jain, S.K. & Sastry, A.R.K. (ed.). *Materials for a Catalogue of Threatened Plants of India.* BSI, Howrah, p. 33.

The material for this sheet was supplied by A.N. Henry and V. Chithra, Botanical Survey of India, Coimbatore.



Actinodaphne lanata Meisn.

Status : Rare. Endemic to the Nilgiris and adjoining regions of W. Ghats. The greatest source of danger to this species is the destruction of habitat for cultivation of plantation crops.

Distribution : India. Tamil Nadu : Nilgiris; Kerala : South- East Wynaad.

Habitat and Ecology : Evergreen forests from 1000 to 1800 m.

Conservation Measures Taken : Its natural habitats are included in the Nilgiri Biosphere reserve.

Conservation Measures Proposed : None.

Biology and Potential Value : Occurs in isolation on hill range only and hence of distributional interest.

Description : A small tree; branchlets rufous-tomentose. Leaves 5 to many in whorls, 7-18×2.4-6.7 cm, chartaceous, obovate-oblanceolate, obtuse or subacute at apex, attenuate at base, rufous-tomentose. Inflorescence lateral; peduncle rufous-tomentose. Female flowers 6-8, in umbels; perianth cup-shaped, deciduous (2, 3).

References :

1. Ahmedullah, M. & Nayar, M.P. (1987). *Endemic plants of the Indian Region* 1 : 64. BSI, Calcutta.

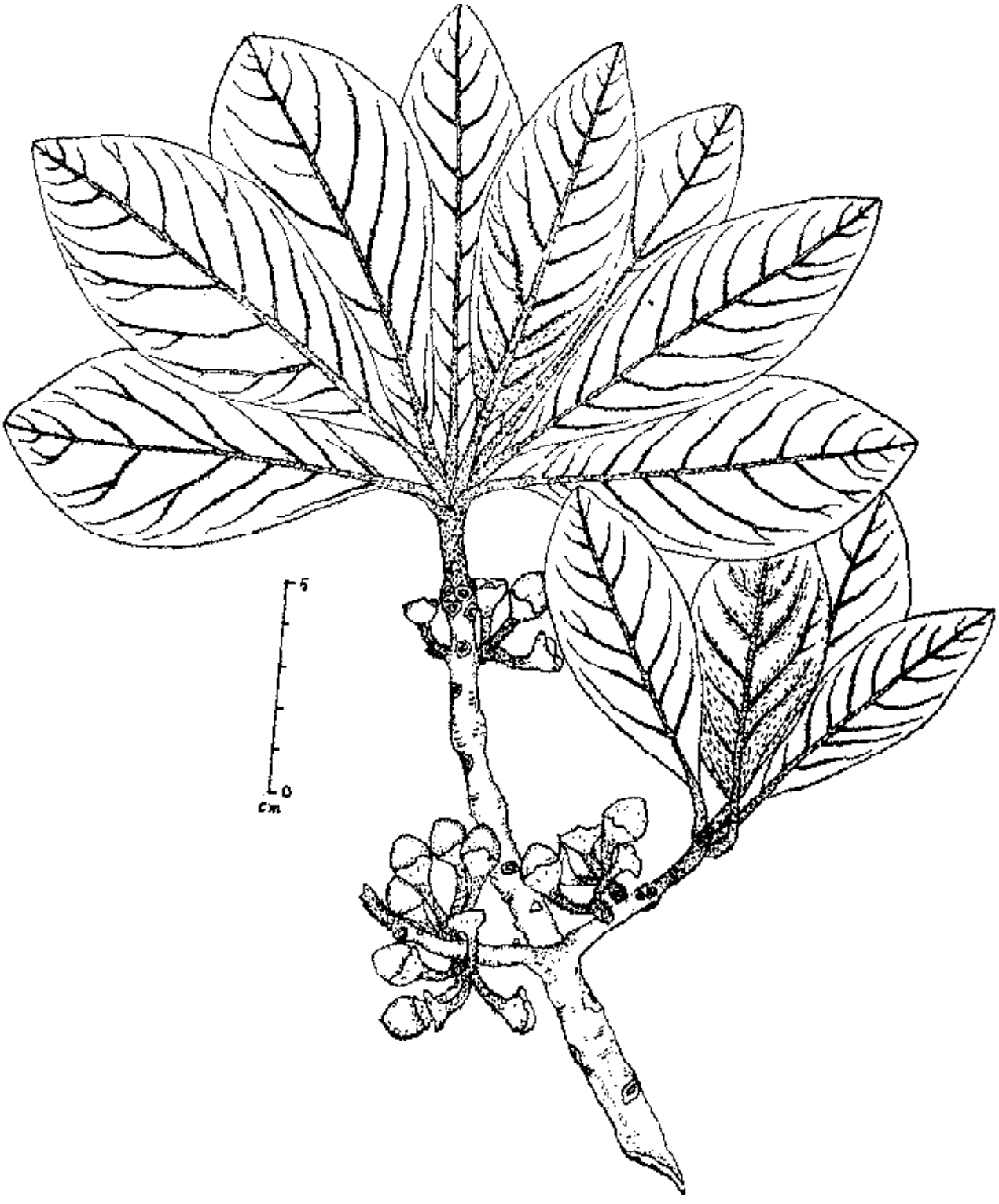
2. Gamble, J.S. (1925). *Kew Bull.* 1925 : 129.

3. Gamble, J.S. (1957). *Fl. Pres. Madras* 2 : 862. (repr. ed.).

4. Sharma, B.D., *et. al.* (1957). *Biological Memoirs* 2(1&2) : 122.

5. Vajravelu, E. & Daniel, P. (1983). *In :* Jain, S. K. & Sastry, A.R.K. (ed.). *Materials for a Catalogue of Threatened Plants of India.* BSI, Howrah. p. 33.

The material for this sheet was supplied by A. N. Henry and V. Chithra, Botanical Survey of India, Coimbatore.



Actinodaphne lawsonii Gamble

Status : Rare. The species is restricted to Gujarat and Maharashtra with sporadic occurrence. The holotype was collected in 1954 at Borivili in the Island of Salsette, near Bombay. Thereafter, it was known from Krishnagiri National Park at Borivili and Kanheri caves near Bombay. Lastly, it was reported by Shah and Suryanarayana (1968) from a single locality in Gujarat as occasional. The species is becoming rare due to biotic effects.

Distribution : Gujarat (Ahwa in Dangs) and Maharashtra (Borivili, Kanheri Caves). Endemic.

Habitat and Ecology : It grows in moist places in plains and lower hill slopes of Krishnagiri National Park and Salsette Island at Borivili and on hilly slopes of Ahwa forests at Dangs, Gujarat. It was found associated with *Chlorophytum tuberosum* Baker.

Conservation Measures Taken : The habitat of the species is included in the Krishnagiri National Park at Borivili.

Conservation Measures Proposed : (i) All efforts should be made to protect the plants from biotic effects. Though it is growing in Krishnagiri National Park, but the Park has become a place for public entertainments etc. Stringent conservation measures to its habitat suggested. (ii) Needs introduction and protection in Botanic Gardens also.

Biology and Potential Value : It flowers in June. Roots of allied species like *Chlorophytum tuberosum* Baker are edible and its leaves used as a vegetable. Some other species of *Chlorophytum* are cultivated in gardens for their ornamental flowers. Its potential as a horticultural plant should be studied.

Cultivation : None so far.

Description : Rhizomatous herbs with 1-9 sessile root-tubers upto 5 cm long, 1cm in diam. Leaves radical, coriaceous, spirally imbricate at base, sessile, linear, lorate or ensiform, acute, flat, 8-22 × 0.7-1.8 cm. Flowers in a raceme, white, 2.5-3.5 cm across, bracteate, pedicellate, in clusters of 3; bracts linear, papery, purplish. Capsules greenish-yellow, obcordate, triquetrous, loculicidal. Seeds orbicular, discoid, black.

References :

1. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 48.

2. Santapau, H. & Fernandez, J. (1955). *J. Bombay Nat. Hist. Soc.* 52 : 897. ff. A-F.

3. Santapau, H. & Henry, A. N. (1973). *Dictionary of flowering plants of India*. C.S.I.R., New Delhi. p. 3.

4. Shah, G. L. (1978). *The Flora of Gujarat State* 2 : 680. S. P. University Press, Vallabh-vidyanagar.

5. Shah, G. L. (1983). *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 51.

6. Shah, G. L. & Suryanarayana, B. (1966). *J. Bombay Nat. Hist. Soc.* 63(3) : 778.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Vulnerable.

Distribution : Maharashtra State. Endemic.

Habitat and Ecology : On gravelly, grassy hill tops.

Conservation Measures Taken : None.

Conservation Measures Proposed : (i) To grow the bulbs in Botanic gardens. (ii) To declare Trombay hills, Shivneri hills and Panchgani as conserved areas.

Biology and Potential Value : It is a member of the genus *Dipcadi* Medik. which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It belongs to the same tribe in which the alkaloid yielding plants, *Urginea indica* Kunth and *Scilla hyacinthina* Macbride belong and may so this be also a potential alkaloid yielding species.

Cultivation : It is in cultivation in the experimental garden, Botanical Survey of India at Pune.

Description : Bulbous scapigerous herbs, about 15-30 cm long. Bulbs *ca* 20 mm across, globose, tunicated. Leaves linear, longer than scape, arising from the scape of the bulb. Flowers small, fragrant, white to plae-cream or orange, often greenish outside, 6-14, in terminal racemes, gamophyllous; perianth in two whorls, outer 3 united upto 1/3 of the length from the base and inner 3 united upto 2/3 of the length from the base forming a tube. Stamens 6, at the throat of the tube, filaments very short, anthers oblong or linear-oblong, dorsifixed, ovary obovoid-oblong, style as long as ovary. Capsule as long as broad, trilobed, loculicidally dehiscent. Seeds semiorbicular, compressed, glossy, black.

References :

1. Blatter, E. & McCann, C. (1928). Some new species of plants from Western Ghats. *J. Bombay Nat. Hist. Soc.* 32 : 735-736.

2. Mahabale, T. S. & Chennaveeraiah, M. B. (1954). Karyotypes in *Dipcadi* Medik. *Curr. Sci.* 11 : 367.

3. Chennaveeraiah, M. B. & Mahabale, T. S. (1962). Morphological and Embryological Studies in *Dipcadi*. *Plant Embrology*: A *symposium*. C. S. I. R., New Delhi, p. 12-22.

4. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Dipcadi* Medik. (Liliaceae) in India. *J. Bombay Nat. Hist. Soc.* 75:63.

5. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7 : 1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

Status : Rare.

Distribution : Restricted to Dive Ghat, Pune Dist., Maharashtra.

Habitat and Ecology : The plant is found growing on exposed rocky areas and gravelly slopes of Dive Ghats.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : The type locality should be protected and plants be searched in the neighbouring areas. The plants be cultivated in the experimental gardens.

Biology and Potential Value : Not known.

Cultivation : This species is under cultivation in 7-Koregaon Road garden of Botanical Survey of India, Pune.

Description : Scapigerous, bulbous herbs; bulbs ovate or subglobose, 5-7×3-4 cm; leaves (after flowering) narrowly linear, 20-25×0.2-0.3 cm, erect or ascending, fleshy, grooved above. Scapes upto 15 cm long; racemes dense, shorter than leaves. Flowers ascending, perianth lobes reflexed; bracts spurred; perianth 6, in two whorls, elliptic-oblong or oblong. Capsules ovate or elliptic-ovate, trilocular, 0.8-1.0 cm long. Seeds broadly ovate or subglobose, winged, black.

Reference :

1. Ansari, M. Y. (1981). *Drimia razii* sp. nov. (Liliaceae) from Maharashtra, India. *J. Bombay Nat. Hist. Soc.* 78(3) : 572-574. fig. 1-8.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status : Rare. Sporadic and represented by few specimens collected from Himalayan region only.

Distribution : Barnaj Nullah in Kashmir, Simla in Himachal Pradesh, Tsomgo in Sikkim; Bhutan : Mela and Thang Chu—Ritang and Nepal : Arun valley, Kumgrang La.

Habitat and Ecology : On cliffs or on rocks and gravels, amongst moss or grass at 3695-3810 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : Intensive search for the wild populations; introduction of its bulbs in the experimental gardens of the Botanical Survey of India at Pauri and Shillong for multiplication.

Biology and Potential Value: Confined to Himalayas. Its related species *L. serotina* has a wide distribution. Species of *Lloydia* are ornamental plants in temperate gardens.

Cultivation : Not known.

Description : Small, 10-17 cm long, bulbous, leafy herbs. Leaves narrow, few, as long as stem, arising from the bulbs, and a few small on the stem. Flowers solitary, 17-25 mm long, campanulate, greenish-white, terminal. Perianth segments 6, free, lanceolate. Stamens 6, free, less than half the length of the perianth; anthers oblong, basifixed. Pistils of 3 united carpels, longer than stamens, with oblong ovary and long style.

Reference :

1. Royle, J. F. (1839-40). *Illustr. Bot. Himal.*, p. 387-388. t. 93.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

Status : Rare. So far collected from two localities in Arunachal Pradesh and one locality in Burma.

Distribution : Thachu valley and Delei valley in Arunachal Pradesh; Namtamai valley, Burma.

Habitat and Ecology : On rocky alpine meadows or on slopes of ridges at 3048-3695 m altitude, on loamy and granite chips exposed to sunlight, in association with the plants like *Rodgersia, Roscoea, Iris* and *Paphiopedilum*.

Conservation Measures Taken : None on record.

Conservation Measures Proposed : Collection of live plants and conservation in experimental gardens of the Botanical Survey of India at Shillong and Pauri.

Biology and potential value : Like the species of *Lilium* this can be popularised as an ornamental plant. This species together with 4 other species of the section *Lophophora* is distinct from typical *Nomocharis* in its filaments which are like those of *Lilium*.

Cultivation : Not known.

Description : Tall, 60 cm-1m long, bulbous, leafy herbs. Bulbs 3-4×2.5-3.5 cm, ovoid, scaly. Leaves alternate, lanceolate, sessile. Flowers 2-4, apical, pink, irregularly purple-blotched, saucer shaped, bisexual, hypogynous, bracteate, pedicelled. Perianth segments free, 4-5×1.3-2.5 cm, oblong, with a deep coloured bilobed nectary at the base. Stamens 6, as long as 1/4th of the perianth; anthers half the filaments, oblong, dorsifixed. Pistil of 3 unit carpels at the centre, longer than the stamens, ovary as long as style. Capsules obovoid-oblong, 6-lobed, 6-winged with many light brown, compressed seeds.

References :

1. Sealy, J. R. (1950). *Nomocharis* and *Lilium*. *Kew Bull.* 5 : 296.

2. Dasgupta, Syamali & Deb, D. B. (1983). Taxonomic revision of the genus *Nomocharis* (Liliaceae) in India and adjoining region. *J. Econ. Tax. Bot.* 4 : 553.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

Status: Endangered. Known on the basis of several gatherings. It has not been seen anywhere since 1945 though the region has been very thoroughly explored during this period. Due to developmental activities the original habitats might have undergone changes leading to the loss of populations of the species.

Distribution: S. India and Sri Lanka.

Habitat and Ecology: On hills near sea coast.

Conservation Measures Taken: None.

Conservation Measures Proposed: To make a thorough search for the plants in the region and if available to grow the bulbs in botanic gardens.

Biology and Potential Value: It is related to *U. indica* Kunth which is medicinally important for its alkaloids used in cardiac treatment.

Cultivation: Not known.

Description: Small, 10-60 cm long, slender, bulbous, scapigerous herbs. Bulbs *ca* 5×4 cm, ovate, tunicated. Leaves narrow, few, arising from the bulb, whorled, sheathing at the bases, as long as or smaller than scape. Scape narrow, erect, terete, glabrous, naked, bearing terminal dense raceme of 10-14 flowers. Flowers white or purple, small, bisexual, hypogynous, bracteate, campanulate; bracts solitary, minute, falling before plant matures. Perianth segments 6, free, in 2 whorls, *ca* 5×2 mm, oblong-lanceolate. Stamens 6, free; anthers oblong, dorsifixed, dehiscing longitudinally; filaments as long as or smaller than anthers. Pistil nearly as long as the perianth. Capsule subglobose, trilobed, loculicidal, 9-12-seeded. Seeds compressed, deep brown, shining, winged.

References:

1. Wight, R. (1853). *Icon. Plant. Ind. Orient.* 6,: t. 2063 & 2064.

2. Baker, J. G. (1871). Revision of the genera and species of herbaceous, capsular, gamophyllous Liliaceae. *J. Linn. Soc.* 11:349.

3. Deb, D. B. & Dasgupta, Syamali (1974). Revision of the genus *Urginea* Steinh. (Liliaceae) in India. *Bull. Bot. Surv. India* 16: 116-124. (1977).

4. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7: 1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

Status: Rare. So far known from Gujarat and Rajasthan with sporadic collections only. The holotype was collected by Blatter and Hallberg from Rajasthan in 1917. Santapau (5) remarks "only seen in fruits in Oct. 1945." Last collection of this was made from Devikot in 1973 (CAL). Based on field observations, Pandey *et al* (4) and Kothari & Hajra (3) also consider this species as 'rare'. The rarity of the species is due to biotic effects. Local name: Moto-Jal-Bhangro (Marwari).

Distribution: Gujarat (Jamnagar), Rajasthan (Jodhpur, Devikot); Pakistan (Sind).

Habitat and Ecology: On wet ground and marshy places in association with *Ammania baccifera* L., and species of *Cyperus, Typha* etc.

Conservation Measures Taken: None.

Conservation Measures Proposed: (i) Protection of natural habitats. (ii) Live plants should be collected and introduced in Botanic/experimental gardens.

Biology and Potential Value: It flowers in September-November. Other details not known.

Cultivation: None so far.

Description: Erect, rigid, scabrous, papillose herbs, 10-30 cm high. Leaves lanceolate, acute or sub-obtuse, auricled, feather-veined, 3.8-7 × 0.5-0.7 cm. Flowers red-purple, axillary; calyx leathery, campanulate, 7-nerved; petals 4, caducous. Capsules crowded, reddish-brown, 2.5 mm in diam., pericarp transparent, shining. Seeds yellowish, minute, many.

References:

1. Bhandari, M. M. (1978). *Flora of the Indian Desert*. Scientific publishers, Jodhpur. p. 157.

2. Blatter, E. & Hallberg, F. (1918). *J. Bombay Nat. Hist. Soc.* 25: 213.

3. Kothari, M. J. & Hajra, P. K. (1983). *In*: Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 45.

4. Pandey, R. P., Shetty, B. V. & Malhotra, S. K. (1983). *In*: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 56.

5. Santapau, H. (1962). *Fl. Saurashtra* [1]: 227. Saurashtra Research Society, Rajkot.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status: Indeterminate. Known from India by only one collection of Clarke (in CAL) which is in a very poor condition and is without fruits. This could not be recollected since 1886, although Khasi Hills have been well-explored botanically.

Distribution: In India it is recorded from Theria locality in Khasi Hills (Meghalaya). There is no record of its distribution in any other part of the country. Also in Bangladesh.

Habitat and Ecology: A slender twining shrub growing in tropical evergreen forest (*ca* 1000 m). Flowers during September and fruits are possibly set by December.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: A thorough exploration in its known habitat should be made and if relocated its further collection should be stopped to protect *in situ*.

Biology and Potential Value: Nothing is known so far about its biology and potential value.

Cultivation: Not in cultivation.

Description: Twiners. Branches glabrescent. Leaves oblong, ovate-obovate or rounded, 7-11 cm long, bases acute, apices acuminate, glabrous above, minutely tomentose on nerves beneath, petioles 0.8-1.7 cm long. Panicles decompound, 12-21 cm long, grey-tomentose. Flowers white, pedicels 5-9 mm, articulated below middle at *ca* 3 mm from base, glabrescent above articulation; sepals ovate, *ca* 1×0.75 mm; petals ovate, *ca* 3-4 mm long; anthers ovoid, *ca* 1 mm long, filaments *ca* 1.2 mm long; ovary glabrous, styles *ca* 2 mm long, stigma capitate. Samara ovate or orbicular, *ca* 3×1.5-2.5 cm, obtuse at apices.

References:

1. Blatter, E. (1930). A proposed revision of the Flora of British India. *J. Indian Bot. Soc.* 140-150.

2. Hooker, J. D. (1874). Malpighiaceae. *Fl. Brit. India* I : 420.

3. Kanjilal, U. N., Kanjilal, P. C. & Purkayastha, C. (1936). *Fl. Assam* 2 : 187.

4. Srivastava, R. C. (1985). Notes on threatened taxa of Malpighiaceae of India. *J. Econ. Tax. Bot.* 6(1) : 64.

The material for this sheet was supplied by R. C. Srivastava, Botanical Survey of India, Allahabad.

Status: Rare. Known only from a few collections.

Distribution: Endemic to the W. Ghats of Peninsular India. Way back in the year 1861 Dalzell and Gibson reported it from the Ramghat and Koombarli ghat areas in the northern W. Ghats. Woodrow located it at Amboli ghat in Pune district in October 1885. Talbot and Meebold collected it from Gersoppa Falls in N. Kanara district in November 1883 and October 1908 respectively. Gamble reported it from S. Kanara and Mysore. Subsequently, only a few isolated collections could be made from a few scattered localities like Anamoda, Castle Rock, Susla, Jog Falls and Amboli Ghat.

Habitat and Ecology: In deciduous forests and scrub jungles in hilly terrain.

Conservation Measures Taken: None.

Conservation Measures Proposed: Status evaluation through field surveys must be conducted throughout its known range of distribution. An intensive search in the under-explored areas, particularly with ecological conditions that are conducive to this species, may prove to be decisive for its evaluation.

Biology and Potential Value: No information is available. Flowering period is October-November. The species is of botanical and phytogeographical interest.

Cultivation: Not known in cultivation.

Description: Shrubs. Middle and lower leaves deeply trilobate; lobes 4-8×1.0-2.5 cm, lanceolate to oblong-lanceolate, margins serrate, apex acute. Flowers axillary, solitary or clustered. Bracteoles not exceeding half the length of the calyx. Corolla 5.0 cm in diameter, yellow with a purple centre, hairy outside. Capsules 8-10×10-15 mm, densely hairy. Seeds reniform, smooth.

References:

1. Cooke, T. (1957). *Fl. Pres. Bombay* 1 : 10 (repr. ed.).

2. Dunn, S. T. (1957). *In :* Gamble, J. S., *Fl. Pres. Madras* 1 : 68. (repr. ed.).

3. Wight, R. (1840). *Icon. Pl. Ind. Orient.* t. 88.

The material for this sheet was supplied by M. P. Nayar, M. Ahmedullah and T. K. Paul, Botanical Survey of India, Calcutta.

Decaschistia trilobata Wt. Flowering branch.

Status: Endangered in Meghalaya, but reported as a rare species from Japan also. Causes for its decline and rarity are loss of its host and habitat. Lastly it was collected in 1969 from Mowsmai forest, Khasi hills of Meghalaya.

Distribution: Mowsmai forest in Meghalaya; andJapan. The only species of *Mitrastemon* reported from India and is a good example of transpecific distribution as it was originally reported from Japan.

Habitat and Ecology: A root parasite on *Castenopsis* species and other members of the family Fagaceae and grows in thick moist virgin forests. It grows so closely with the host that its seems to be a part of host plant. Its growing period is from December to February and needs low light intensity.

Conservation Measures Taken: None. However, the Mowsmai forest in Meghalaya has been declared as a 'reserved forest' recently.

Conservation Measures Proposed: To declare the locality as protected area so it may propagate naturally in due course of time. Efforts are also being made to locate this species in other adjoining areas in wild.

Biology and Potential Value: A very striking member of genus *Mitrastemon*, having scale-like thick brown leaves with small flowers, appearing in the wild during November to March.

Cultivation: Being a root parasite no steps would be possible for its cultivation.

Description: A fleshy root parasite, *ca* 4-6 cm high, dark brownish after drying. Leaves small, scale-like, *ca* 1-2.3 cm long, ovate or deltoid, margins incurved; flowers *ca* 2 cm long. Stamens *ca* 1.5-2 cm long, filaments fused, anthers free, *ca* 5 mm long, extrorse. Ovary superior, sessile, unilocular; style short with capitate stigma.

References:

1. Ohwi Jisaburo (1965): *Fl. Japan*, p. 402.

2. Rao, A. S. (1974): Vegetation and Phytogeography of Assam—Burma. *In*: M. S. Mani (ed.). *Ecology and Biogeography in India*. pp. 204-246.

The material for this sheet was supplied by A. S. Chauhan, Botanical Survey of India, Eastern Circle, Shillong.

Status: Rare. This species was earlier known from Lachen & Yumthang in north Sikkim and has recently been collected from Tali, Tehri-Garhwal. A population of only 10 plants was found in a limited area.

Distribution: Garhwal; Uttar Pradesh ; Lachen, Yumthang, Sikkim ; Nepal; S. E. Tibet ; in the alt. of 3600-3700 m.

Habitat and Ecology: Grows on humus rich black soils under the forest canopy of *Quercus*.

Conservation Measures Taken: None so far. The export of all species of Orchidaceae is regulated under the CITES convention.

Conservation Measures Proposed: Habitat should be preserved.

Biology and Potential Value: Flowers during June-July. It is of botanical interest as it is a rare saprophytic orchid.

Cultivation: Not known.

Description: Terrestrial leafless herbs, 10-30 cm high, pale-brown in colour, glabrous. Racemes 4-7 cm long, many-flowered, rachis stout. Flowers *ca* 4 mm across, sepals subequal, linear, acuminate, spreading, apices recurved; petals externally keeled, pale brown; lip ovate, obscurely lobed, concave. Column very short, rostellum prominent; anther with reflexed margins. Pollinia two, clavate.

References:

1. Bose, T. K. & Bhattacharjee, S. K. (1980). *Orchids of India*, p. 71. Calcutta.

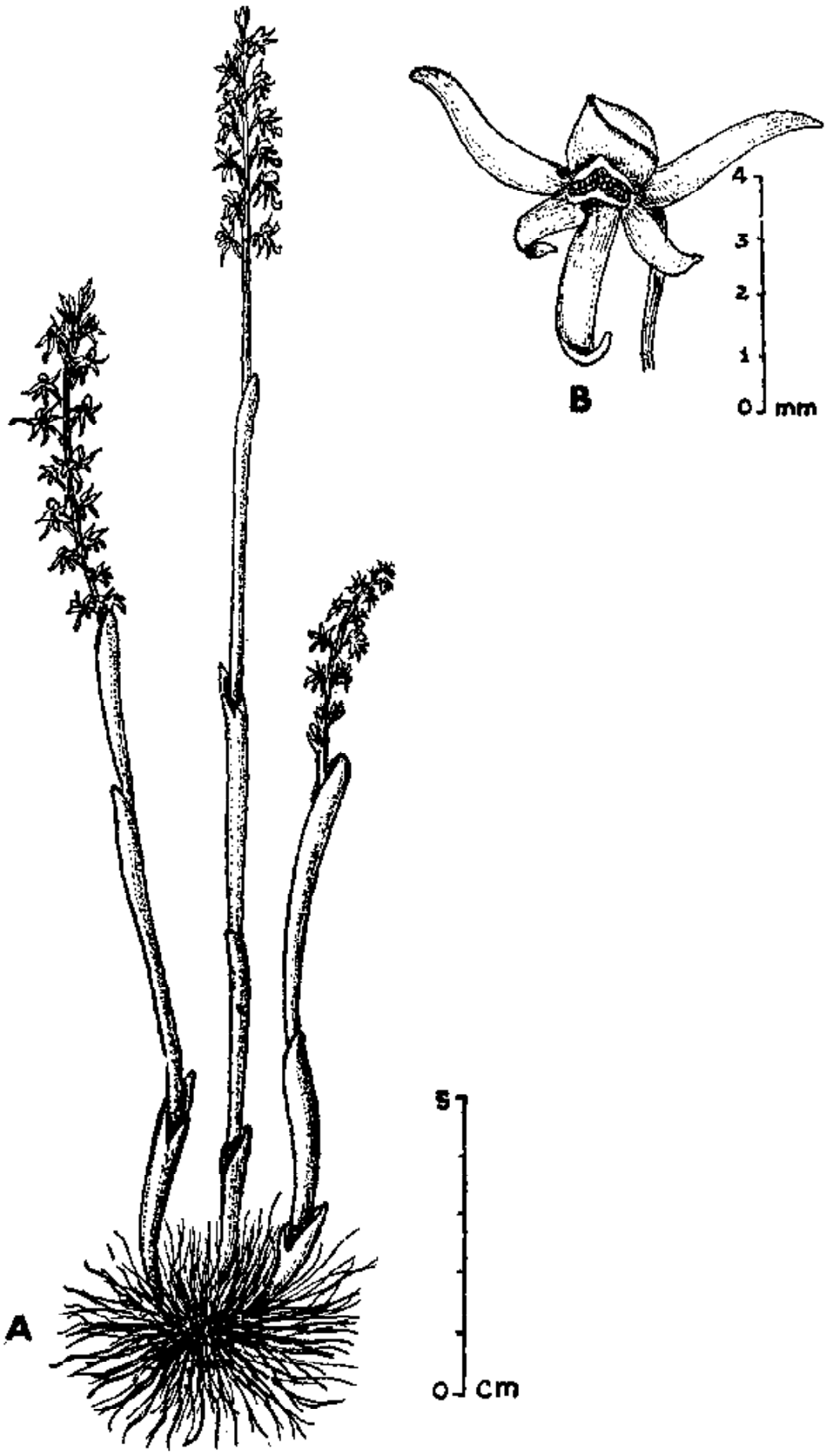
2. Hara, H., *et al.* (1978). *Enumer. Flower. Pl. Nepal* 1 : 31.

3. King, G. & Pantling, R. (1896). *Journ. As. Soc. Beng.* 65(2) : 128.

4. King, G. & Pantling, R. (1898). The Orchids of Sikkim Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 8 : 262. t. 348. Calcutta.

5. Pradhan, U. C. (1976). *Indian Orchids : Guide to Identification and Culture* 1 : 139. Calcutta.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Aphyllorchis parviflora King & Pantl. A. Habit. B. Flower.

Status: Vulnerable.

Distribution: Nilgiris; endemic.

Habitat and Ecology: Epiphyte in moist deciduous forests.

Conservation Measures Taken: Its distributional areas in the Nilgiris are now declared as a Biosphere Reserve.

Conservation Measures Proposed: The type locality and neighbouring areas be searched for this species. It should be protected *in situ*. The plants should also be propagated through seed/tissue culture.

Biology and Potential Value: Not known.

Cultivation: None.

Description: Rhizomatous epiphytes with slender rhizomes, pseudobulbs distant, ovoid, 1.9-2.5 cm long; leaves linear-oblong, 7-11 cm long, apex obtuse, emarginate. Scapes 5-10 cm long, slender, shorter than leaves. Flowers pale greenish-yellow, tinged with pink afterwards becoming reddish or light rusty coloured; in 6-8-flowered umbels; dorsal sepal ovate, 5-nerved; lateral sepals linear-lanceolate; lateral petals broadly oblong, shorter than dorsal sepal; lip ovate, cordate, recurved, hairy on back; column pubescent within, processes short, erect, red.

References:

1. Fischer, C. E. C. (1957). *In :* Gamble J. S., *Fl. Pres. Madras* 3 : 993. (repr. ed.).

2. Hooker, J. D. (1890). *Fl. Brit. India* 5 : 778.

3. Joseph, J. (1982). *Orchids of Nilgiris,* p. 98. t. 80a-80c. B. S. I., Calcutta.

4. Wight, R. (1852). *Icon. Pl. Ind. Orient.* t. 1654.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status: Rare. Only a few populations are known in the Eastern Himalayas, but are fast depleted in wild due to the clearence of forest areas for agricultural purposes (or Jhum cultivation) by which the plant is lost with its host trees.

Distribution: Arunachal Pradesh; Darjeeling Hills, West Bengal; Bhutan; China.

Habitat and Ecology: It grows as an epiphyte on trees. It occurs usually at an altitude of *ca* 2000 m.

Conservation Measures Taken : None for the wild plants or its habitats. Orchids are included in Appendix 2 of the 1973 Convention on International Trade in Endangered Species of Fauna & Flora, which bans export of orchids.

Conservation Measures Proposed: To bring live plants into cultivation from wild for multiplication by tissue culture/seed culture etc. Though it has a wider distribution, only it is found in a few localities with limited populations in India.

Biology and Potential Value: Ornamental. The many biseriately arranged flowers in long drooping racemes appear in June-July and last for about 2 weeks.

Cultivation: Only two plants introduced from Subansiri district in 1965, are under cultivation in the National Orchidarium, Botanical Survey of India, Shillong. It can easily be brought under cultivation (3).

Description: Epiphytes. Pseudobulbs oblong, *ca* 5 cm long, close, 2-leaved. Leaves linear-lanceolate, acuminate, nerves distinct. Inflorescences arise from the base of pseudobulbs, drooping, many-flowered. Flowers in biseriate arrangement, whitish or yellowish; bracts brownish.

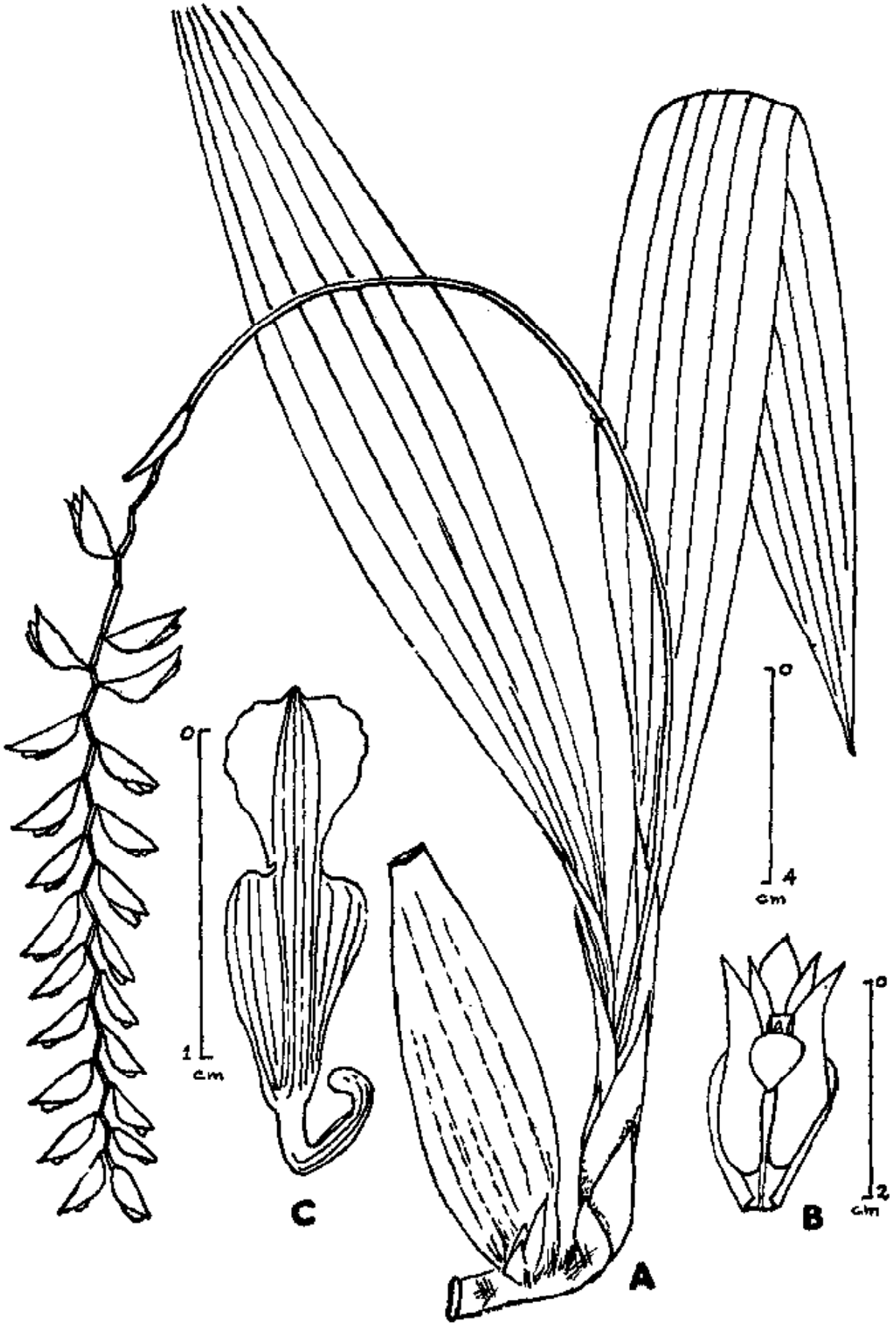
References:

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India—A State-of-tne-Art-Report*. Botanical Survey of India, Howrah.

2. Kataki, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic orchids of Sikkim and North-eastern India.* Posscef., Botanical Survey of India, Howrah. p. 11, t. 6.

3. Sastry, A. R. K. & Kataki, S. K. (1965). Notes on the distribution of *Bulleyia yunnanensis* Schltr. *Ind. For.* 91 (12): 862.

The material for this sheet was supplied by S. K. Kataki (Shillong) and A. R. K. Sastry (Howrah), Botanical Survey of India.



Bulleyia yunnanensis Schltr. A. Habit. B. Flower. C. Lip.

Status : Rare. Destruction of habitats rendered the species to become rare in its distribution range and is presently known from a few scattered populations in India.

Distribution: Uttar Pradesh (Garhwal, Kumaon); Sikkim; Nepal; Bhutan.

Habitat and Ecology: Temperate to subalpine region, at an alt. of 2000-3300 m in the forests, near streams and in shady places.

Conservation Measures Taken: None so far except that the export of all species of Orchidaceae is regulated under the CITES Convention.

Conservation Measures Proposed: An effort should be made to determine the exact extent to which this species occurs; habitat should be preserved as a part of *in-situ* conservation measures ; further collection of the wild plants should be discouraged, and attempts for multiplication by tissue culture and reintroduction in its natural habitat be made.

Biology and Potential Value: Flowers during July-Aug.; ornamental. Perigone white, tipped with green, lip white, striped with dull red; spur pale yellowish.

Cultivation: The species has been in cultivation in some orchid nurseries in Eastern India.

Description: Pseudobulbs 2.0-2.5 cm long, sub-cylindric with two or three annular markings. Pseudostem short. Leaves 15-18×3.5-5.0 cm, glabrous, oblanceolate, acuminate, sessile. Raceme 15-30 cm long, 4 or 5-flowered. Flowers *ca* 2.0 cm across, secund; sepals ovate-oblong, 5-nerved; petals elliptic-lanceolate, 3-nerved; lip shorter than sepals with a cylindric spur, without lateral lobes, edges deeply incised and pectinate. Column short, broadly winged; spur equalling the sepals, stout, slightly incurved.

References:

1. Hooker, J. D. (1880). *Fl. Brit. India* 5: 850.

2. King, G. & Pantling, R. (1898). Orchids of the Sikkim Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 8 : 170 t. 229. Calcutta.

3. Pradhan, U. C. (1979). *Indian Orchids : Guide to Identification and Culture* 2: 257. Faridabad.

4. Rathore, S. R. (1983). Endemic and rare species of *Calanthe* R. Br. (Orchidaceae). *In :* Jain, S. K. & Rao, R. R. (Eds.). *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 238-239.

5. Seidenfaden, Gunnar & Arora, C. M. (1982). An enumeration of the orchids of North-Western Himalaya. *Nord. Journ. Bot.* 2 : 11.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.

Calanthe alpina Hook. f. ex Lindl.

Status : Endangered (in India). It is recorded only from one locality along Bangladesh border of Meghalaya in Garo Hills. Only one plant is located which is kept under cultivation in the residence of Chief Conservator of Forests, Meghalaya at Shillong.

Distribution : India (Garo Hills in Meghalaya); Thailand.

Habitat and Ecology : It grows on limestone cliffs in open areas.

Conservation Measures Taken : None for the wild population or its habitat. All the species of Orchidaceae are included in the Appendix 2 of CITES Convention.

Conservation Measures Proposed : Intensive search has to be made to locate more plants of this species in wild and then to bring them under cultivation. Rapid propagation is only possible through tissue culture.

Biology and Potential Value : It is a good ornamental orchid with attractive white flowers, which appear during July.

Cultivation : This species does well in cultivation in a mixture of leaf-mould, sand and powdered charcoal in the proportion of 8 : 1 : 1. Only one plant is under cultivation.

Description : Terrestrial, *ca* 45 cm tall. Leaves elliptic, plicate. Inflorescence terminal, many-flowered. Flowers white; bracts erect, as long as the pedicelled ovary; sepals ovate-oblong, puberulous, petals clawed towards base, oblanceolate, glabrous; lip 3-lobed, spurred; pollinia 8.

References :

1. Seidenfaden, G. (1975). *Dansk Bot. Ark.* 29 (2) : 19.

2. Goswami, N. & Joseph, J. (1985). *Ind. For.* 111 (4): 179-181, Pl. 1 & 2.

The material for this sheet was supplied by S. K. Kataki, Botanical Survey of India, Shillong.

Status : Rare. It is known only from a few localities with small populations.

Distribution : Himalayas: Arunachal Pradesh, Uttar Pradesh (Garhwal, Kumaun), Sikkim & Nepal, Bhutan; Meghalaya (Khasi Hills).

Habitat and Ecology : In moist shady places in the forests, among rock boulders and along the mountain streams, in sub-tropical to temperate areas in *Quercus* forests.

Conservation Measures Taken : None so far, except that the export of all species of Orchidaceae is regulated under the CITES Convention.

Conservation Measures Proposed : Intensive exploration to find out some more populations in other localities; its collection from the disturbed habitats for reintroduction in undisturbed similar habitats in its distribution range and introduction into orchidaria are suggested.

Biology and Potential Value : The species is of horticultural interest.

Cultivation : Reportedly grown in some private nurseries.

Description : Terrestrial herbs. Pseudobulbs small. Pseudostem *ca* 8.0 cm long. Leaves two or three, *ca* 25.0 cm long, oblanceolate-oblong. Racemes 10-12-flowered. Flowers *ca* 5 mm across, chocolate brown, very small, deflexed after expansion; sepals connivent, ovate-lanceolate; petals linear-spathulate, not spreading; lip 3-lobed, yellow, with a red blotch at apex; spur very short, conical, lip with lateral lobes attached to whole length of column, 3- lamellate from base to near apex.

References :

1. King, G. & Pantling, R. (1898). Orchids of the Sikkim Himayala. *Ann. Roy. Bot. Gard. Calcutta* 8 : 167 t. 225. Calcutta.

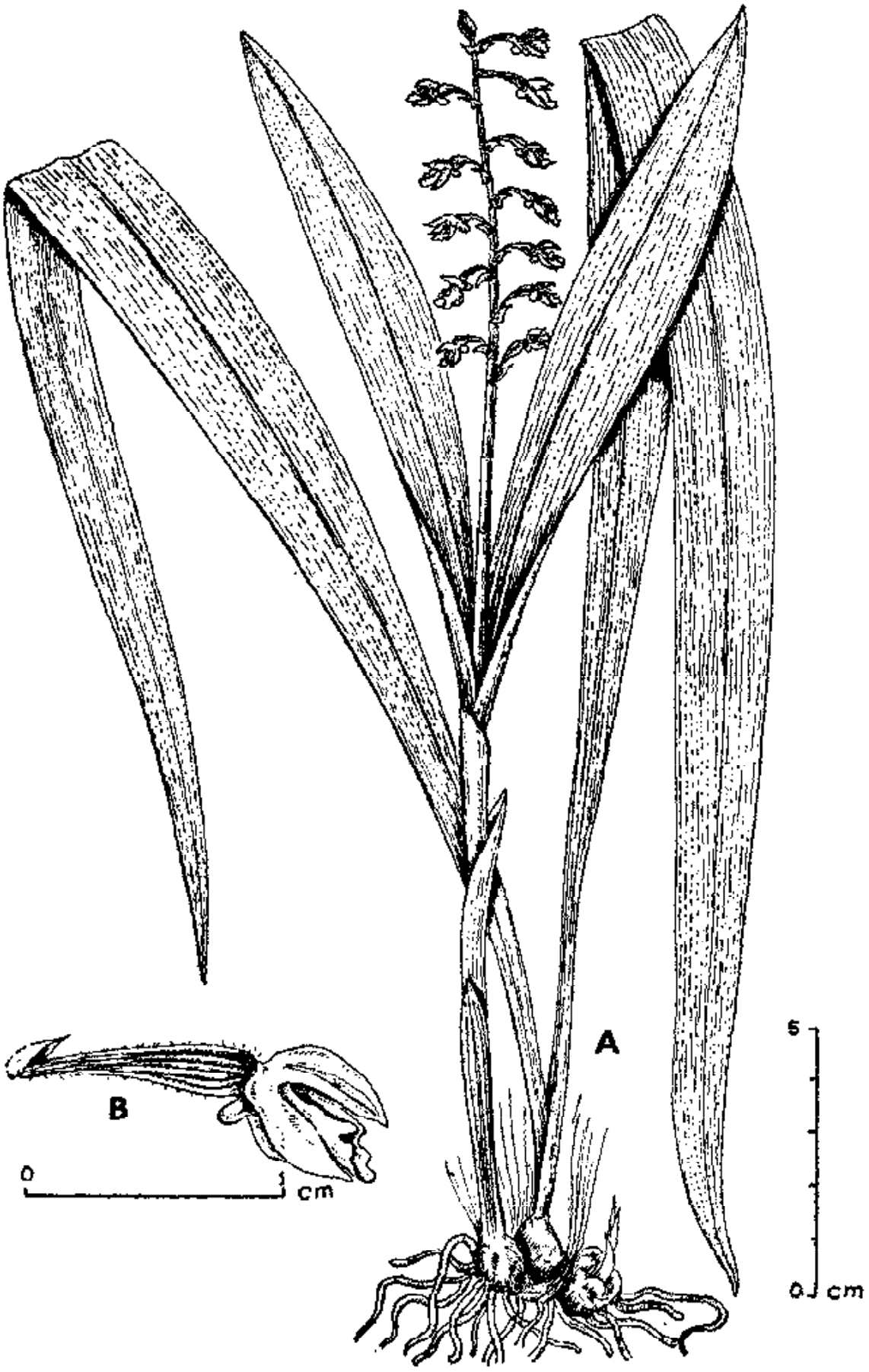
2. Duthie, J. F. (1906). Orchids of the North-West Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 9 (2) : 120. Calcutta.

3. Kataki, S. K., Jain S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-eastern India*. Posscef, Botanical Survey of India, Howrah. p. 15 t. 9.

4. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2 : 256. Faridabad.

5. Seidenfaden, Gunnar & Arora, C. M. (1982). An enumeration of the Orchids of North-western Himalaya. *Nord. Journ. Bot.* 2 : 11.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Calanthe mannii Hook. f. A. Habit. B. Flower.

Status : Endangered. This species is known only from its type collection and has become endangered in India due to habitat destruction.

Distrubution : Himachal Pradesh (Simla), Uttar Pradesh (Mussoorie); Nepal; Indo-China.

Habitat and Ecology : In shady forest floors at about 2,000 m altitude.

Conservation Measures Taken : None so far. However, its export is regulated due to inclusion of the family Orchidaceae in Appendix 2 of the CITES Convention.

Conservation Measures Proposed : Monitoring to search the known localities and other likely areas as this species has not been collected in the recent past; if rediscovered its habitats should be protected and plants be introduced into the National Orchidaria of the Botanical Survey of India.

Biology and Potential Value : Its greenish yellow, attractive flowers in dense recemes, makes it of horticultural value; flowers in July.

Cultivation : Not known.

Description : Terrestrial herbs. Stems short, swollen at the base. Leaves 30-60 cm long, linear-lanceolate, acuminate, many, nerves prominent. Inflorescence in the axils of sheath, usually overtopping the leaves, 20-30 cm long; rachis and pedicels puberulous; bracts deflexed, very small. Flowers dense, *ca* 2.0 cm across; sepals 3-nerved, ovate-obtuse, reflexed; petals spathulate, 3-nerved, lip adnate to column, 3-lobed, spur cylindric, shorter than sepals. Column very broad.

References :

1. Duthie, J. . (1906). Orchids of the North-West Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 9(2) : 121. t. 104. Calcutta.

2. Hajra, P. K. (1983). Rare, threatened and endemic plants of Western Himalayas-Monocotyledons. *Plant Conserv. Bull.* 4 : 1-13. Posscef, Botanical Survey of India, Howrah.

3. Hooker, J. D. (1890). *Fl. Brit. India* 5 : 850.

4. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identifcation and Culture* 2: 260. Faridabad.

5. Rathore, S. R. (1983). Endemic and Rare species of *Calanthe* R. Br. (Orchidaceae). *In :* Jain, S. K. & Rao, R. R. (Eds.) *An Assessment of Threatened Plants of India.* Botanical Survey of India. Howrah. p. 238-239.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.

Calanthe pachystelix Reichb. f. ex Hook. f. A. Plant. B. Inflorescence. C. Flower.

Status : Vulnerable. It was first reported from India in 1876 from Chandubi, Kamrup district of Assam. The main reason for its fast depletion in the wild is due to disturbances in its native habitat, Chandubi being a picnic spot frequently vistited by tourists. Moreover, the felling of its host trees is also another reason for its vulnerability.

Distribution : Chandubi in Assam and Sibulatang in Mizoram; Burma.

Habitat and Ecology : Epiphytic on tall tree trunks of *Shorea robusta* and *Schima* sp. in mixed sal forests, at low altitudes.

Conservation Measures Taken : None. It is included in Appendix 2 of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Conservation Measures Proposed : A rare species in wild; an attempt should be made to locate in other areas. Rapid multiplication is only possible through tissue culture.

Biology and Potential Value : Botanical and horticultural importance; flowers during October-November.

Cultivation : It can be grown in well-drained charcoal filled pots or in baskets or directly on tree trunks.

Description : Rhizome creeping, stout. Pseudobulbs ovoid, ridged, yellowish-green, 2-leaved. Leaves oblong-lanceolate, acute, plicate. Inflorescence on young shoots, 1-6-flowered. Flowers 2.5-3.8 cm across, creamy-white. Sepals subequal, oblong-lanceolate. Petals linear. Labellum 3-lobed, the lateral lobes, the base of midlobe and the apex are brown which is sometimes deep or pale or yellow, the midlobe sub-reniform, entire and wavy, the lateral lobes with 3-4 brown nerves, lamellae 3 from base to apex, sometimes 5 on midlobe.

References :

1. Reichenbach, H. G. (1884). *Gard. Chron.* 2 : 808.

2. Hooker, J. D. (1890). *Fl. Brit. India* 5 : 843, 6 : 192.

3. Veitch, (1890). *Man. Orch. Pl.* 1 : 48.

4. Pfitzer, E. & Kranzlin, F. (1907). *In* : Engler, *Das Pflanzenreich* 32 : 48.

5. Das, S. & Jain, S. K. (1976). *Ind. For.* 102 : 472.

6. Das, S. & Jain, S. K. (1980). *Fasc. Fl. India* 5 : 26. Botanical Survey of India, Howrah.

The material for this sheet was supplied by S. Phukan, Botanical Survey of India, Shillong.

Coelogyne rossiana Reichb. f.

Status : Rare. A tiny herb with very restricted distribution. So far, it is known from its type locality, a single spot near Elephant falls, Shillong, which is much visited by tourists. As a result its habitat is severely threatened.

Distribution : Meghalaya—Khasi Hills. Endemic.

Habitat and Ecology : It grows in moist areas amidst dense mosses either on ground or on tree trunks near water sources, ensured with water spray.

Conservation Measures Taken : None. The family Orchidaceae is in Appendix 2 of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Conservation Measures Proposed : The IUCN Plant Red Data Book has included one species of *Corybas* i.e. *C. fornicatus* from Indonesia. The two species of *Corybas* viz. *C. himalaicus* from Sikkim and *C. purpureus* from Meghalaya are not reported elsewhere except from their type localities. Now, an urgent effort should be made to locate them in other places too for protection in wild or to introduce them into orchidaria.

Biology and Potential Value : A botanical curiosity. Flowers during July. The species is very much allied to *C. himalaicus*.

Cultivation : A very delicate plant. It is difficult to maintain it in cultivation. Hence, the best way of conservation is to preserve its natural habitat.

Description : Terrestrial. Tuber small with a very short slender stem. Leaf solitary, sessile, cordate. Flowers solitary, pinkish-white.

References :

1. Joseph, J. & Yoganarasimhan, S. N. (1967). *Corybas purpureus*—a new species of orchid from United Khasi & Jaintia Hills, Assam. *Ind. For.* 93 (12) : 815-817.

2. Kataki, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India*. Posscef, Botanical Survey of India, Howrah. p. 22, t. 15.

The material for this sheet was supplied by S. K. Kataki, Botanical Survey of India, Shillong.

Status : Rare and habitats are vulnerable. In India, it is confined to one or two localities in Nagaland. Its known population in India is seriously endangered due to the cutting of its host trees for Jhum cultivation—a practice of clearance of forest areas and burning on hill slopes for cultivation. It was collected from Khonoma (Nagaland) in 1978 but recently it could not be collected again.

Distribution : India: Nagaland; Burma; Thailand.

Habitat and Ecology : It grows as an epiphyte on medium-sized trees of *Quercus* species preferably in sunny areas. It occurs at an altitude of *ca* 1200 m.

Conservation Measures Taken : The Forest Department of Nagaland has kept few plants of this species under cultivation. All species of Orchidaceae are included in Appendix 2 of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Conservation Measures Proposed : As this species is much depleted in forests due to various reasons like destruction of its habitat, overcollection for its horticultural interest, it can be introduced in Reserve Forest near Kohima, which is close to its original habitat and where it can be naturally protected. Besides, this should also be multiplied by tissue culture/seed culture method.

Cultivation : It is grown in the Orchidarium of the Forest Department of Nagaland, Kohima. It is easy to cultivate and propagate vegetatively.

Biology and Potential Value : An interesting species of horticultural value. Flowers during April-May. A distinct species from all other species of *Cymbidium* but not popular in cultivation.

Description : Epiphytes. Pseudobulbs ovoid, 3-5-leaved. Leaves oblong-lanceolate, 10-15 cm long. Scape slender, longer than the leaves, sub-erect, few-flowered. Flowers *ca* 5 cm across, greenish with reddish spots; lip 3-lobed, white with a brown band.

References :

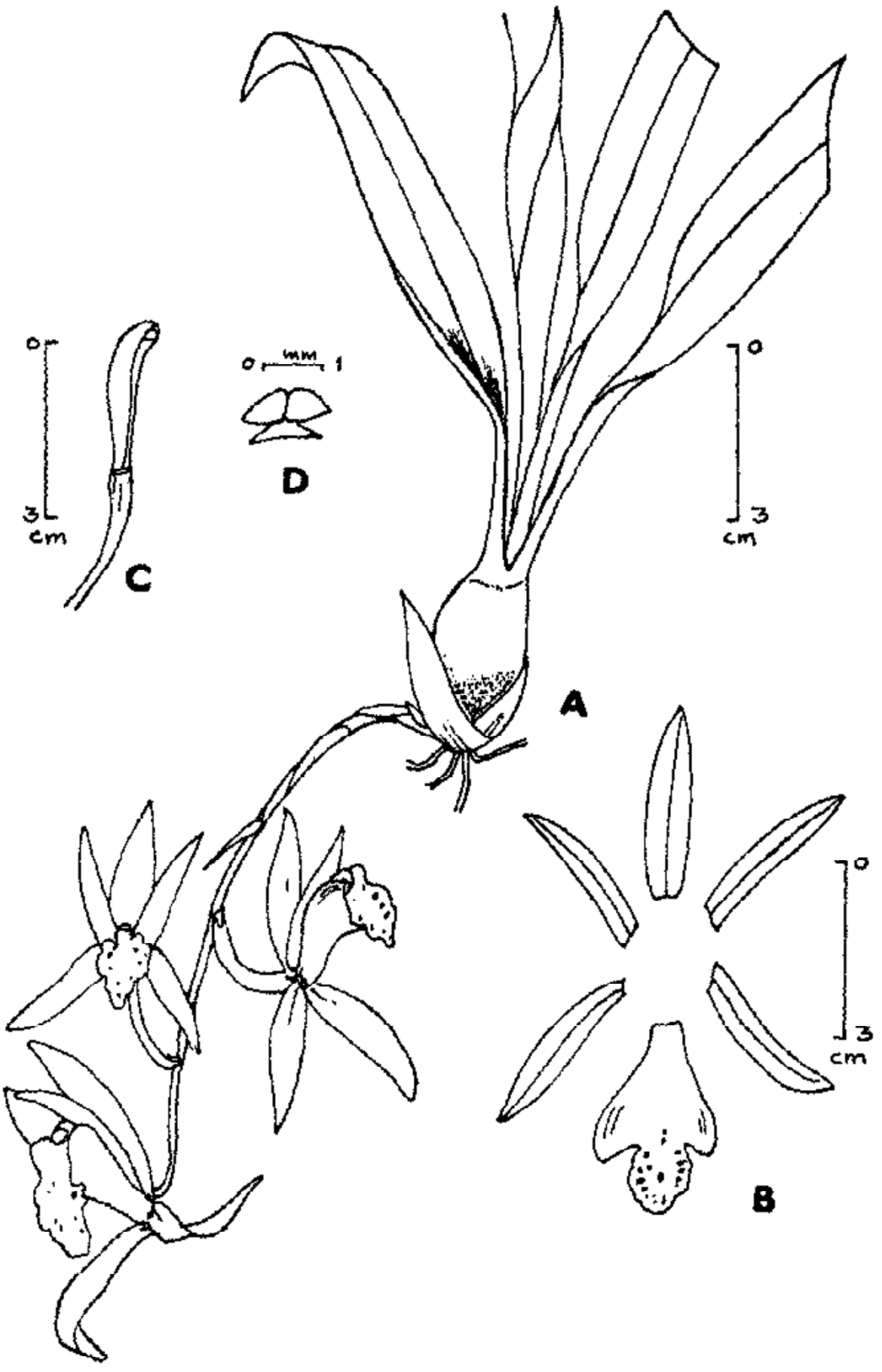
1. Hooker, J. D. (1890). *Fl. Brit. India* 6: 9.

2. Kataki, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India.* Posscef, Botanical Survey of India, Howrah. p. 35 t. 28.

3. Pradhan, U. C. (1979). *Orchids of India. Guide to Identification and Culture* 2:473. Faridabad.

4. Bijay Krishna & Sastry, A. R. K. (1975). *Cymbidium tigrinum* Par. A new record from Nagaland, India. *Bull. Bot. Surv. India* 14 : 179-180.

The material for this sheet was supplied by S. K. Kataki, Botanical Survey of India, Shillong.



Cymbidium tigrinum Par. ex Hook. f. A. Habit. B. Floral parts. C. Column. D. Pollinia.

Status : Rare. One of the Lady's Slipper orchids, once reported to be abundant in the North-Western Himalayas, has now become rare due to widespred ecological degradation in its natural habitats.

Distribution : Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh (Garhwal) in the alt. 2800-3400 m. Also in Nepal, Bhutan, Pakistan.

Habitat and Ecology : In open rocky places amidst other herbs and under *Quercus—Rhododendron-Viburnum* forests.

Conservation Measures Taken : None so far. Export is regulated as the family Orchidaceae is included in Appendix 2 of CITES.

Conservation Measures Proposed : Cultivation in National Orchidaria; multiplication by tissue culture method and reintroduction in its natural habitats.

Biology and Potential Value : A spectacular ground orchid of horticultural value. Flowers during May-June.

Cultivation : Reportedly grown in some private nurseries in India and abroad.

Description : Terrestrial herbs, 25-60 cm high, puberulous. Leaves 4-5, scattered, 5-18×4-11 cm, orbicular to lanceolate, acute to acuminate at apex, membranous. Bracts leaf-like, 8-10×3-4 cm. Flowers solitary or sometimes two; sepals and petals spreading, greenish-yellow or white; dorsal sepal ovate-acuminate; lateral connate; petals equalling dorsal sepal, narrowly lanceolate, acuminate; lip oblong, white, often with purple spots outside; column yellow; ovary glandular-pubescent. Capsule erect clavate, *ca* 3.8 cm long.

References :

1. Hajra, P. K. (1983). Rare, Threatened and Endemic plants of the Western Himalayas. *In :* Jain, S. K. & Sastry, A. R. K. (ed.) *Pl. Cons. Bull.* 4 : 3. Posscef, Botanical Survey of India, Howrah.

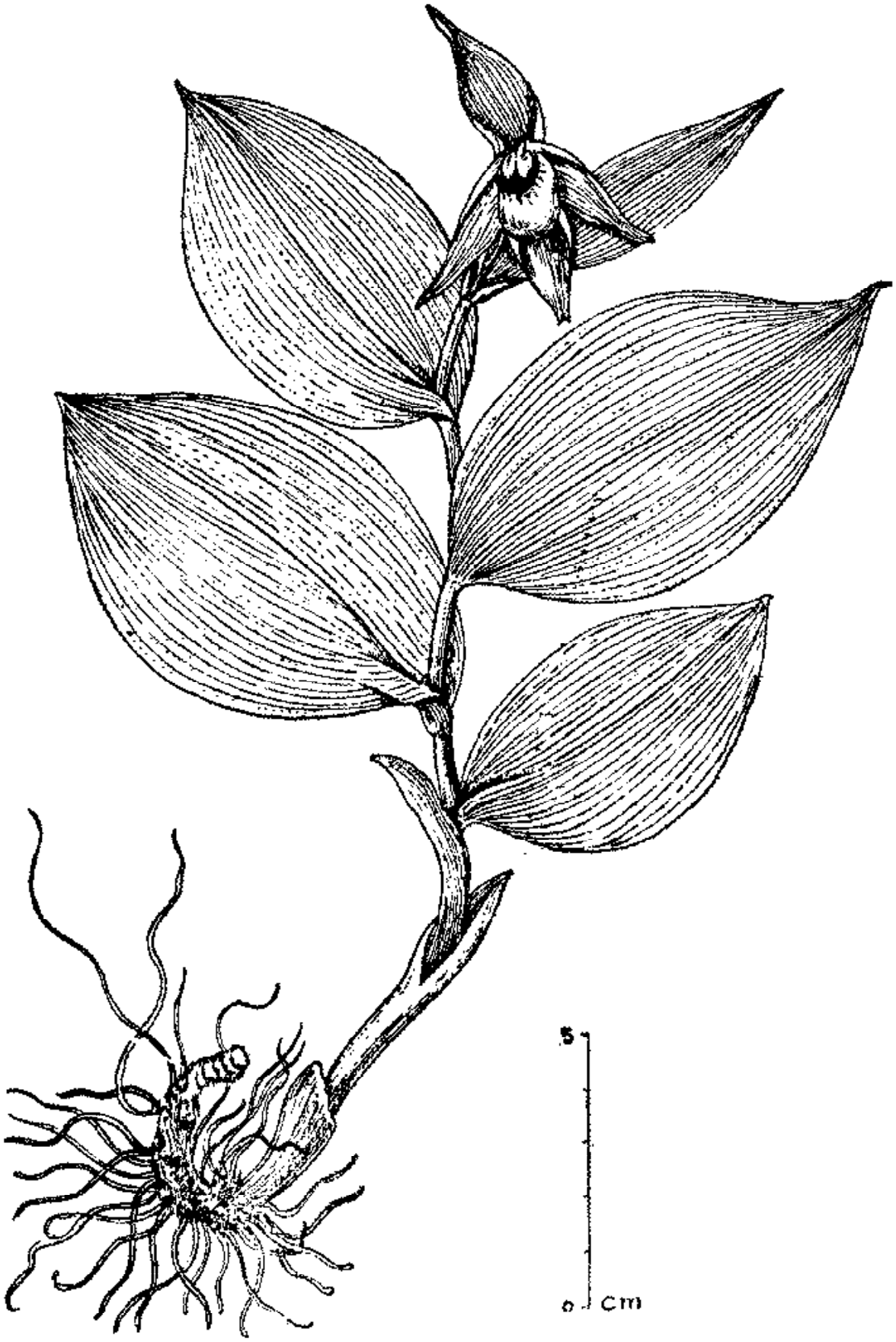
2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India—A State-of-the-Art Report*, p. 19. New Delhi.

3. Pradhan, U. C. (1976). *Indian Orchids : Guide to Indentification and Culture* 1 : 35. Faridabad.

4. Rao, A. S. (1979). *Orchids of India*, p. 33. New Delhi.

5. Seidenfaden, G. & Arora, C. M. (1983). An enumeration of Orchids of Northwestern Himalaya. *Nord. Journ. Bot.* 2 : 12.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Cypripedium cordigerum D. Don

Status : Vulnerable. It was first discovered by Mr. Boxall in 1873-74 in Moulmein. From India it is only known from two areas, viz., Manipur and Mizoram, bordering Burma, but its populations appear to be very thin. The causes of its depletion in nature are due to habitat disturbance and over-exploitation for its attractive red flowers.

Distribution : India and Burma.

Habitat and Ecology : Epiphyte in evergreen forests.

Conservation Measures Taken : It is introduced into the Orchid Preservation Centre, Khonghampat, Manipur (India).

Conservation Measures Proposed : Protection of its natural populations ; introduction of the plants into National Orchidaria, multiplication and reintroduction are suggested.

Biology and Potential Value : A small orchid with conspicuously large brilliant red flowers which immediately attract the horticulturists and is botanically important for its rarity.

Cultivation : A single plant is under cultivation in the National Orchidarium, Shillong (India). A few plants are recently introduced into the Orchid Preservation Centre, Manipur.

Description : Stems short, erect, terete *ca* 7 cm high, very slender at base, brown in colour. Young stems covered by purple striated sheaths, old naked. Leaves 2-3, linear-lanceolate. Flowers 1-3 on a short bracteate peduncle on the upper joints of the defoliated stems, orange-red ; lip elliptic, acute, purple-veined, 2 calli from the base gradually enlarged and united on the disk and raised into 3-dentations at the base.

References :

1. Reichenbach, H. G. (1874). *Gard. Chron.* 2 : 354.

2. Veitch, J. (1887-94). *A Manual of Orchidaceous Plants* 1 : 18.

3. Hooker, J. D. (1890). *Fl. Brit. India* 5 :734.

4. Kataki, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and N. E. India*, p. 37. t. 29. Posscef, Botanical Survey of India, Howrah.

The material for this sheet was supplied by N. C. Deori, Botanical Survey of India, Shillong.

Status: Endangered, or probably extinct in the natural habitats. This species was first figured by Reichb. f. in 1887 and later Rolfe described it as *D. chryseum* in 1888, from a plant from Assam introduced in Colchester, England. J. D. Hooker recorded its distribution from Bhutan Himalaya, Assam and Sylhet. In 1977 a single individual was in bloom under cultivation in the National Orchidarium, Botanical Survey of India at Shillong.

Distribution: Bhutan and Sylhet (Bangladesh) and the adjoining areas bordering Assam state in India.

Habitat and Ecology: An epiphyte in moist evergreen forests at low attitudes.

Conservation Measures Taken: None. It is included in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Conservation Measures Proposed: No recent collection with precise locality is known. If it is rediscovered, measures should be taken to conserve it in natural habitat or to rehabilitate in protected areas in the region.

Biology and Potential Value: A plant with deep-yellow flowers attracts horticulturists and botanists for its elegance and acute rarity. Flowers in May.

Cultivation: Its introduction in England in 19th century is on record. A single plant is under cultivation in the National Orchidarium, BSI, Shillong (India).

Description: Stems erect, terete, *ca* 55 cm high. Leaves lanceolate, obliquely bifid at apices. Flowers 1-3 on a short peduncle, arising from the upper joints of the defoliated stems, golden-yellow; lip almost orbicular with short convolute base, few crimson lines on the either side at the base, disk pubescent, margins shortly fimbriate.

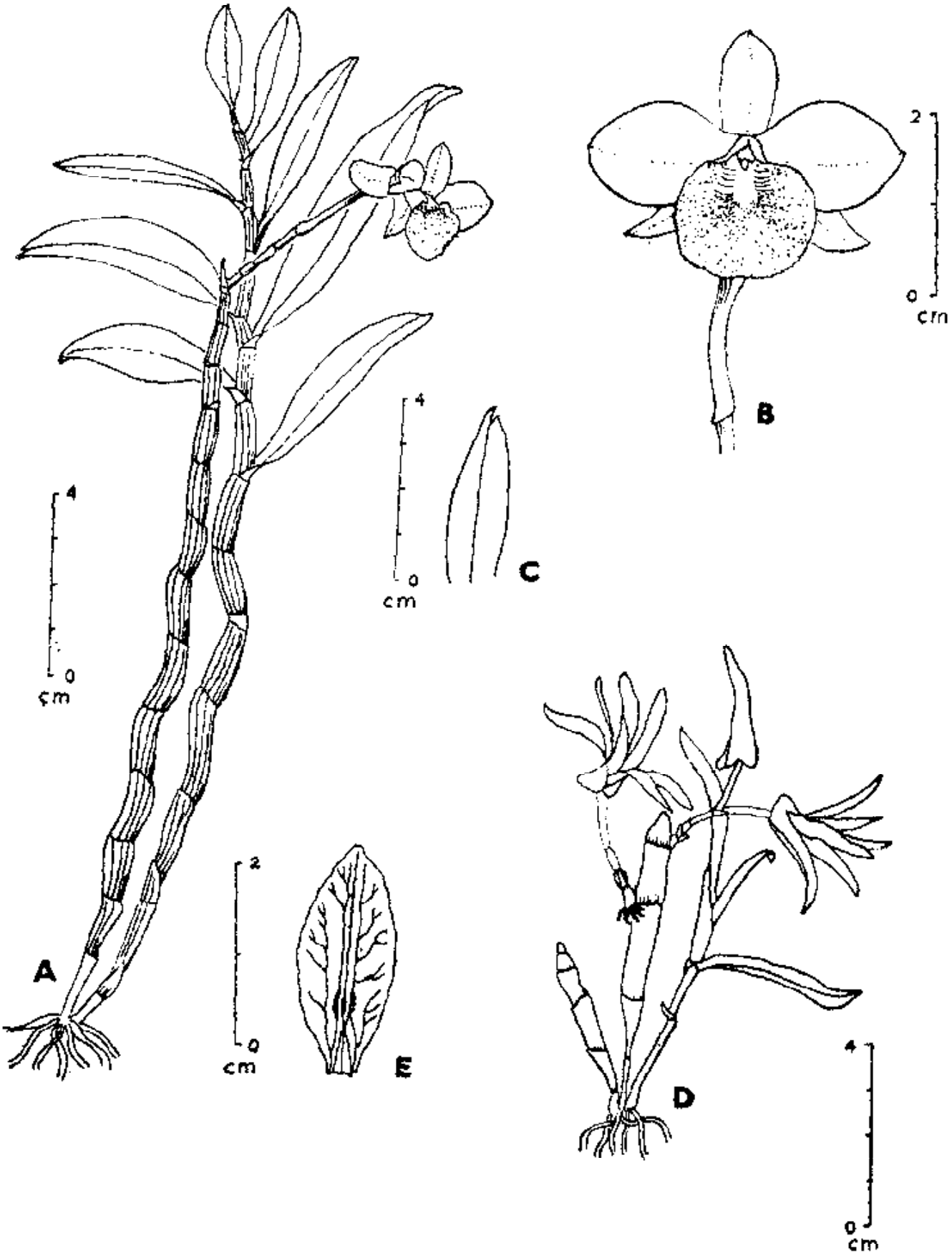
References:

1. Reichenbach, H. G. (1887). *Gard. Chron.* 2 : 9.

2. Veitch, J. (1887-91). *A Manual of Orchidaceous Plants* 1 : 29 (as *D. chryseum*).

3. Hooker, J. D. (1890). *Fl. Brit. India* 5 : 751, 748 (as *D. chryseum*).

The material for this sheet was supplied by N. C. Deori, Botanical Survey of India, Shillong.



A. *Dendrobium aurantiacum* Reichb. f. B. Flower. C. Leaf apex. D. *Dendrobium arachnites*· Reichb. f. E. Lip.

Status: Rare; collected in 1899, 1966, 1970 and 1976 from different localities of Western Ghats. Every collector reports that the species is rare.

Distribution: Tamil Nadu, Nilgiri Dt.: Ootacamund and T. R. Bazaar Shola. Kerala, Palghat Dt.: Silent Valley ; Karnataka, Hassan Dt.: Shiradi Ghats. Endemic to Western Ghats (1-3).

Habitat and Ecology: Epiphytic on trees in evergreen forests or Sholas receiving high rainfall both during south-west and north-east monsoons

Conservation Measures Taken: One of the localities, i.e., Silent Valley is declared as a National Park. Hence, its habitat is likely to be protected. Ootacamund and T. R. Bazaar Shola are included in the Nilgiri Biosphere Reserve.

Conservation Measures Proposed: Study of population of the species, *ex-situ* conservation in gardens are suggested.

Biology and Potential Value: This species is found both in evergreen and relict shola vegetation with restricted distribution. It is closely related to *Eria dalzelli* Lindl. which is also endemic to Western Ghats. *E. albiflora* differs from *E. dalzelli* in having three or more leaves, pubescent scape and ovary with pedicel; suborbicular lip. Flowers in July (2).

Cultivation: No report from any source.

Description: Herbs with aggregate pseudobulbs. Fresh shoots lateral with a few sheathing scales and with usually 3 leaves. Leaves elliptic-lanceolate, abruptly narrowed into a short or long sheathing base, acute at tip. Racemes 5-10 cm long, terminal. Flowers white, many, lax, scattered, distinctly pedicellate. Perianths sparsely gland-dotted. Dorsal sepal oblong-lanceolate, obtuse, tri-nerved. Lateral sepals obliquely lanceolate, ovate, obutse, tri-nerved. Lateral petals ligulate-ovate, obtuse, tri-nerved. Lip suborbicular, conduplicate, beaked at the tip, attached to the foot of the column, sparsely gland-dotted.

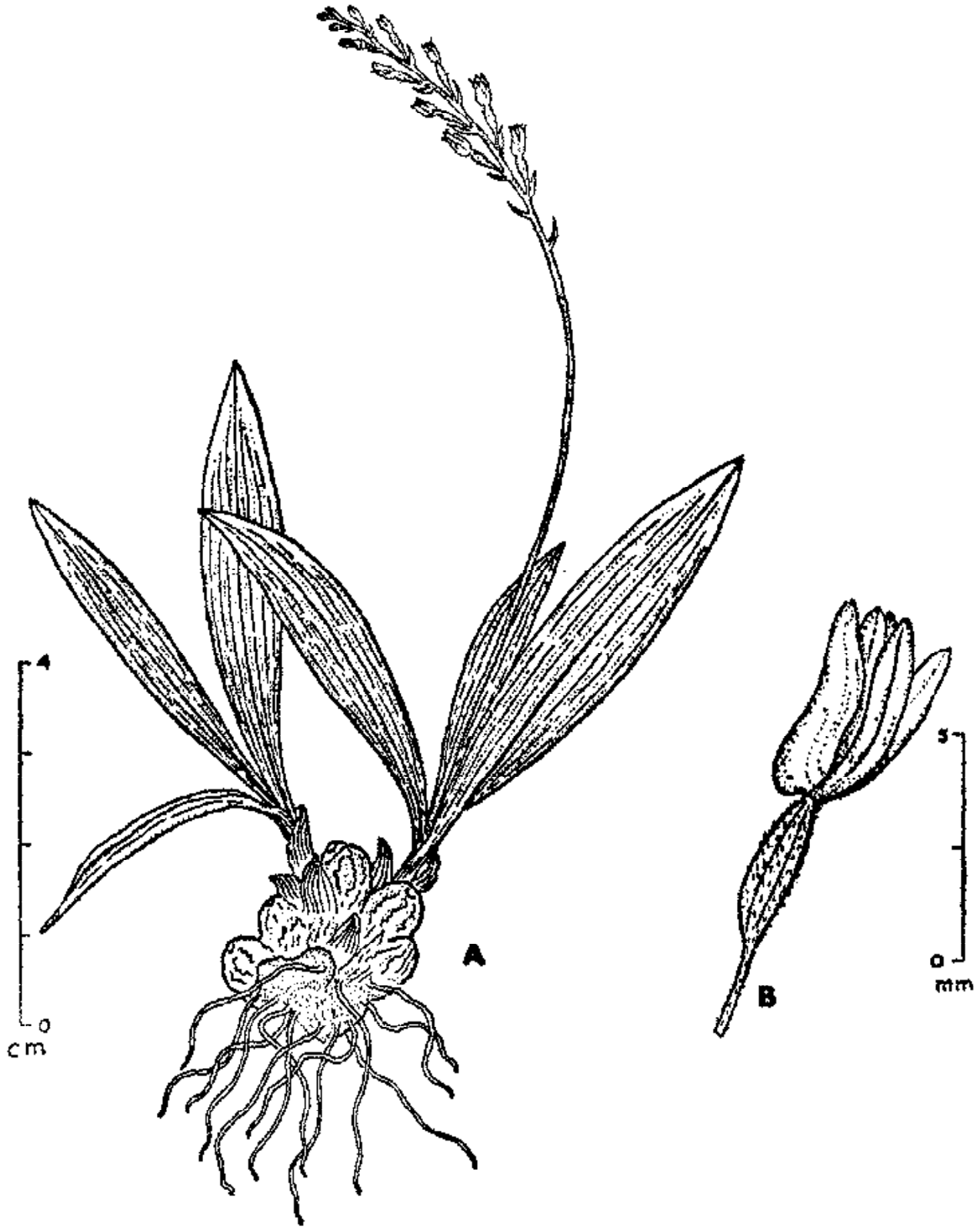
References:

1. Fischer, C. E. C. (1928). *In* : Gamble, J. S. & Fischer, *Fl. Pres. Madras*, p. 1425.

2. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22 : 111.

3. Saldanha, C. J. & Nicolson, D. H. (1976). *Fl. Hassan District*, p. 827.

The material for this sheet was supplied by A. V. N. Rao and V. Chitra, Botanical Survey of India, Coimbatore.



Eria albiflora Rolfe A. Habit. B. Flower.

Status: Endangered. Causes for its depletion are due to restricted distribution, limited number of individuals in each population and deforestation of natural habitats.

Distribution: Apparently endemic to Nicobar Islands. Known only from the type collection made in 1972 and another from Katchal Island in 1974.

Habitat and Ecology: Shaded places in coastal forests and inland forests, prefers sandy-loam with low percentage of clay and shaded moist places.

Conservation Mesures Taken: A few plants were brought under cultivation in the Botanic Garden at Port Blair. All orchids are included in the Appendix 2 of the Convention on International Trade in Endangered Species of wild Fauna and Flora and hence its export from India is regulated.

Conservation Measures Proposed: Various propagation methods should be tried to multiply the plants in cultivation. Soil requirements of the species should be studied for successful cultivation. *In situ* preservation should also be undertaken.

Biology and Potential Value: The plants are perennial with under ground pseudobulbs and tubers. The shoots appear in wet months from March onwards. Flowers appear from April to June and fruits in July to September. An interesting orchid of ornamental value, useful for cultivaton in gardens. The flowers present a beautiful appearance when grown in groups. Some tribals use the tubers to remove swollen glands of neck and hence probably of medicinal value.

Cultivation: Preliminary trials on its cultivation have not resulted in satisfactory multiplication of the species. Probably edaphic requirements are specific. Detailed studies on the habitat requirements and various modern propagation methods should be undertaken.

Description: Terrestrial herbs with tuberous pseudobulbs, partially emerging above the ground; leaves 3-4, linear-lanceolate, 20-55 cm long, 2-4 cm broad; scape erect, appearing with leaves, 30-45 cm long; flowers 12-15 per inflorescence, densely arranged, *ca* 3 cm across; sepals and petals greenish-brown with dark green bands on midrib outside, yellowish at margins and purplish-brown inside; lip oblong with crisped margins, yellow with purple streaks; midlobe crested with yellow elongate clustered tubercles on disk.

References:

1. Balakrishnan, N. P. & Nair, N. G. (1973). *Eulophia nicobarica* Balakr. & N. G. Nair (Orchidaceae)—A new species from Car Nicobar Island. *Bull. Bot. Surv. India* 15: 271-273, ff. 1-13.

2. Chakrabarty, P. (1979). A contribution to the flora of Katchal Island in Andaman and Nicobars. *Bull. Bot. Surv. India* 21 : 1-17.

The material for this sheet was supplied by N. P. Balakrishnan, Botanical Survey of India, Coimbatore.

Status: Rare. Known from a few old collections only. It is known from a single collection from Pakistan.

Distribution: Kashmir; Pakistan; 2500-3000 m.

Habitat and Ecology: In shady places of temperate Himalayas.

Conservation Measures Taken: None so far. All species of Orchidaceae are included in Appendix 2 of the CITES and banned for export.

Conservation Measures Proposed: Habitat in India should be preserved and attempts to locate further distributional areas should be made.

Biology and Potential Value: Floweres yellowish-brown and of botanical interest; flowering time July-August.

Description: Terrestrial, erect, leafless 15-35 cm high herbs. Root fibres crowded. Stem stout, enveloped by three or four large, loose, blunt sheaths. Racemes many flowered, 6-10 cm long. Flowers *ca* 8 mm long, sepals and petals 2mm long, connivent; lip pendulous, twice as long as sepals, narrowly obovate-oblong, deeply cleft into two spreading lobes; column arched forward.

References:

1. Beauverd, G. (1926). *Bull. Soc. Bot. Geneve, Ser* 2, 17 : 339.

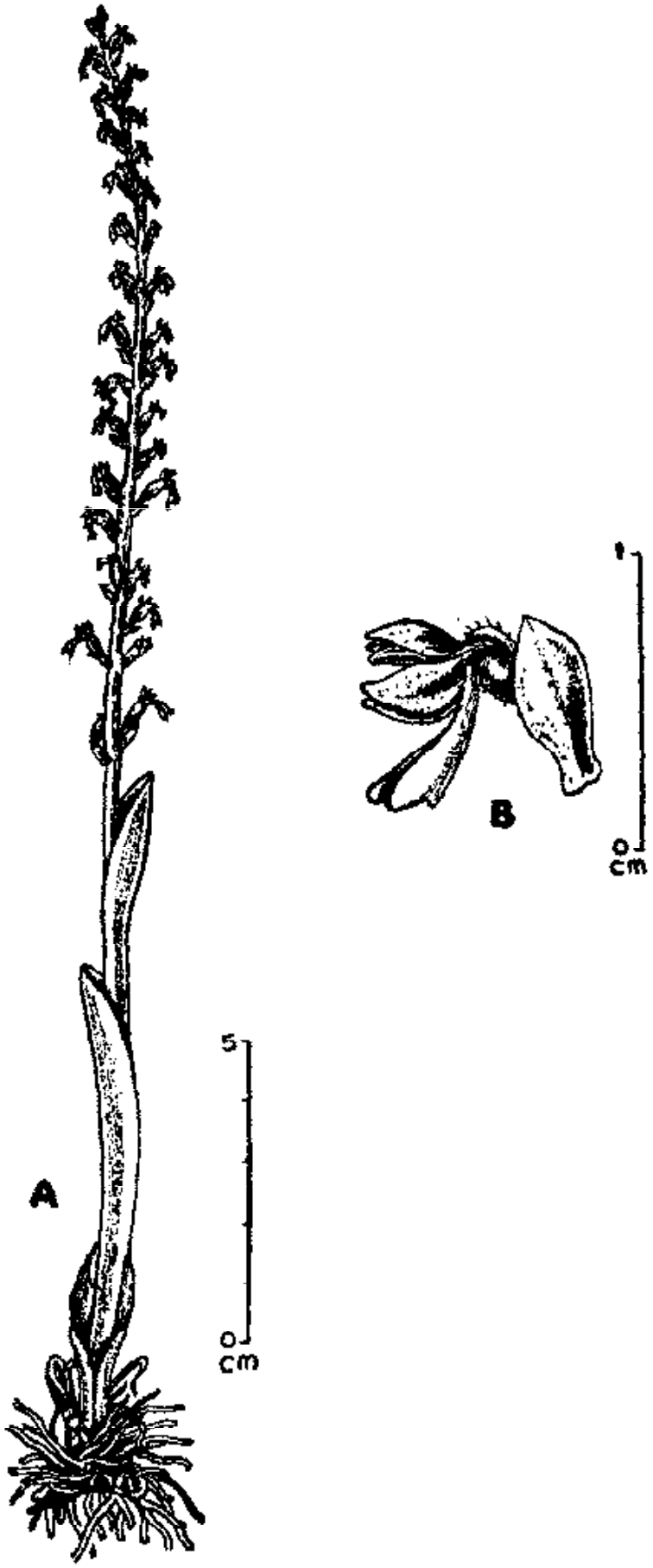
2. Duthie, J. F. (1906). The Orchids of North-western Himalaya. *Ann. Roy. Bot. Gard. Calcutta.* 9 (2) : 152-153. t. 118. 119.

3. Mehra, P. N. & Kashyap, S. K. (1979). IOPB Chromosome Number Report 64. *Taxon* 28 : 407.

4. Pradhan, U. C. (1976). *Indian Orchids : Guide to Identification and Culture* 1 : 129-130.

5. Seidenfaden, G. & Arora, C. M. (1983). An enumeration of the Orchids of North-western Himalaya. *Nord. Jour. Bot.* 2 : 21.

The material for this sheet was supplied by P. K. Hajra, Botanical Survey of India, Dehra Dun.



Neottia inayatii (Duthie) Beauv. A. Habit. B. Flower with bract.

Status: Rare; due to forest clearings and cutting of trees.

Distribution: Western Ghats; Hills of Hassan district and Palghat hills; (so far known localities). Endemic.

Habitat and Ecology: Small epiphytic herb on slender branches of trees in moist deciduous forests.

Conservation Measures Taken: None.

Conservation Measures Proposed: The habitats should be protected.

Biology and Potential Value: Very striking member of the genus being very tiny with long inflorescence and of distributional interest

Description: Very small pendulous epiphytic herbs. Leaves fleshy, 2-4, ovate-oblong. Flowers orange or yellow. Sepals gland dotted. Petals oblong-obovate. Lip 3-lobed, gland dotted; midlobe 2-lobulate.

References:

1. Abraham, A. & Vatsala, P. (1981). *Introduction to Orchids*, p. 416.

2. Blatter, E. & McCann, C. (1931). *J. Bombay Nat. Hist. Soc.* 35 : 257.

3. Joseph, J. & Vajravelu, E. (1976). *Bull. Bot. Surv. India* 20 : 169.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status: Rare. At present this species is known only from two localities which are subjected to the pressures of urbanisation. Unless protective measures are employed this species may become endangered in the near future.

Distribution: Endemic to a very narrow range in the southern W. Ghats. The original type collection was made by Barber from Kannikatti in May 1901. Subsequently, it could only be collected from the type locality "after a lapse of over six decades" (4). Later, Henry located it at Kilaviarumalai, Balamore, in Kanyakumari district in 1976.

Habitat and Ecology: Evergreen forests between 500-1000 m altitude.

Conservation Measures Taken: None.

Conservation Measures Proposed: Monitoring of the populations of this *rare* species for quantitative assessment (1). Estimation of population size and evaluation of the degree of rarity and threat is of cardinal importance. This wild pepper species should be conserved by *ex situ* strategies taking cognisance of the gene-pool-niche interation. Preservation of germplasm in seed banks could go a long way.

Biology and Potential Value: Fruiting period—August. The Southern W. Ghats region is probably the centre of origin of black pepper (*P. nigrum*). Many other wild species of this genus have been reported to be of economical potential. However, this species which is a wild relative of such popularly cultivated crops (eg. *P. nigrum* and *P. betle*), has never been studied due to its rarity. It would be interesting to study the phenotypic and genotypic characteristics of this plant. Evaluation of the genetic potential of this species for the purpose of crop improvement through hybridisation is called for.

Cultivation: Not known in cultivation.

Description: Scandent undershrubs with swollen nodes. Leaves 7-14.5 $\times$0.9-4.5 cm, elliptic-lanceolate, glabrous above, pale and minutely punctate below, apex long acuminate, unequally acute at base, pinnately nerved; stipules 5-10 mm long, lanceolate, caducous. Spikes *ca* 10 cm long, on slender, filiform peduncles. Male-flowers: Stamens 2; filaments 0.5 mm long; anthers 2-locular. Female flowers: Ovary 1-locular, obovoid, ovule solitary; style absent; stigmas 3, cylindric, deflexed. Berries 4 mm across, obovoid.

References:

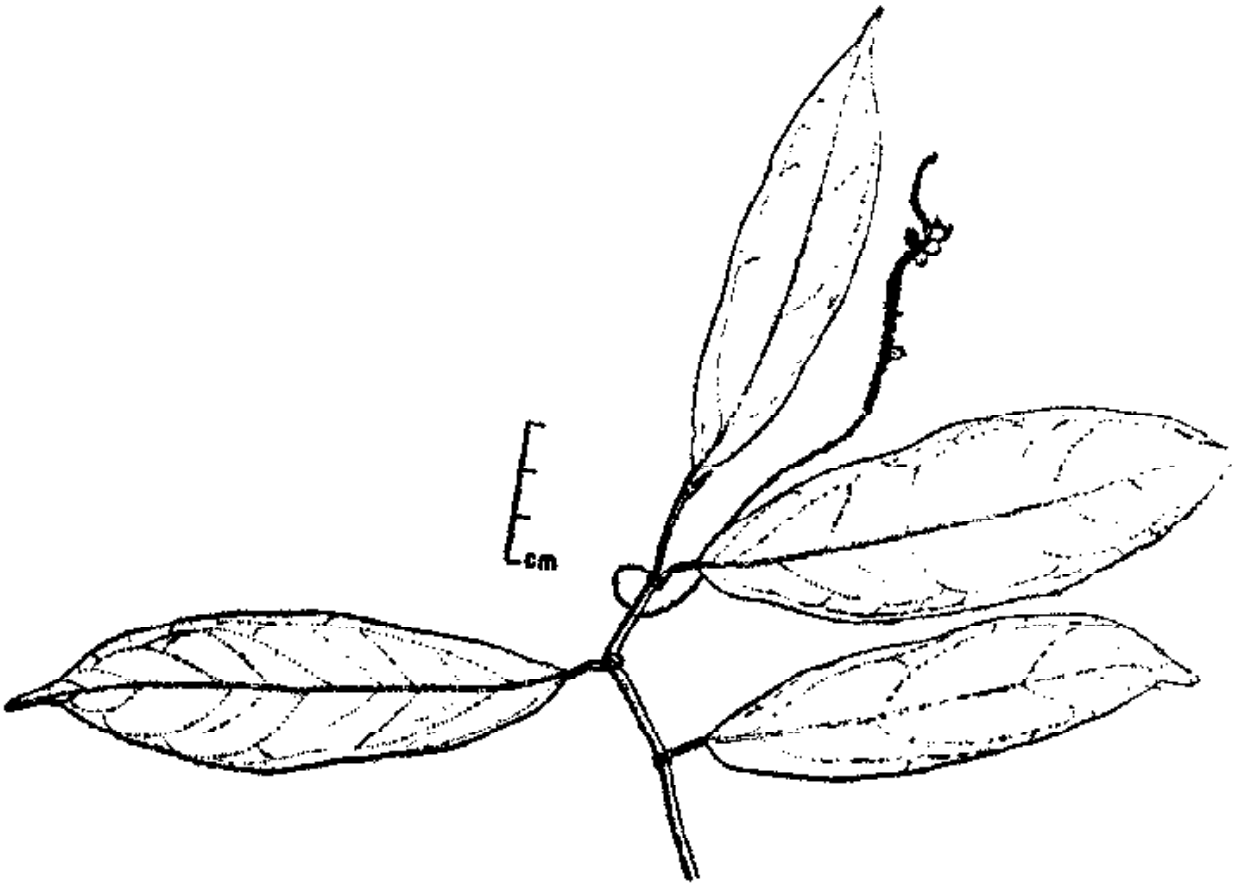
1. Anon. (1969). *The Wealth of India : Raw Materials* 8 : 83-118.

2. Ahmedullah, M. & Nayar, M. P. (1987). *Endemic Plants of the Indian Region* 1 : 10-16. Botanical Survey of India, Calcutta.

3. Gamble, J. S. (1924). *Kew Bull.* 1924 : 387.

4. Subramanyam, K. & Henry, A. N. (1970). Rare or little known plants from South India. *Bull. Bot. Surv. India* 12 (1-4) : 4.

The material for this sheet was supplied by M. P. Nayar and M. Ahmedullah, Botanical Survey of India, Calcutta.



Piper barberi Gamble

Status: Rare. This species is restricted to Panchgani plateau in Maharashtra State. It is found scattered here and there among other grasses and herbs.

Distribution: Endemic to 'Table land' and vicinity of Panchgani, Satara District, Maharashtra State. It was reported by Blatter and McCann in 1927 (1) and by Okle in 1968 (4). This was also collected by the present author in 1964.

Habitat and Ecology: Small annual, found on open rocky and gravelly plateau amongst species of *Conyza, Euphorbia, Eriocaulon, Heteropogon,* etc.

Biology and Potential Value: Not known.

Conservation Measures Proposed: A thorough search should be made in the area to determine the full geographical extent of this species. Panchgani table-land with several other rare and endemic species should be declared as a protected area.

Description: Small annual, 5-35 cm high with bearded nodes. Leafblades 3.0-8.0 cm, acuminate, bulbous hairy. Racemes 1-3, solitary or digitate, *ca* 3 cm long; peduncles capillary. Sessile spikelets *ca* 3 mm long; lower glume broadly oblong, pitted, 5-7-nerved, hairy except near the pit. Pedicelled spikelets 3 5-4.0 mm long; lower glume pitted, armed with spreading marginal bulbous-based bristles.

References:

1. Blatter, E. & McCann, C. (1927). Two new species of grasses from Panchgani (Satara District). *J. Bombay Nat. Hist. Soc.* 32 : 357-358.

2. Blatter, E. & McCann, C. (1935). *The Bombay Grasses,* pp. 90-91, fig. 58.

3. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan,* p. 135.

4. De Wet, J. M. J. & Harlan, J. R. (1968). Taxonomy of *Dichanthium*-Section *Dichanthium* (Gramineae). *Bol. Soc. Arg. Bot.* 12 : 220.

5. Deshpande, U. R. (1984). *Fasc. Fl. India* 15 : 21, figs. 33-34. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

Status: Rare. This species was collected from Khandala in 1918 by Blatter & McCann and was described by Bor in 1949. So far it was collected from Khandala and Lonavala in Pune District but in 1969 this was also collected from Ratnagiri District. This species is restricted to these places only.

Distribution: Western Ghats in Pune and Ratnagiri Districts, Maharashtra State. Endemic.

Habitat and Ecology: Annual grass growing in open areas on the plateaus along with *Dimeria gracilis* Nees ex Steud. and *Senecio belgaumensis* (Wt.) C. B. Cl.

Conservation Measures Taken: None.

Conservation Measures Proposed: Its habitats should be protected.

Biology and Potential Value: Not known.

Description: Tall annual, 30-80 cm high. Leaf blades 10-15 cm long, linear, acuminate. Racemes 2-4, subdigitate, 3-5 cm long. Spikelets 8-12 mm long, awned, lower glume upto 8 mm long; upper upto 12 mm long with 1-2 long hairs near the tip; lower lemma *ca* 6 mm long, hyaline, oblong; upper lemma *ca* 8 mm long, bilobed, awned; awn *ca* 2.6 cm long, geniculate.

References:

1. Bor, N. L. (1949). Two new Grasses from India. *Kew Bull.* 1949 : 70.

2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 140, fig. 4, 18.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

Status: Rare. The species occurs only in Ratnagiri District, Maharashtra State.

Distribution: Ratnagiri District, Maharashtra State. Apparently endemic to Western Ghats.

Habitat and Ecology: On exposed marshy lateritic hill tops; in open situations along coastal areas with *Ischaemum indicum* (Houtt.) Merr. and *Pulicaria angustifolia* DC.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Ratnagiri District and adjoining Konkan hilly areas are rich in endemic plants. The area needs to be protected.

Biology and Potential Value: A rare species restricted only to Ratnagiri District in Maharashtra State.

Description: Tufted annual, *ca* 25 cm high. Leaves linear, acute, flat or conduplicate, sparsely villous. Racemes solitary, erect, 3-6 cm long with purplish tinge, joints of the rachis and pedicels 2-2.5 mm long, fused into a stout internode, densely villous on margins and at tip, very oblique. Sessile spikelets 3.5-4.0 mm long (excluding awn); lower glume awned, oblong-ovate, 2.5-3.0 mm, densely ciliate on the margins and at back below, unequally winged on both keels upto the base, wings hyaline and finely purple-veined; upper glume oblong-lanceolate, boat shaped. Pedicelled spikelet (excluding awn) oblong, ovate, *ca* 4 mm long; lower glume oblong, lanceolate, oblique, 5-nerved, winged on one margin with hyaline, purple-veined wing upto the base, other margin produced into a slender antrorsely barbellate awn; upper glume ovate-lanceolate, oblique, 2-3-nerved, strongly keeled, margins unequal, keel broadly winged, purple-veined, broad above, gradually narrowing down to the base.

References:

1. Clayton W. D. (1970). Notes on the tribe Andropogoneae (Gramineae). *Kew Bull.* 35 (4): 815.

2. Jain, S. K. & Deshpande, U. R. (1968). *Manisuris santapaui* Jain *et* Deshpande—A new grass from India. *Bull. Bot. Surv. India* 10 (3 & 4): 277-279.

3. Jain, S. K. (1970). The genus *Manisuris* L. (Poaceae) in India. *Bull. Bot. Surv. India* 12 (1-4): 15, fig. 11.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

Status: Rare. This species has been described nearly 15 years before but besides type collections this has not been collected again.

Distribution: Apparently endemic to Maharashtra State in Pune and Sholapur Districts.

Habitat and Ecology: This grows on the plateau in moist places along with other annuals and grasses.

Conservation Measures Taken: None so far.

Conservation Measures Proposed: Areas rich in endemics and rare and threatened plants in Western Ghats deserve protection.

Biology and Potential Value: Not known.

Description: Annual, 15-75 cm high, erect, culms slender. Leaf-blades 6-15 cm, linear, flat, hirsute with tubercle-based hairs, margins cartilaginous, thickened. Panicle lax, 5-20 cm long, with capillary branches upto 5 cm long, pedicels with one to several glandular bands. Spikelets globose, 2.5-3.00 mm long. Glumes equal to or slightly shorter than the spikelet, setosely hirsute on dorsal side. Florets with tufts of long copious, woolly hairs, subequal, 2.0-2.8 mm long.

References:

1. Hemadri, K. (1971). *Isachne borii* Hemadri, a new grass from India. *Ind. For.* 97: 223-225, pl. 1, figs 1-8.

2. Ved Prakash & Jain, S. K. (1984). *Fasc. Fl. India* 14:14-15. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

Status: Rare, so far known only from the type collection from Karnataka State.

Distribution: Endemic to a single locality-Kundaguda near Agumbe, Shimoga District, Karnataka State.

Habitat and Ecology: Confined to Western Ghats in Mysore State. It grows in moist rocky crevices, associated with species of *Lindernia, Utricularia, Canscora,* etc.

Conservation Measures Taken: None.

Conservation Measures Proposed: Efforts to relocate the species in its type locality and to monitor its population should be made.

Biology and Potential Value: Not known.

Description: Delicate, annual grass, *ca* 8 cm high. Leaf-blades 7-12 cm, ovate to ovate-elliptic, amplexicaul, soft, hirsute near the apex. Panicle lax, upto 2.3(-3.0) cm long, pedicels with reddish glandular bands; spikelets *ca* 1.2 mm long, globose. Glumes setosely hirsute on back; lower *ca* 1 mm long, nerveless; upper *ca* 1.2 mm long, 5-nerved. Lemmas elliptic, concave, coriaceous, nerves obscure, glabrous or pubescent.

References:

1. Raghavan, R. S. (1971). A new species of *Isachne* R. Br. (Poaceae) from Mysore. *Ind. For.* 97 : 304-307, pl. 1.

2. Ved Prakash & Jain, S. K. (1984). *Fasc. Fl. India* 14: 33. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande and R. S. Raghavan, Botanical Survey of India, Pune.

Isachne mysorensis Sundararaghavan

Status: Rare. The species is confined to three districts of Maharashtra State, where it is rare and infrequently distributed. It was collected in 1907 but described only in 1970.

Distribution: Ambewadi, Nasik District; Harischandragarh, Thane District; Amboligbat; Ratnagiri District(Sindhudurg) in Maharashtra State. So far known only from Maharashtra State.

Habitat and Ecology: Annual, grows on rocks and in rocky creivces along the streams, near water falls, associated with *Impatiens* sp. and other grasses.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Survey to monitor the changes in their population levels.

Biology and Potential Value: This species closely resembles with *I. diplopogon* Hook. f. (also endemic to Maharashtra) and with *I. kingii* Hook. f. (endemic to Rajasthan and Maharashtra).

Description: Annual, 20-30 cm high, tufted or not, erect or suberect grass. Leafblades 4.5-9.0 cm long, linear-lanceolate, sparsely tubercle-based hairy on both surfaces. Inflorescence of 2 racemes. Racemes 2-4 cm long. Sessile spikelets 4-5 mm long, lanceolate; lower glume 4-5 mm long, biaristate, lanceolate with a small hump in the lower half, obscurely 4-nerved in the upper half, margins narrowly incurved with a tuft of hairs on either side about the middle, aristae unequal, scabrous, longer one 20 mm long while shorter upto 13 mm long; upper glume 4-5 cm long, boat-shaped with a hump and a tuft of hairs in the centre, apex bifid with an arista of *ca* 45 mm long. Pedicelled spikelets 4-5 mm long; lower glume 4-5 mm long, margins keeled in the upper half, apex bifid; upper glume 3.5-4.0 mm, oblong-lanceolate, 3-nerved, boat shaped.

Reference:

1. Hemadri, K. & Billore, K. V. (1970). *Ischaemum raizadae* Hemadri *et* Billore—A new grass from India. *Ind. For.* 96(4): 318-321.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

Status: Rare, known only from few collections. Grazing seems to be the main threat factor.

Distribution: Jammu and Kashmir (Kamri valley); Himachal Pradesh (Lahul).

Habitat and Ecology: Alpine region at 3500-5000 m. Reported to grow gregariously forming purplish patches.

Conservation Measures Taken: None.

Conservation Measures Proposed: The species should be thoroughly searched in the type locality and adjacent areas for its recollection so that a more elaborate study can be made which will help in suggesting suitable conservation measures for this extremely rare grass.

Biology and Potential Value: Nothing is known.

Cultivation: Not known in cultivation.

Description: Tufted perennial grass, culms 6-23 cm tall, erect. Leafblades flat or folded, 1-5 cm long, 1-1.5 mm wide, green, scaberulous above. Panicle contracted, 1.3-3.5 cm long, branches smooth, very short, bare in the lower part and bearing only 1 or 2 spikelets each. Spikelets 4.5-5 mm long, 2-3-flowered, variegated with purple; glumes oblong-elliptic, acute or subacute, upper 2-2.5 mm long, 3-nerved, lower 1.2-1.8 mm long, 1-nerved; lemmas 3.2-3·5 mm long, oblong-elliptic, acute, the tip compressed and apiculate, glabrous, palea keels smooth.

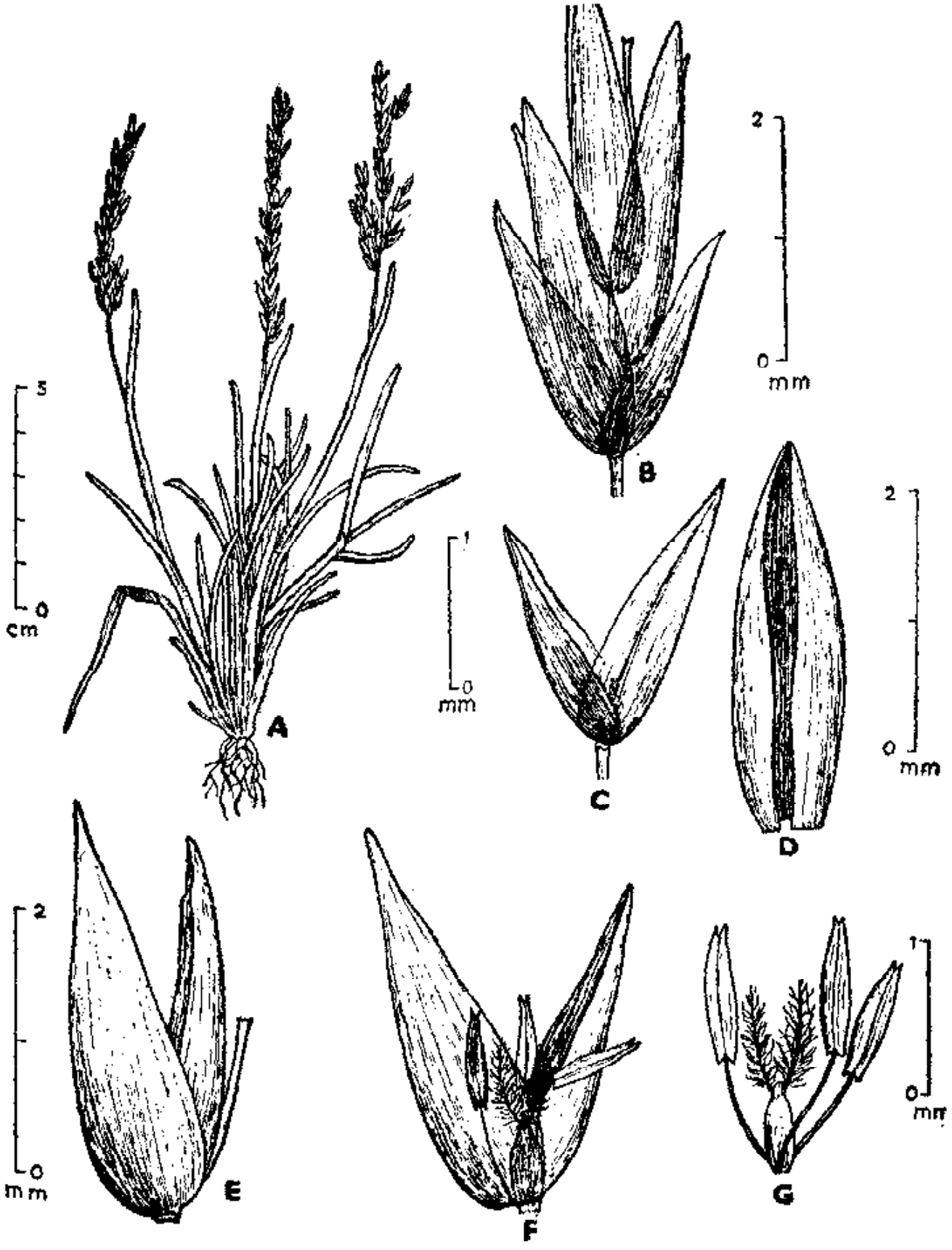
References:

1. Bor, N. L. (1953). *Kew Bull.* 1953: 270. 1953.

2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan,* p. 562.

3. Cope, T. A. (1982). *In :* Nasir & Ali (ed.). *Fl. West Pakistan* 143 : 433.

The material for this sheet was supplied by H. J. Chowdhery, Botanical Survey of India, Dehra Dun.



Puccinellia kashmiriana Bor. A. Habit. B. Spikelet. C. Lower & Upper glumes. D. Lemma. E. Lemma and palea. F. Floret. G. Ovary and stamens.

Status : Rare. Bhide collected this species in 1909 from Castle Rock in N. Kanara District. After a lapse of nearly 56 years, Kulkarni (4) collected it twice from another locality at Ratnagiri (Sindhudurg), Maharashtra, where it is available in a small area and distributed rearely.

Distribution : Castle Rock, N. Kanara, Karnataka State and Amboli, Ratnagiri District (Sindhudurg), Maharashtra State thus extending its distribution towards north. Endemic to Konkan in Western Ghats.

Habitat and Ecology : It grows on open rocky plateau alongwith *Ischaemum pilosum* (Klein ex Willd.) Wt. and *I. dalzellii* Stapf ex Bor.

Conservation Measures Taken : Nil.

Conservation Measures Proposed : The area abounds in several other rare, threatened and endemic plants and is worthy of declaring it as a 'protected area'.

Biology and Potential Value : Not known.

Description : A delicate grass, *ca* 30-45 cm high. Leaves 2.5-7.5 cm long, hairy on both surfaces. Racemes solitary, 12-25 cm long on a very slender peduncle exserted from the subtending sheaths. Sessile spikelets 3 mm long; lower glume oblong, obtuse, faintly 5-7-nerved; upper glume little longer than the lower, 3-nerved, oblong, apiculate; lower lemma hyaline; upper lemma bilobed, awned in the sinus. Pedicelled spikelets *ca* 4 mm long.

References :

1. Bhide, R.K. (1911). New and revised species of Gramineae from Bombay. *J. Proc. Asiat. Soc. Bengal* (*N.S.*) 7 : 514, pl. IV. (as *Andropogon paranjpyeanum* Bhide).

2. Blatter, E. & McCann, C. (1935). *The Bombay Grasses*, pp. 97-98. (as *Eremopogon paranjpyeanum* (Bhide) Blatt. & McC.)

3. Bor, N.L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 216.

4. Kulkarni, B.G. (1973). Some interesting and rare plants from Maharashtra. *J. Bombay Nat. Hist. Soc.* 70 : 237, t. 4.

5. Raghavan, R.S. & Singh, N.P. (1983). *In :* Jain, S.K. & Sastry, A.R.K. (ed.). *Plant Conservation Bulletin* 3 : 8. Posscef, Botanical Survey of India, Howrah.

6. Raizada, M.B. & Jain, S.K. (1953). On the genus *Eremopogon* Stapf and its affinities with *Schizachyrium* Nees. *Proc. Ind. Sci. Congr. Abst. part.* 3 : 130.

The material for this sheet was supplied by Miss U.R. Deshpande, Botanical Survey of India, Pune.

Status : Rare and Vulnerable. Reported only from Tirunelveli District, Tamil Nadu. Collected by Karthikeyan in 1972. It has not been collected or reported afterwards from the type locality or elsewhere.

Distribution : Southern Western Ghats (Tirunelveli Hills) in Tamil Nadu.

Habitat and Ecology : Aquatic herb, recorded from Thulukkamparai, Tirukkurumgudi, Tirunelveli District growing on rocks in running streams, at an altitude of about 850 m.

Conservation Measures Taken : None so far.

Conservation Measures Proposed : Detailed surveys of similar areas to be taken in Western Ghats so that more such niches can be identified and suitable protective measures recommended. Since the species of Podostemaceae grow mostly on rocks in swiftly flowing streams, the species can be conserved only by *in situ* measures by protecting their habitats.

Biology and Potential Value : This species is botanically and morphologically interesting and peculiar and more details are yet to be known.

Description : Aquatic herbs, rhizomes 5-25 cm long, 3-7 mm across, suberect, sparingly branched below, attached by long hepterae only at base. Leafy shoots simple, numerous, densely crowded, completely covering the upper surface of the rhizome. Leaves ca 1.5 × 0.8 mm, sessile, simple, arranged in four vertical rows, ovate to lanceolate, entire, subacute at apex, narrowed at base, midrib reaching 3/4 the length of lamina. Flower bearing leafy shoots often branched below; the upper few, linear; leaves more or less connate below forming a sheath, enclosing the basal part of pedicel. Flowers solitary, terminal, regular, bisexual, hypogynous, monochlamydeous, pedicellate, reddish. Perianth 3-segmented, persistent, oblong-obovate, obtuse, concave. Stamens 3, alternating with perianth segments; filaments pale-red, slender; anthers ovate-oblong, basifixed, introrse. Ovary ellipsoid, sessile, smooth, 3-loculed; placentation axile, thick; ovules many; stigmas 3, sessile, short, fleshy, papillose. Capsules 2-3 mm long, ellipsoid, 9-ribbed, dehiscing into 3 valves; seeds ellipsoid, minute, smooth.

References :

1. Sharma, B.D., *et al.* (1974). *Bull. Bot. Surv. India* 16(1-4) : 157-161, ff. 1-17.

2. Kumari, G.R. (1987). *In :* Henry, A.N., *et al.* (ed.) *Fl. Tamil Nadu* 1(2) : 200.

The material for this sheet was supplied by K. Ramamurthy, Botanical Survey of India, Coimbatore.

Status: Rare; over-collection due to its curious nature and for study by students and Research workers, together with loss of its habitats rendered the species threatened. Habitat loss due to construction of dams rendering reduced flow of water in rivers and streams is a threat factor.

Distribution: Western Ghats: Anamalai hills; located recently from Palghat hills. Endemic to south India.

Habitat and Ecology: Curious plant with shoots resembling *Lycopodium selago*, attached in tufts to the thallus on partly exposed wet rocks in swiftly flowing river beds.

Conservation Measures Taken : Its habitats in Palghat hills bordering Silent Valley are now declared as a National Park and hence the chances for its survival.

Conservation Measures Proposed: *In situ* protection of the species is the only method to save this species.

Biology and Potential Value: A species of botanical and distributional interest.

Description: Small tufted herbs with erect imbricate shoots. Thallus crustaceous, fleshy, closely attached to the rocks; secondary shoots crowded, erect, forming dense tufts. Leaves of floriferous shoots decussate, triquetrous. Flowers naked, sessile terminal. Stamens 2. Capsule smooth.

References:

1. Beddome, R. H. (1864). *Mniopsis selaginoides. Trans. Linn. Soc., p.* 25. t. 28.

2. Hooker, J. D. (1886). *Fl. Brit. India* 5 : 68. (as *Podostemon selaginoides* Benth.)

3. Willis (1902). *Ann. Roy. Bot. Garden, Peradeniya* 1 : 370.

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Vulnerable, due to its medicinal properties: there is no appropriate cultivation of this medicinal herb.

Distribution : Endemic to Bashahr, Himachal Pradesh.

Habitat and Ecology : Alpine regions of Himalaya.

Conservation Measures Taken : None.

Conservation Measures Proposed : Further collection of this plant from the wild should be banned/stopped and attempts should be made to cultivate this deadly poisonous aconite for its proper exploitation.

Biology and Potential Value : Fls. and Frts. : May-October. Deadly poisonous of all the aconites, used in many medicines under the trade name "Bish" or "Atis"

Cultivation : Not known in cultivation.

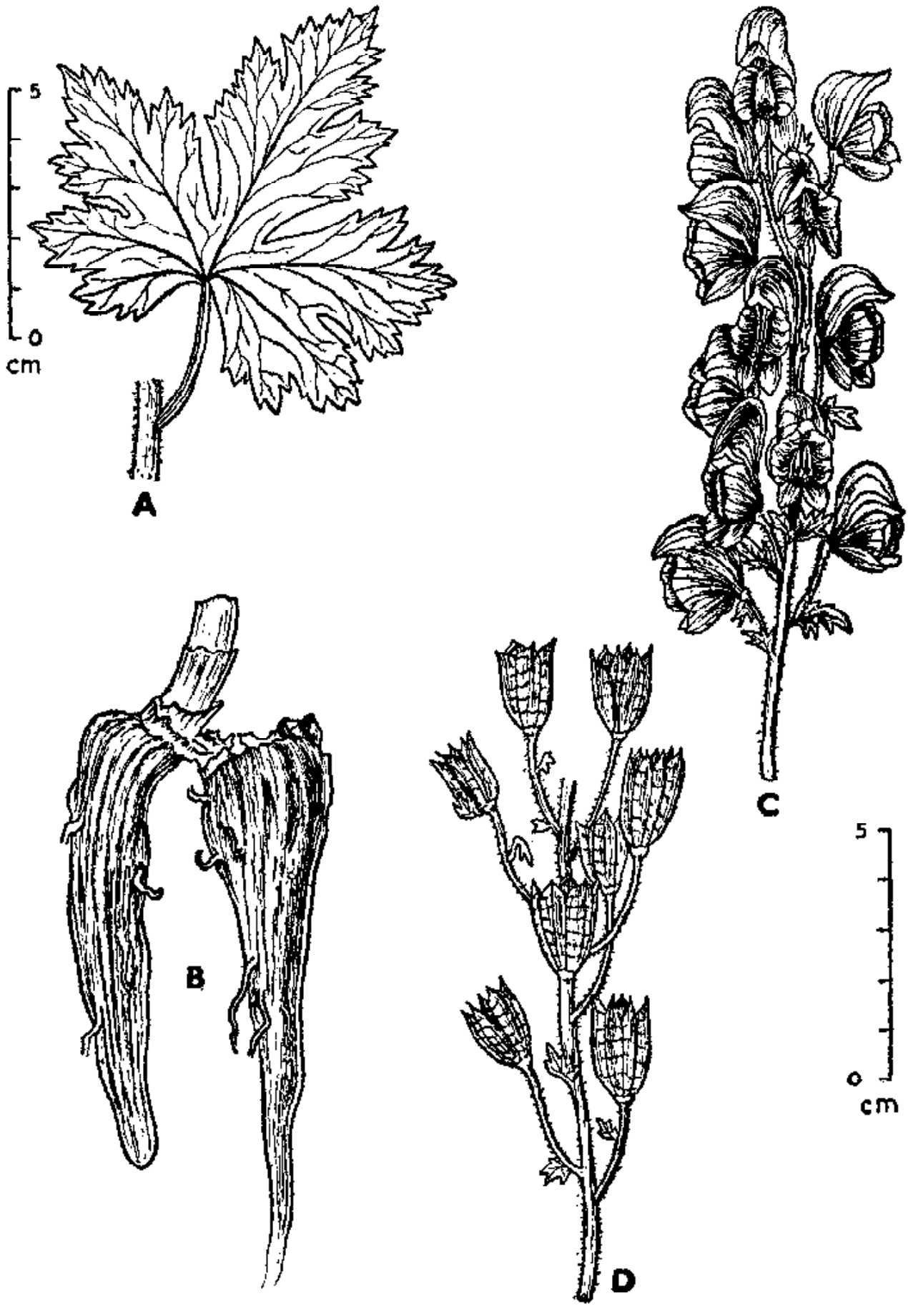
Description : Erect, tall herbs with paired roots, 12×2.5 cm with few root fibres. Stems upto 1 m tall, slightly hairy above. Leaves scattered, upper leaf-blades 3-partite, above 1 cm across, lobes coarsely crenate or dentate. Inflorescence tomentose with spreading hairs. Carpels glabrous.

References :

1. Basu, B. D. (1918). *Indian Medicinal Plants*, part 1. p. 17.

2. Stapf, C. (1904). *Aconites of India*, p. 164. pl. 105. fig. 13, 14.

The material for this sheet was supplied by H. J. Chowdhery, Botanical Survey of India, Dehra Dun.



Aconitum falconeri Stapf var. *latilobum* Stapf. A. Cauline leaf. B. Roots. C. Inflorescence. D. Infrutescence. (after *Stapf*)

Status : Vulnerable. Recollected after a period of ten decades in 1979, which represents the only collection available in Indian herbaria for this species, [(*B. S. Aswal* 11913 (CDRI)].

Distribution : Kashmir and Himachal Pradesh; Pakistan; Beluchistan and Afghanistan. Recent collection in 1979 by B. S. Aswal from Chamba district of Himachal Pradesh indicates that in recent times the species is known from only one locality in India.

Habitat and Ecology : On the shady slopes of *Quercus-Rhododendron* forests (1500 m) and parhaps has a very short life span (April-May).

Conservation Measures Taken : None.

Conservation Measured Proposed : Thorough explorations should be made to locate this plant for proposing suitable conservation measures.

Biology and Potential Value : Not known; ornamental.

Cultivation : Not known in cultivation.

Description : Stem simple, terete, pubescent densely above with spreading hairs. Radical leaves crowded, petiole dilated at the base, 2-12 cm long, laminae 3-5 sect to base, subglabrous to villous, segments narrow-cuneate at the base, pinnately dissected into narrow toothed lobes; cauline leaves reduced, lobes narrower. Inflorescence racemose to subpaniculate, lax, spreading hairy; bracts lanceolate. Sepals blush-purple to pale, sparsely villous; spur hooked. Petals deeply 2-fid. densely hairy. Follicles 3, straight, glabrous or hairy.

References :

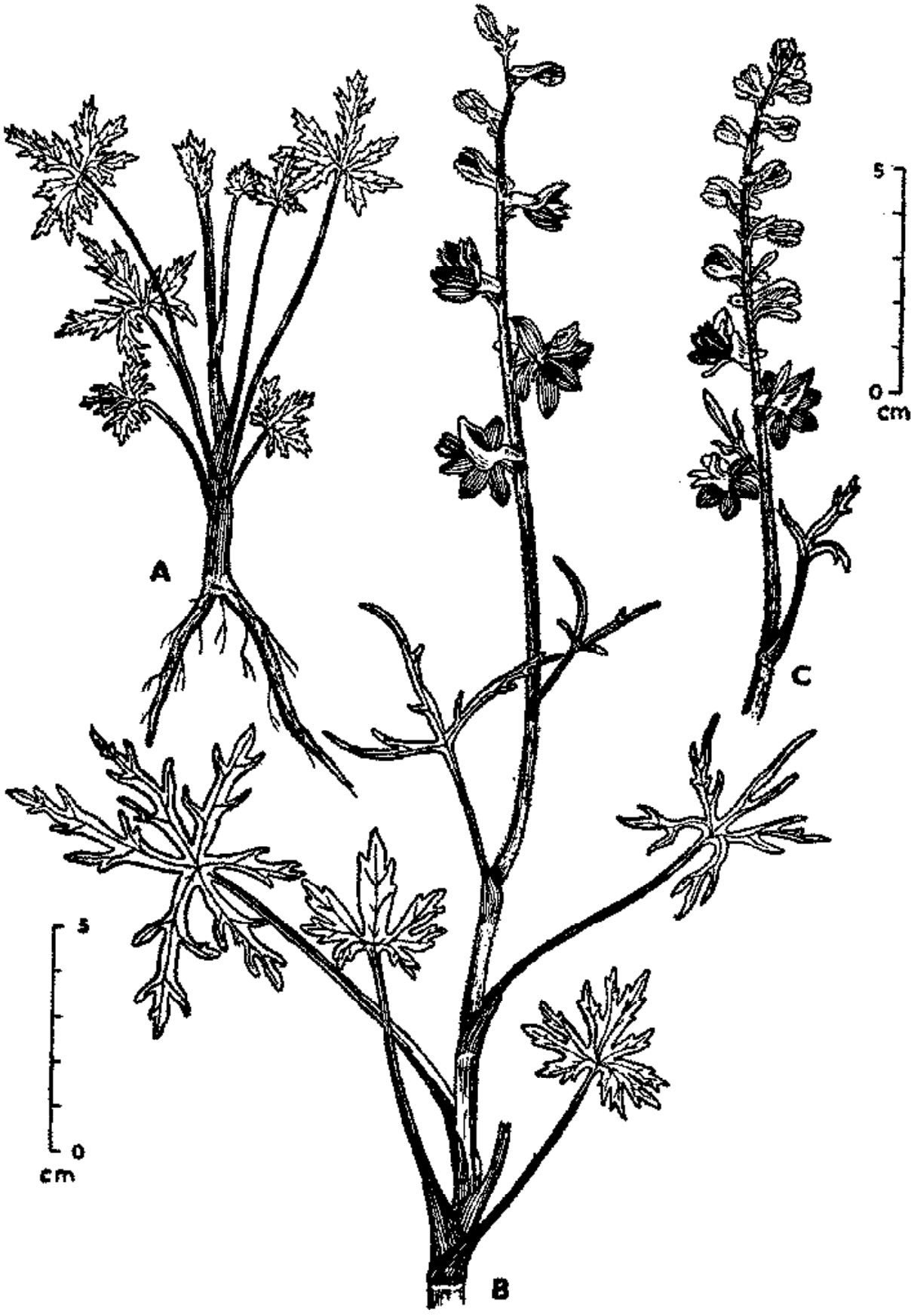
1. Aswal, B. S. & Mehrotra B. N. (1983). *Delphinium uncinatum* Hook. f. & Thoms. (Ranunculaceae) and *Lilium wallichianum* Schultes. f. (Liliaceae)—Two rare finds from North-West Himalayas. *In :* Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah.

2. Bruhl & King, G. (1896). *Ann. Roy. Bot. Gard. Calcutta* 5 : pl. 116. fig. 2, 3.

3. Hooker, J. D. & Thomson, T. (1872). *In :* Hooker, J. D., *Fl. Brit. India* 1 : 24. 1872

4. Munz, P. A. (1967). A synopsis of the Asian species of *Delphinium* sensu stricto. *Journ. Arnold Arb.* 48 : 300.

The material for this sheet was supplied by H. J. Chowdhery, Botanical Survey of India, Dehra Dun.



Delphinium uncinatum Hook. f. *et* Thoms. A. Habit. B. Flowering plant. C. Inflorescence. (after *Bruhl & King*)

Status: Vulnerable, due to habitat loss.

Distribution: Meghalaya, Assam and Nagaland. Endemic.

Habitat and Ecology: In moist dense forests.

Conservation Measures Taken: None.

Conservation Measures Proposed: Cultivation in the gardens as an ornamental plant for its fairly large beautiful flowers.

Biology and Potential Value: Worthy of cultivation in the gardens as an ornamental plant.

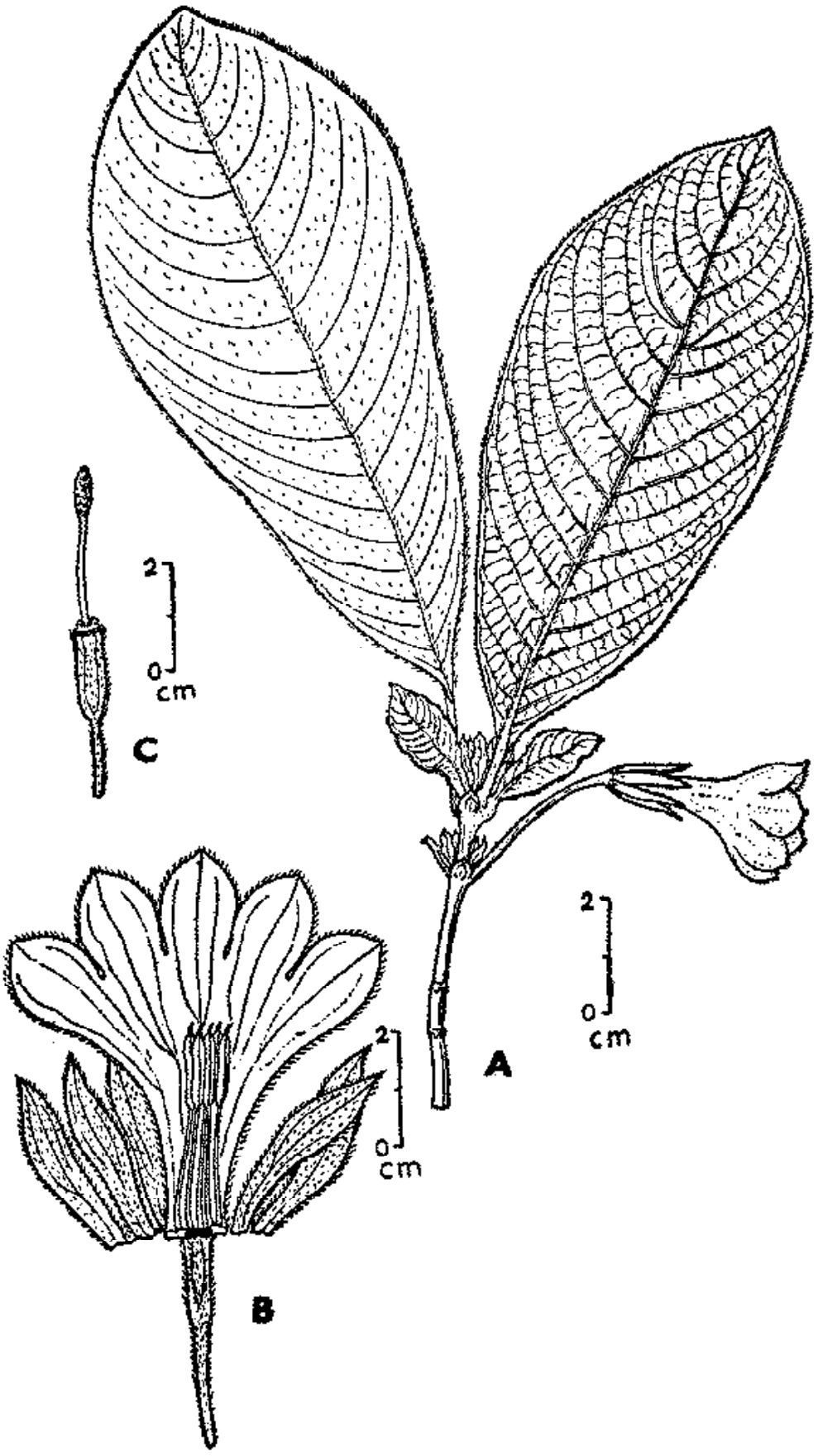
Cultivation: Not known to have been cultivated anywhere.

Description: A short undershrub, hirsutely tomentose; stem cylindric, short, sometimes epiphytic. Leaves large, 10-25 cm long, elliptic or oblanceolate, acute, hirsute on both surfaces; stipules interpetiolar, broad, acute. Flowers in short peduncled subterminal bracteate cymes. Calyx tube oblong, lobes 5, persistent, linear-lanceolate, about 2-2.5 cm long. Corolla blue, about 3.5-4 cm long, funnel-shaped, densely villous; lobes valvate, short, rounded. Stamens 5, included within the tube; filaments filiform; anthers included, cohering into a tube, pointed and spurred at their tips. Ovary 1-celled, long, fusiform; style filiform; stigma clavate, furrowed; ovules numerous, in two parietal 2-lamellate placentas. Fruit a berry, oblong, 2-celled, many seeded, about 4 cm long, with persistent calyx lobes.

Reference:

1. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 92.

The material for this sheet was supplied by D. B. Deb, Botanical Survey of India, Howrah.



Acranthera tomentosa R. Br. ex Hook. f. A. Flowering branch. B. Floral parts excluding style. C. Pistil.

Status: Vulnerable. Habitat loss apparently accounts for its rarity.

Distribution: Tamil Nadu. Endemic.

Habitat and Ecology: In forests at about 1500 m altitude.

Conservation Measures Taken: None.

Conservation Measures Proposed: It should be cultivated in botanic gardens.

Biology and Potential Value: A plant of academic interest. Flowering and fruiting time: May-July.

Cultivation: Not taken up anywhere.

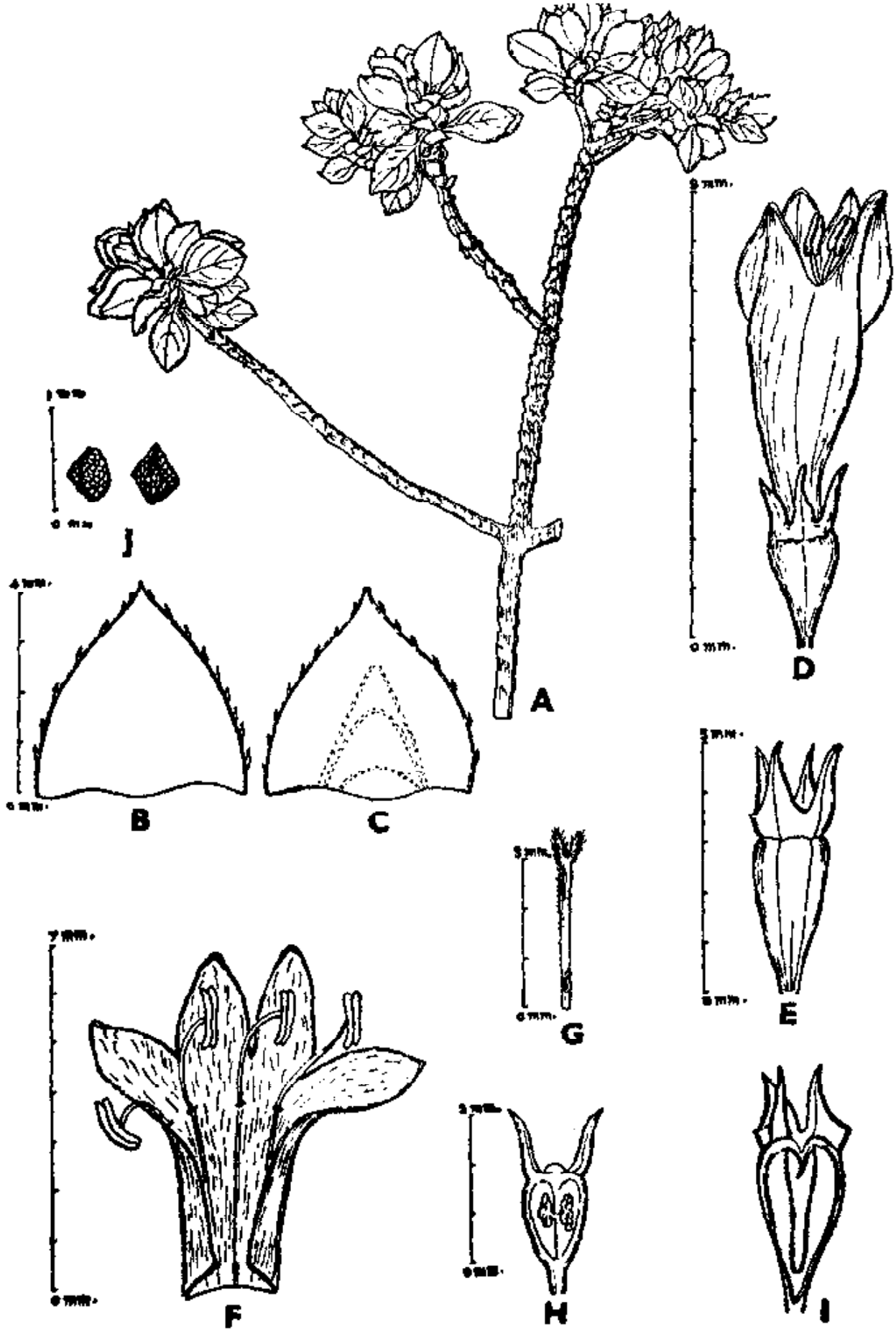
Description: Small undershrubs branching dichotomously; branches rough and corrugated with stipular scars, black when dry, crowded with leaves above. Leaves subsessile, 1-1.5×0.6-0.7 cm, ovate, obtuse at apex, contracted at the base, coriaceous, revolute at margins, pale brown in colour; stipules opposite, sheathing at base, glandular at margin, whitish, scarious when dry. Inflorescence from upper axils, sessile, a 3-flowered cyme with 2 linear bracts at base. Flowers short pedicelled, 7-9 mm long, heterostylous. Calyx tube very small above the obovate hypanthium; lobes 4, lanceolate, minute. Corolla tubular, 3-4 mm long, densely pubescent at throat; lobes 4, oblong, 2-3 mm long, pubescent inside. Stamens 4, exserted; filaments 1.5-2 mm long, adnate at throat. Ovary small, ovoid, 2-celled; ovules few on axile placentation; style 3 mm long; stigma bilobed, papillose. Fruit capsular, 2.5-3.5×1-2 mm, ovoid, glabrous. Seeds few, planoconvex or angular; testa smooth, reticulate.

References:

1. Gamble, J. S. (1920). *Kew Bull.* 1920 : 68.

2. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 600.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis barberi (Gamble) Henry *et* Subr. A. Habit. B. & C. Dorsal & Ventral sides of stipule. D. Flower. E. Hypanthium with calyx. F. Corolla. G. Style & Stigma. H. L. S. of ovary. I. Capsule—split. J. Seeds.

Status: Vulnerable due to habitat loss.

Distribution: Kerala. Endemic.

Habitat and Ecology: Grows in scrub forests at low altitudes.

Conservation Measures Taken: None.

Conservation Measures Proposed: Introduction of the plants into botanic gardens should be taken up.

Biology and Potential Value: A plant of academic and distributional interest. Flowering and fruiting time: July-August.

Cultivation: Not taken up anywhere.

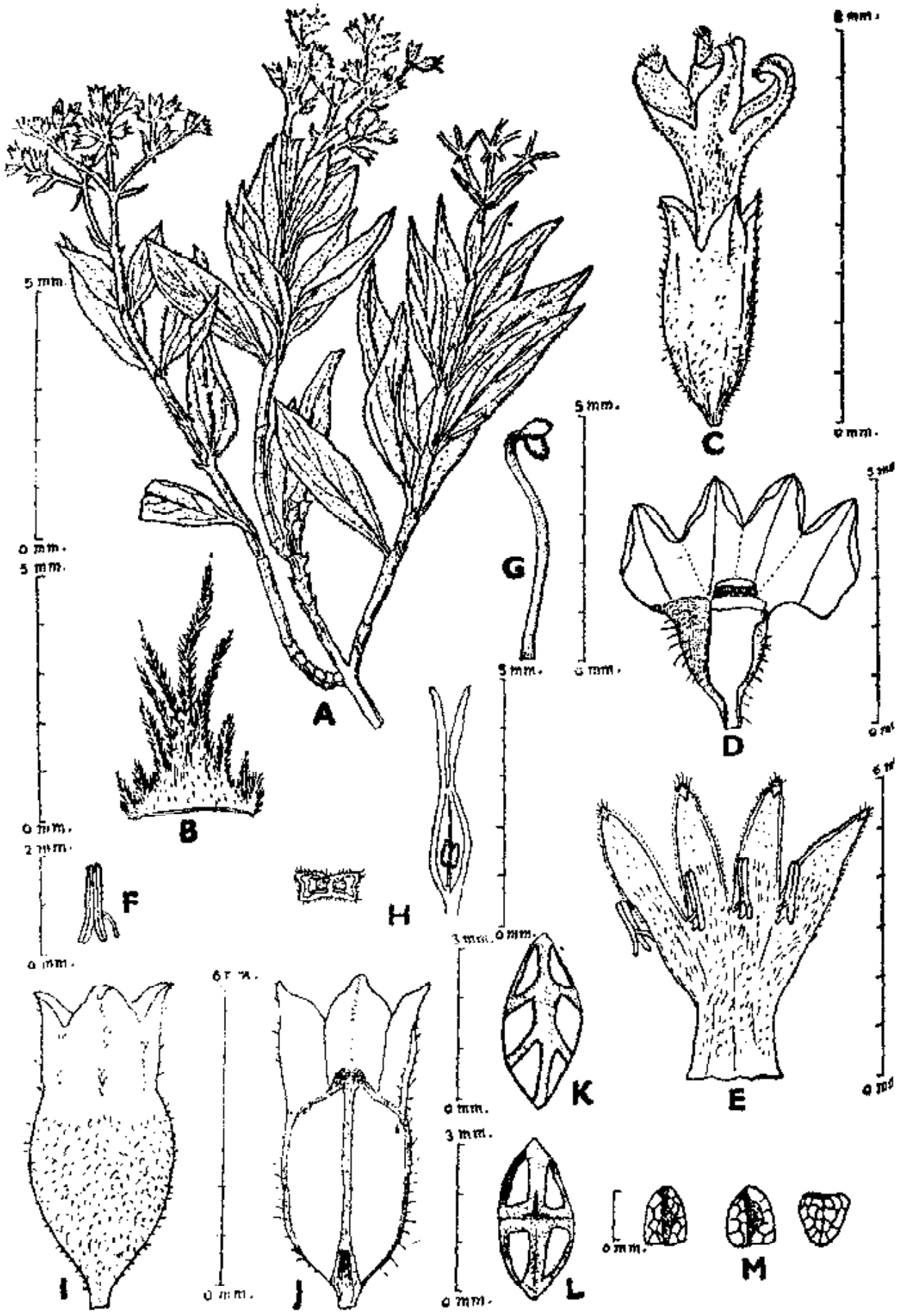
Description: Small shrubs or herbs with woody base, branching dichotomously, pubescent above, glabrous below. Leaves opposite, subsessile to short petioled, 5-6×1-1.5 cm, lanceolate, acuminate at apex, attenuate at base, membranous, pubescent on both the surfaces, more so along the nerves ; nerves 3-4 pairs, oblique ; stipules interpetiolar, 2-2.5×3-5 mm, triangular, elongating with 9-11 pectinate teeth, villous. Inflorescence terminal, trichotomous or dichotomously branched corymbose spreading cymes, villous. Flowers sessile or subsessile, epigynous, 7-8 mm long, bracteate, bracteolate ; bracts leafy, 1-10 mm long, villous; bracteoles small. Calyx tube much produced above the hypanthium, villous ; lobes 4, small, broadly triangular, acute, midnerve prominent, villous. Corolla tubular, 2-3 mm long, densely pubescent outside and at the base within; lobes 4, 2-3 mm long, oblong, incurved, beaked at apex, setolose outside, minutely serrated at margin, pubescent inside. Stamens 4, inserted ; filaments very short, adnate at the sinus of the corolla lobes; anthers 1-2 mm long, linear. Style 4-5 mm long, slender, minutely pubescent; stigma fleshy, bilobed, papillose. Capsule 5-6×2-3 mm, oblong, densely villous at base. Seeds 8-10, minute, planoconvex or triangular, narrowly winged; testa reticulate, narrowly winged, brownish in colour.

References:

1. Gamble, J. S. (1921). *Fl. Pres. Madras,* p. 598.

2. Rolla Rao & Hemadri, K. (1973). *Ind. For.* 99 (6): 378.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis bourdillonii (Gamble) Rolla Rao *et* Hemadri. A. Habit. B. Stipule. C. Flower. D. Hypanthium & Calyx. E. Flower split open. F. Stamen. G. Style & Stigma. H. T. S. & L. S. of ovary. I. Fruit. K. & L. Placenta. M. Seeds.

Status : Rare. Due to recent developmental activities, habitats of the species have undergone changes, reducing the places of occurrence of the plant.

Distribution : West Bengal, Assam; Bangladesh and Burma.

Habitat and Ecology : Sandy beds of forest streams at about 225 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed: Some of its distribution areas should be conserved; the species should be introduced into Botanic gardens.

Biology and Potential Value : The plant has not been studied thoroughly, and is of academic interest; fls. & frs. during February-April.

Cultivation : Not taken up anywhere.

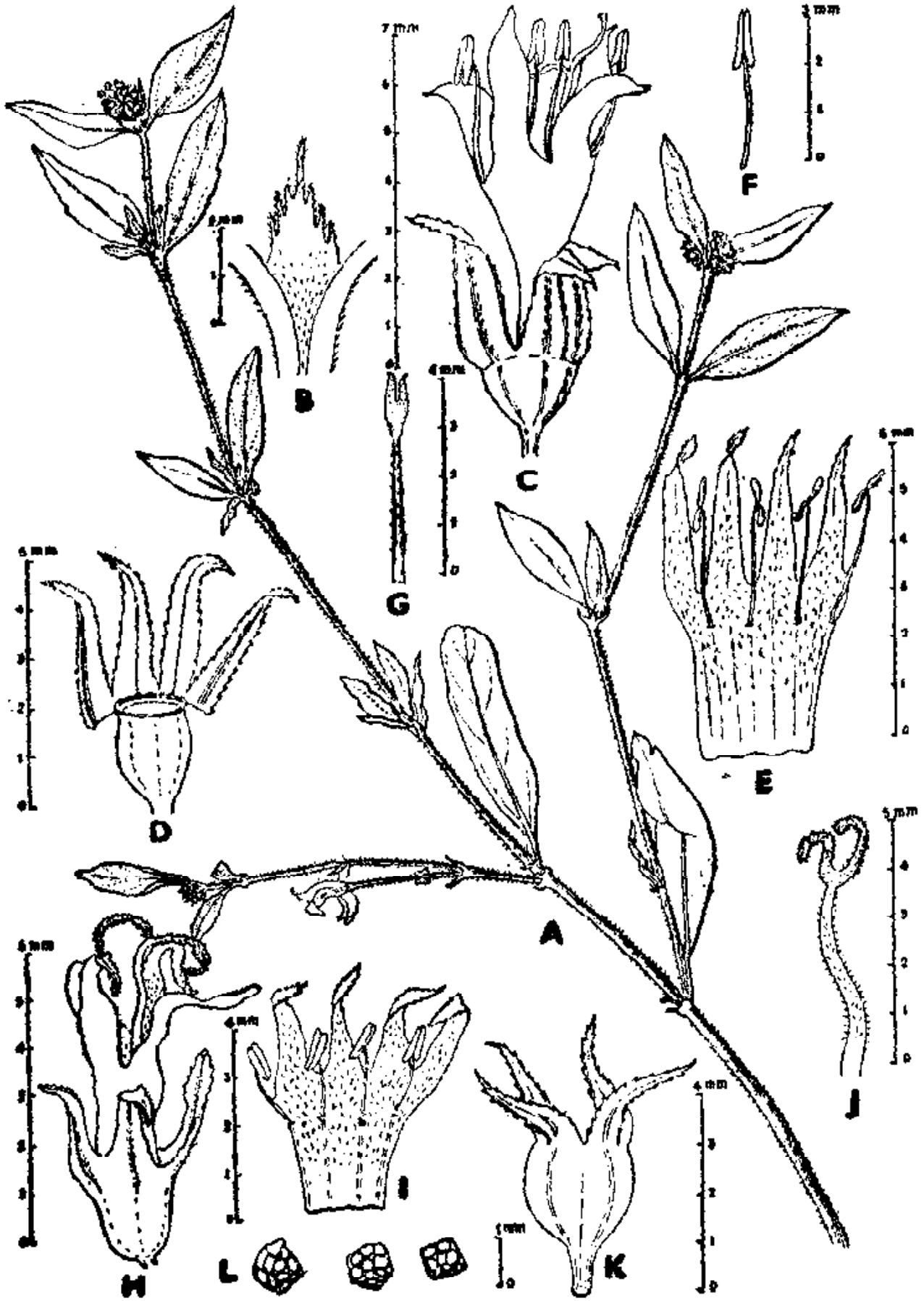
Description : Annual herbs or perennials, woody at base; branches decumbent, straggling or scrambling; stem quadrangular, grooved, puberulous at ridges, dark brown or black when dry. Leaves subsessile or short petioled, 3-8 × 0.5-2.5 cm, elliptic-lanceolate, acuminate, cuneate at base, glabrous, sometimes sparsely pubsescent along the nerves; nerves 3-4 pairs, obscure; petiole 0.7-1 mm long, minutely pubescent; stipules interpetiolar, connate, membranous, 1.5-2.0 × 3-4 mm, elongating, toothed or pectinate. Inflorescence terminal capitate cymes, .5-1.3 cm in diam., rarely on short axillary branches with 2-4 involucral leaves. Flowers subsessile, epigynous, heterostylous. Calyx tube very short; lobes 4, accessory calyx teeth very often present, serrated at margin. Corolla white or pinkish in colour, tube cylindrical, 2.5-3 mm long, pubescent inside above; lobes 2.5-3 mm long, acute, pubescent on the upper half, more densely on the lower half inside. Stamens 4, exserted or not; filaments 1-2.5 mm long, minutely pubescent, anthers 0.8-1 mm long, linear-oblong. Style stout or slender, 3-5 mm long, pubescent; stigma bilobed, linear, papillose. Capsule globose, or subglobose, 2-3 × 2-3 mm, glabrous, prominently ridged or keeled. Seeds many, small, angular; testa granulate, black.

References :

1. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 63.

2. Merrill, E. D. (1936). *Philipp. Journ. Sc.* 60 : 35.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis brunonis Merr. A. Habit. B. Stipule. C. Short styled flower. D. Hypanthium & Calyx lobes. E. Flower split open. F. Stamen. G. Style. H. Long styled flower. I. Corolla & shortly exerted stamens. J. Style. K. Fruit. L. Seeds.

Status : Rare.

Distribution : Tamil Nadu and Kerala. Endemic.

Habitat and Ecology : On hill slopes at about 2600 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : *In situ* conservation; storage of seeds in Seed Banks and introduction of the species in botanic gardens are suggested.

Biology and Potential Value : A plant of academic interest; fls. & frs : April-June.

Cultivation : Not taken up anywhere.

Description : Herbs or undershrubs; stems stiff, with stipular scars, glabrous. Leaves opposite, crowded above, sessile or subsessile, 1-1.5×0.5-0.7 cm, ovate or elliptic, coriaceous, shining, revolute at margins; midrib prominent; stipules interpetiolar, connate at base with 6-7 teeth. Inflorescence cymose, terminal or from upper axils, 3-flowered. Flowers sessile, 9-10 mm long, bracteate, epigynous, heterostylous, sparsely pubescent outside; bracts filiform. Calyx tube produced above the hypanthium; lobes 4, lanceolate, acute. Corolla pale-violet in colour; tube 2-3 mm long, densely pubescent inside; lobes 4, oblong, acute, minutely pubescent inside. Stamens 4; filaments exserted, 1.5-2 mm long, adnate at throat, anthers 0.7-1 mm long, linear. Ovary 2-celled, many ovuled, ovules on axile placentation; style 1-2 mm long, enclosed; stigma bilobed, linear, papillose. Capsule sessile, 2-3×2-2.5 mm, subglobose, glabrous, opening septicidally into two cocci which ultimately become quadripartite. Seeds many, small, 0.3-0.5×0.1-0.3 mm, angular, reticulate.

References :

1. Beddome, R. H. (1865). *Trans. Linn. Soc.* 25 : 218.

2. Fischer, C. E. C. (1921). *Rec. Bot. Surv. India* 9(1) : 91.

3. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 598.

4. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 52.

5. Kunze, O. (1891). *Rev. Gen. Pl.* 1 : 292.

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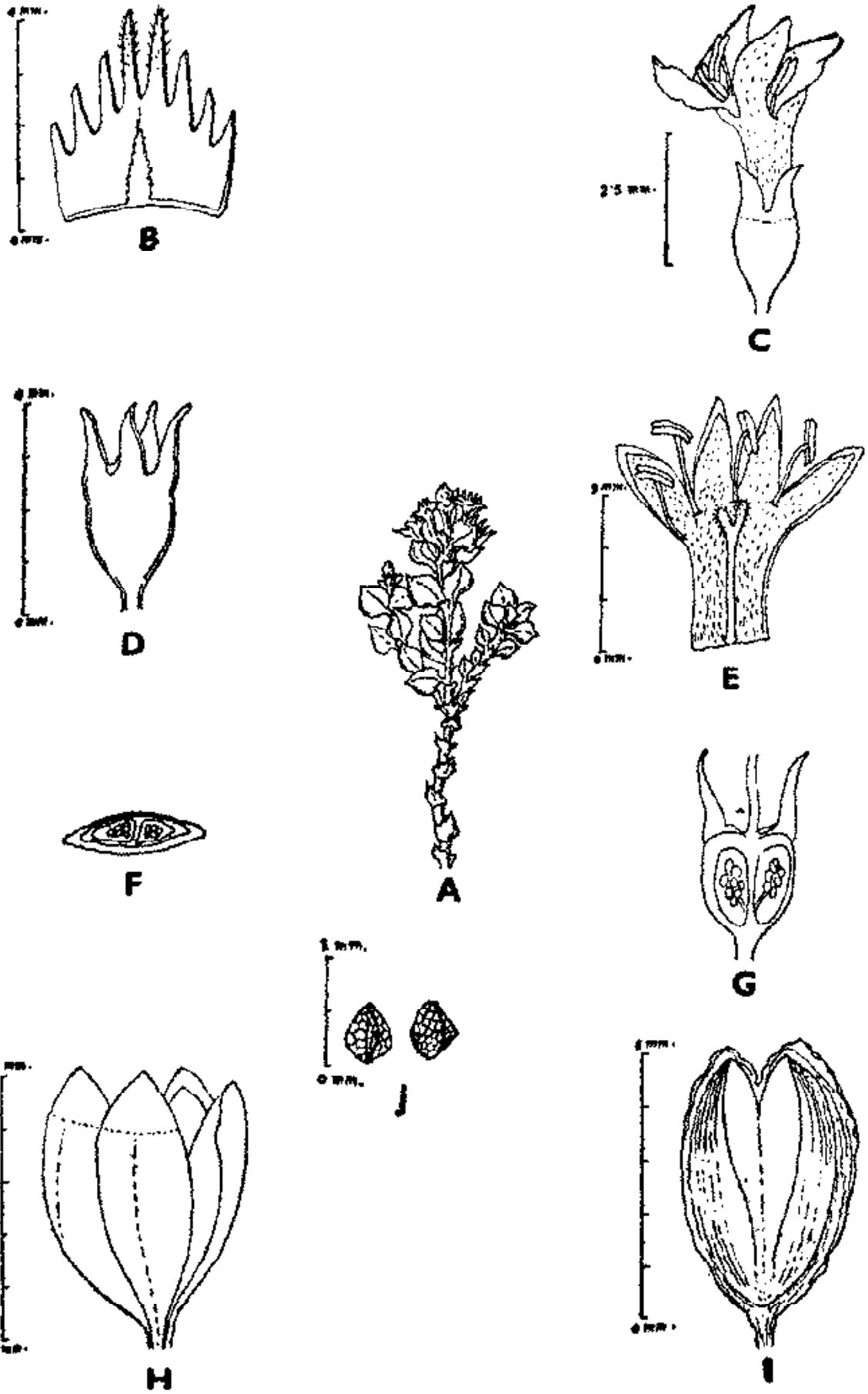

Hedyotis buxifolia Bedd. A. Habit. B. Stipule. C. Flower. D. Hypanthium. E. Flower split open. G. & F. L.S. & T.S. of ovary. H. & I. Fruit. J. Seeds.

Status : Rare. Due to developmental activities, its natural habitats have undergone changes in many localities of its occurrence, for which it is not presently found in some of those localities.

Distribution : Tamil Nadu, Maharashtra and Karnataka; Sri Lanka.

Habitat and Ecology : On rocky slopes or in open deciduous forest floors.

Conservation Measures Taken : None.

Conservation Measures Proposed : *In situ* conservation; storage of seeds in Seed Banks, cultivation in botanic gardens are suggested.

Biology and Potential Value : Local name 'Vashop-pilloo' indicates that it is a poisonous plant. Fls. & frs: October-January.

Cultivation : Not taken up anywhere.

Description : Herbs with stout root-stock, branching from base, branches erect; stem terete, stiff, setaceous throughout. Leaves oppostie or verticillate, sessile, 1-1.5×0.2 cm, linear, aristate at apex, coriaceous, punctate, rigid, revolute at margins, setaceous above and along midrib below; stipules interpetiolar, cupshaped, thin, membranous, white with 3-4 bristles. Inflorescence axillary and terminal capitate cyme with 3-4 flowers. Flowers sessile or shortly pedicelled, 4-5 mm long; pedicel 0.5-1 mm long, setaceous. Calyx setaceous, tube short; lobes 4, triangular-lanceolate, aristate. Corolla blue, 3-4 mm long; lobes 4, lanceolate to linear-lanceolate, 3-nerved, minute puberulous inside, incurved, shortly bristillate at apex; tube short, glabrous inside. Stamens 4, exserted, longer than the corolla lobes; filaments attached near the sinus of corolla lobes, 3-3.5 mm long, ciliate at base; anther subglobose; style slender, 4-5 mm long; stigma bifid, linear, feathery. Capsule globose or ovoid, 2-4×1.5-2 mm, notched at apex, subcoriaceous, ribbed, punctate setaceous, with persistent calyx teeth, dehiscing longitudinally from top. Seeds 40-60, angular, narrowly winged, reticulate.

References :

1. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 597.

2. Hooker, J. D. (1880). *Fl. Brit. India* 3: 60.

3. Kurz, S. (1876). *Journ. Asiat. Soc.* 45(2) : 336.

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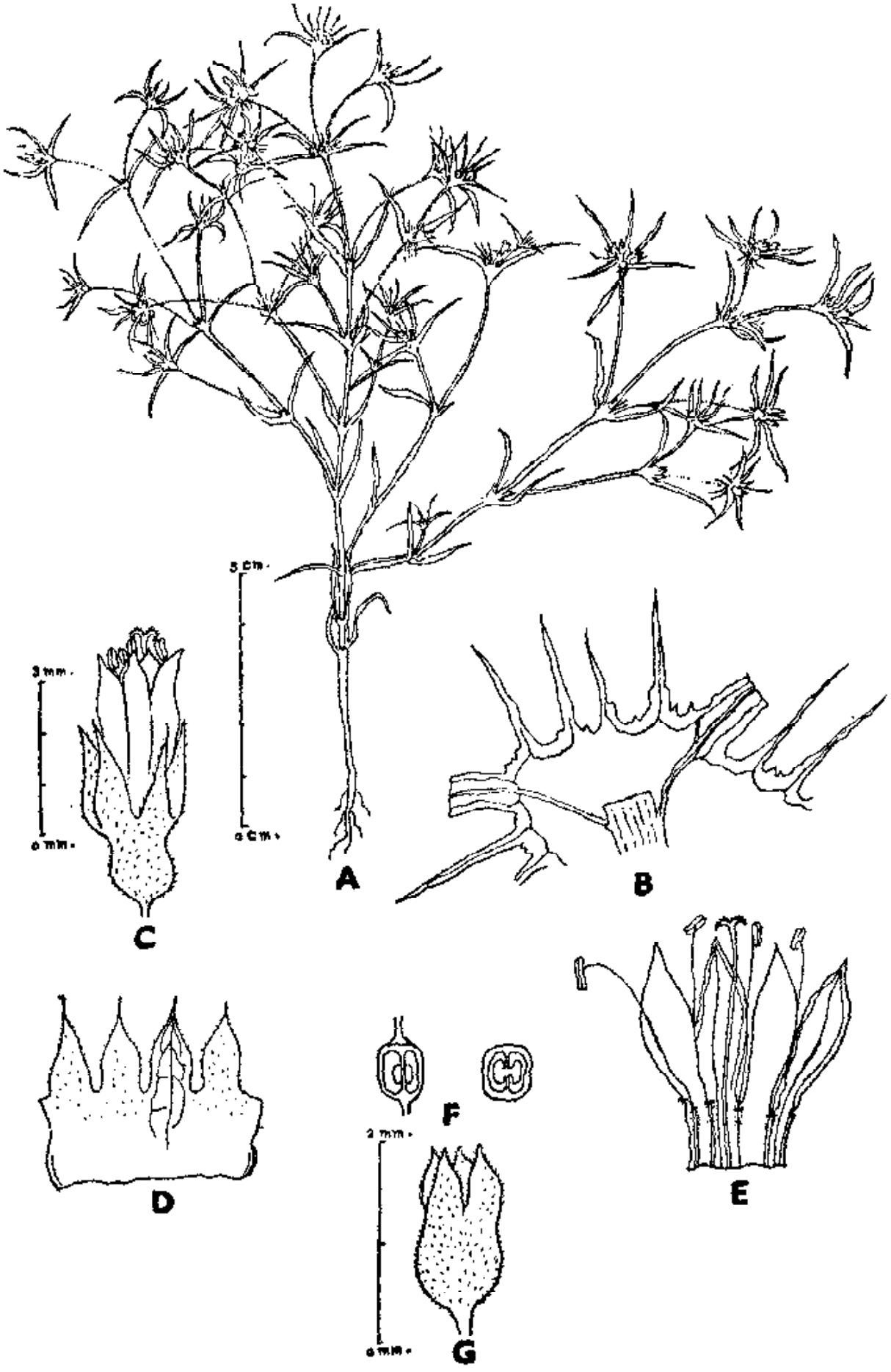

Hedyotis cyanantha Kurz. A. Habit. B. Stipule. C. Flower. D. Calyx. E. Flower split open. F. L.S. & T.S. of ovary. G. Fruit.

Status : Rare. Its habitats have undergone changes due to developmental activities.

Distribution : Tamil Nadu and Kerala. Endemic.

Habitat and Ecology : On forest floor at about 1400 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : To cultivate the plant in botanic gardens.

Biology and Potential Value : A plant of academic interest, not studied thoroughly.
Fls. & frs. : April-December.

Cultivation : Not taken up anywhere.

Description : Herbs or undershrubs, branching, rooting at lower nodes; stems obtusely angular, often prominently winged at lower nodes, grooved, glabrous. Leaves subsessile or petiolate, 3-17×1.5-4.5 cm, ovate or elliptic-lanceolate or oblong-lanceolate, acuminate at apex, attenuate at base, membranous, glabrous, pale green, glossy below; lateral nerves 8-10 pairs, faint; petiole upto 1.2 cm long, dilated at base; stipules triangular, with 3-7 bristles, fleshy, winged at base. Inflorescence terminal or axillary, slender, spreading paniculate cymes, glabrous. Flowers pedicelled, 7-8 mm long, bracteate, bracteolate; bracts foliaceous; bracteoles linear, minute; pedicel 1-2 mm long. Calyx tube slightly extending over the hypanthium; lobes 4, minute, linear-lanceolate or ovate-lanceolate, hairy along the margin. Corolla white, funnel shaped, tube 2-4×1-1.2 mm, slender; lobes 4, oblong, incurved, acute, puberulous outside, minutely pubescent inside, densely pubescent at throat. Stamens 4, inserted or exserted; filaments 0.2-0.3 mm or 1-2 mm long, adnate at sinus of corolla lobes; anthers 0.8-1 mm long, linear. Ovary ovoid, 2-celled, many ovuled, on axile placentas, medianly attached; style 3-3.5 mm or 7-8 mm long, inserted or exserted, slender; stigma bilobed, linear, fleshy papillose. Capsule 2-2.5×2-2.5 mm, globose or subglobose, depressed, glabrous. Seeds 8-20, angular or plano-convex, minute; testa reticulate, brownish.

References :

1. Gamble, J. S. (1919). *Kew Bull.* 1919 : 404.

2. Gamble, J. S. (1921). *Fl. Pres. Madras,* p. 598.

3. Henry, A. N. & Subramanyam, K. (1972). *Proc. Ind. Acad. Sci.* 76 : 28.

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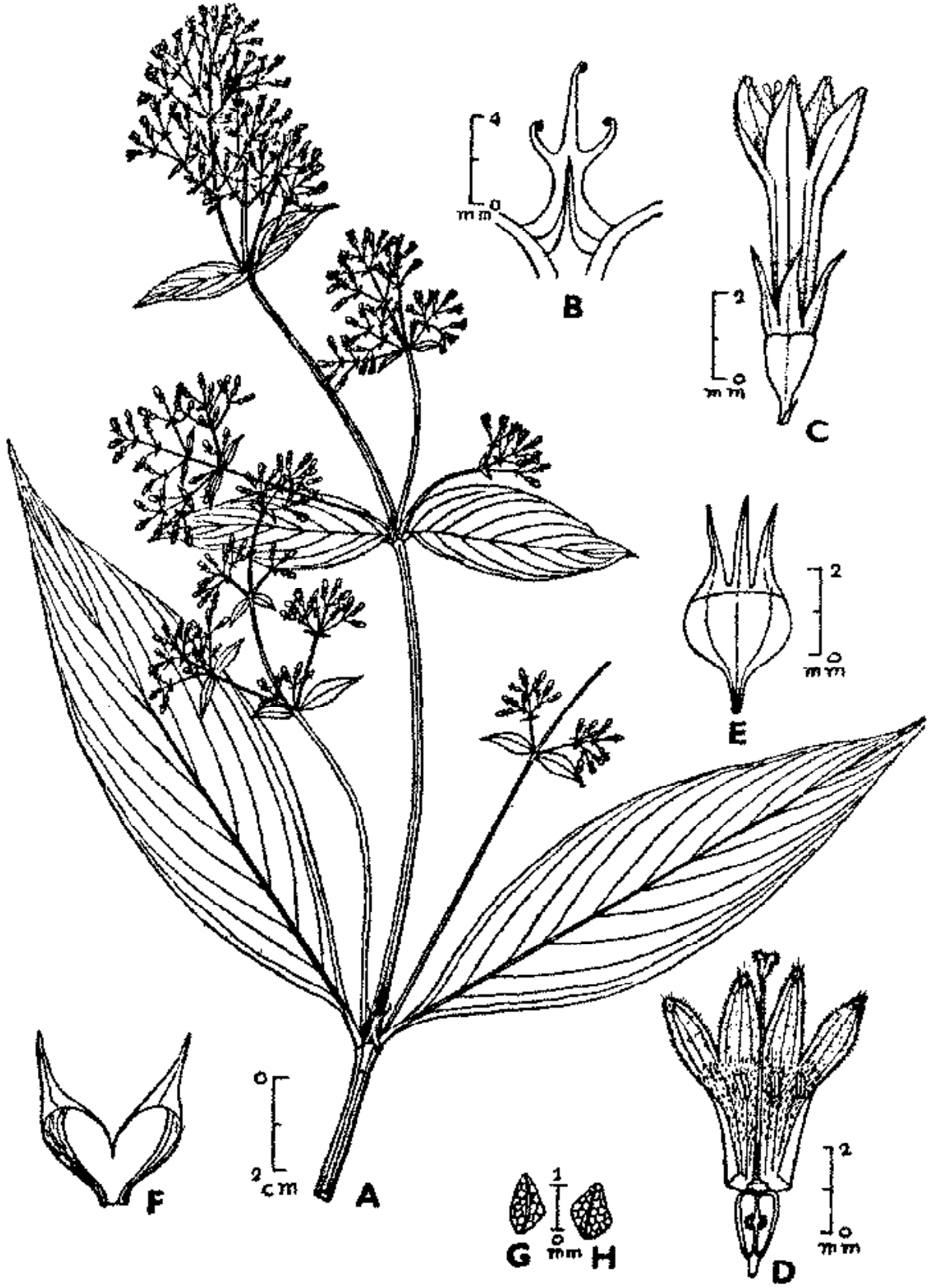


Hedyotis eualata (Bedd. ex Gamb.) Henry *et* Subr. A. Habit. B. Stipule. C. Flower. D. Flower split open. E. Capsule. F. Capsule-dehisced. G. & H. Seeds.

Status : Rare in India. Due to developmental activities, its natural habitats have undergone eco-degradation resulting in rarity of this species.

Distribution : India (Travancore); Sri Lanka and Burma.

Habitat and Ecology : Moist regions upto about 900 m in altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : Efforts should be made to recollect the plants in natural habitats and introduce them in botanic gardens.

Biology and Potential Value : A plant of academic interest. Flowers and fruits from April to November.

Cultivation : Not cultivated.

Description : Shrubs or undershrubs, 15-30 cm, erect, branching; stems obtusely angular or terete, grooved, glabrous. Leaves opposite, subsessile or short petioled, 2-12.5×2-3.5 cm, oblong-lanceolate to narrowly lanceolate, narrowed to the base, coriaceous, glabrous, dark green above, pale, pellucid below; lateral nerves 6-12 pairs, fine, oblique; petiole 1-10 mm long, winged; stipules interpetiolar, 4-5×5-6 mm, triangular, acuminate, keeled, gland-serrated, often pubescent in early stages. Inflorescence a terminal panicle, often pubescent. Flowers sessile or subsessile, epigynous, 8-10 mm, pubescent. Calyx tube campanulate, much produced above the ovary; lobes 4, 0.5-1.5 mm, ovate, acute, curved, often pubescent. Corolla white, funnel shaped, sparsely pubescent outside; tube 2-3 mm long, densely wooly inside near the throat; lobes 2-2.5×1-1.5 mm long, oblong, acute, incurved at apex, setolose outside, minutely pubescent inside. Stamens 4, exserted or not, arising from the throat of the corolla tube; filaments 0.5-2 mm long; anthers 0.7-1 mm long, linear. Ovary inferior; style short or long, upto 5 mm long, slender; stigma bilobed, linear or globose, papillose. Capsule globose or subglobose, 2-3×2-3 mm, ribbed, glabrous or pubescent, dehiscing septicidally, crown enclosed within calyx lobes. Seeds 8-10 in each capsule, angular or plano-convex, narrowly winged, 0.7-1×0.8-1 mm, testa reticulate, brownish in colour.

References :

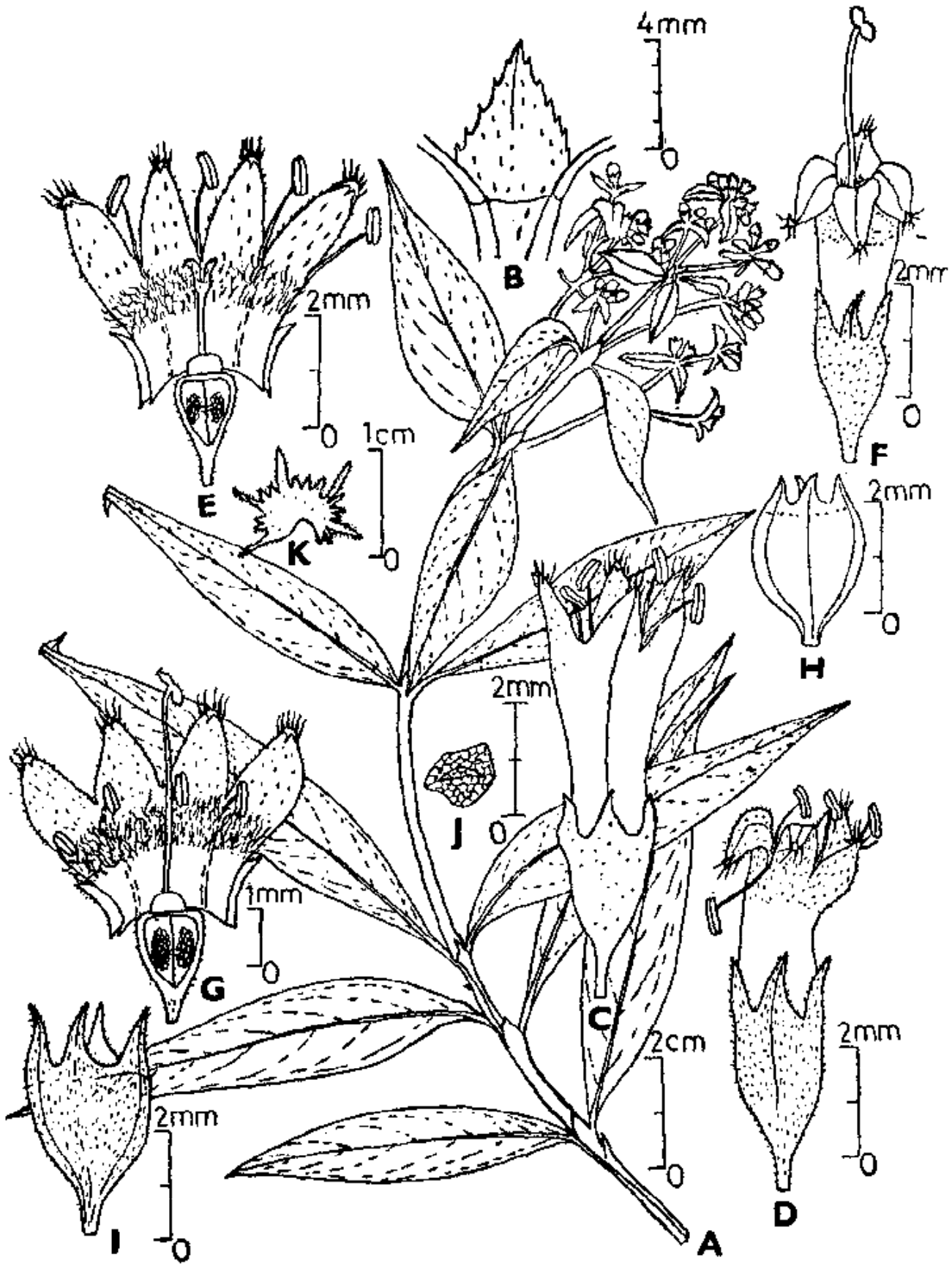
1. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 597.

2. Hooker, J. D. (1980). *Fl. Brit. India* 3 : 49.

3. Linnaeus, C. (1753). *Species Plantarum*, p. 101.

4. Wight, W. & Arnott, G. A. W. (1834). *Prod. Fl. Penin. Ind. Orient.* p. 408.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis fruticosa Linn. A. Habit. B. Stipule. C. & D. Short styled flowers. E. Corolla split open. F. Long styled flower. G. Corolla split open. H. & I. Fruit. J. Seed.

Status : Rare in India.

Distribution : West Bengal, Assam, Arunachal Pradesh; Bangladesh and Burma.

Habitat and Ecology : Along the edges of the forests and in open bamboo forest floor.

Conservation Measures Taken : None.

Conservation Measures Proposed : *Ex-situ* conservation of the species in botanic gardens.

Biology and Potential Value : A plant of academic interest, not yet studied thoroughly. Fls. & frs. : July-December.

Cultivation : Not taken up anywhere.

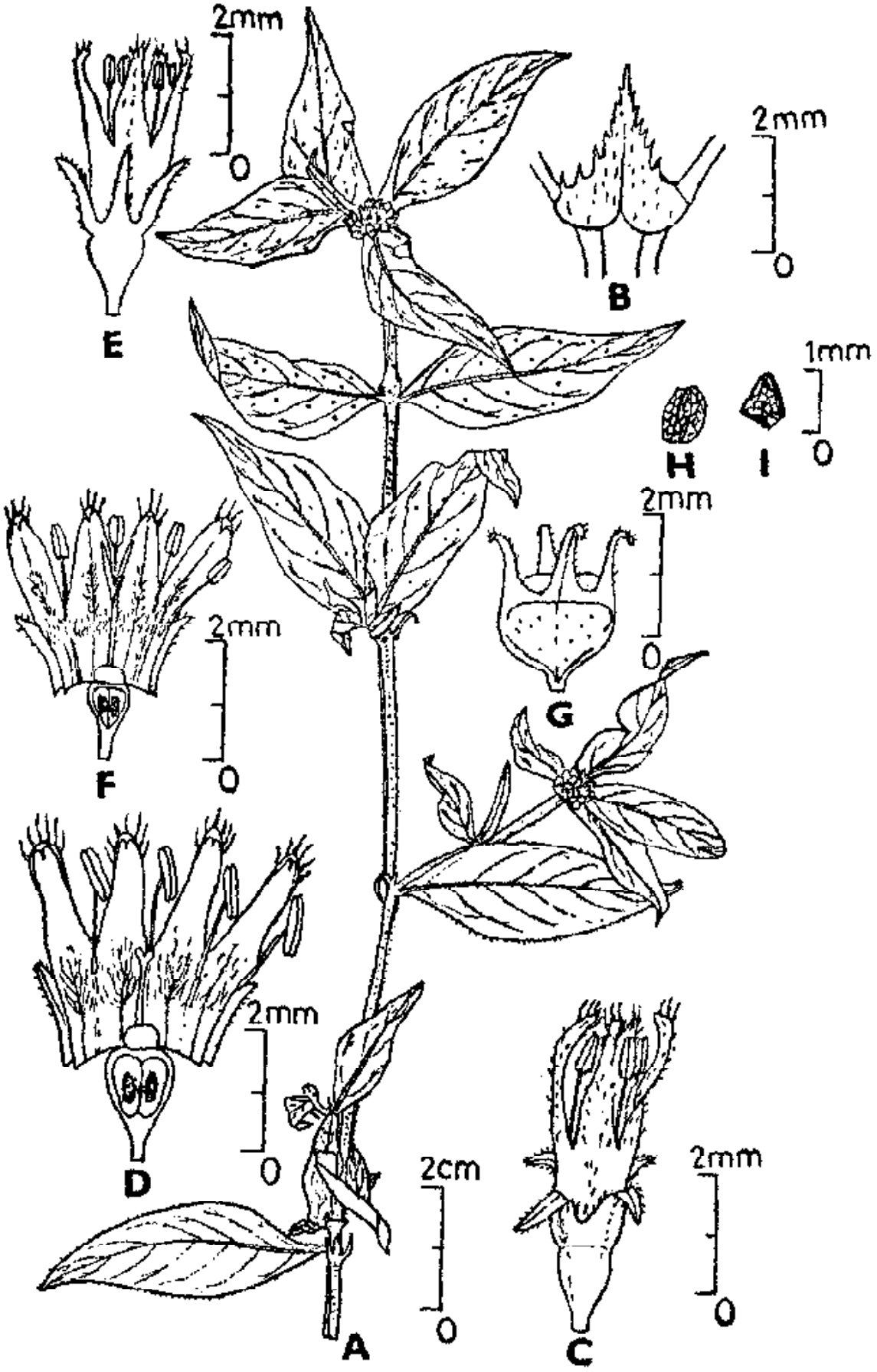
Description : An annual herb or perennial from a stout long woody root-stock; stem obtusely angular above, terete below, scabrid, sometimes glabrescent below. Leaves opposite, sessile or subsessile, 2-10×1.5-2 cm, lanceolate, tapering at both ends, membranous, blackish above, pale below, scabrid above and along the nerves beneath; petioles 1-2 mm long, puberulous; stipules interpetiolar, triangular, pubescent, pectinately gland-serrated. Inflorescence terminal, few flowered capitate cymes with 4-6 involucral ovate-acute bracts. Flowers 4-5 mm long, shortly pedicelled, bracteate, setolose at apex; pedicel 0.3-1 mm long; bracts minute, pectinate. Calyx tube short; lobes 4, minute, triangular-lanceolate, scabrid along the margin. Corolla white, tubular, minutely pubescent outside; tube short, enclosed within the calyx lobes, throat pubescent inside, lobes 4, oblong, 2-3 mm long, minutely pubescent at throat, densely pubescent below. Stamens 4, exserted; filaments 1-1.5 mm long, adherent at sinus of corolla lobes, pubescent; anthers linear-oblong. Style 1-2 mm long, pubescent, enlcosed within the corolla lobes; stigma bilobed, papillose. Capsule 2-3×2 mm, crustaceous, muricated, glabrous or minutely pubescent, apparently indehiscent, but ultimately divides septicidally. Seeds 20-40, angular, reticulate, brownish in colour.

References :

1. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 62.

2. Kurz, S. (1977). *Journ. Asiat. Soc. Bengal* 46(2) : 136.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis scabra Wall.ex Kurz. A. Habit. B. Stipule. C. Flower—short styled. D. Flower split open. E. Flower—long styled. F. Flower split open. G. Fruit. H. & I. Seeds.

Status: Rare due to loss of habitats.

Distribution: Kerala and Tamil Nadu. Endemic.

Habitat and Ecology: On forested hill slopes at 1500-2000 m in altitude.

Conservation Measures Taken: None.

Conservation Measures Proposed: Protection of its habitats, storage of its seeds in Seed Banks and introduction of the species in botanic gardens are suggested.

Biology and Potential Value : A plant of academic interest, not thoroughly studied. Flowers and fruits during June-February.

Cultivation: Not taken up anywhere.

Description: Shrubs or undershrubs, branches short, with stipular scars at short intervals, glabrous but minutely pubescent along grooves near nodes. Leaves opposite, sessile or subsessile, 2.5-7×1-2 cm, elliptic-ovate, acute, contracted at petiole, coriaceous, undulate at margin, yellowish when dry; nerves 3-4 pairs from base; petiole upto 3 mm long, minutely pubescent along the leafbase; stipules interpetiolar, free, elongating with pectinate teeth, glabrous, black glandular at tip. Inflorescence in terminal paniculate cymes, densely pubescent. Flowers pedicellate, epigynous, heterostylous, 7-8 mm long, hispid hairy outside; pedicel 0.8 -1 mm long; bracts small, linear. Calyx tube very short above the hypanthium; lobes 4, lanceolate, acute. Corolla pink or purple, tubular, hispid outside; tube 6-7 mm long, densely pubescent within; lobes 4, oblong, minutely pubescent inside. Stamens 4, inserted or exserted; filaments 0.2-0.3 mm or 1.5-2 mm long, adnate at the throat; anthers linear. Ovary ovoid, 2-celled, many ovuled on medianly placed axile placentas, papillose. Capsules globose, 3-4×1-2 mm, hispid. Seeds many, minute, angular, winged; testa reticulate.

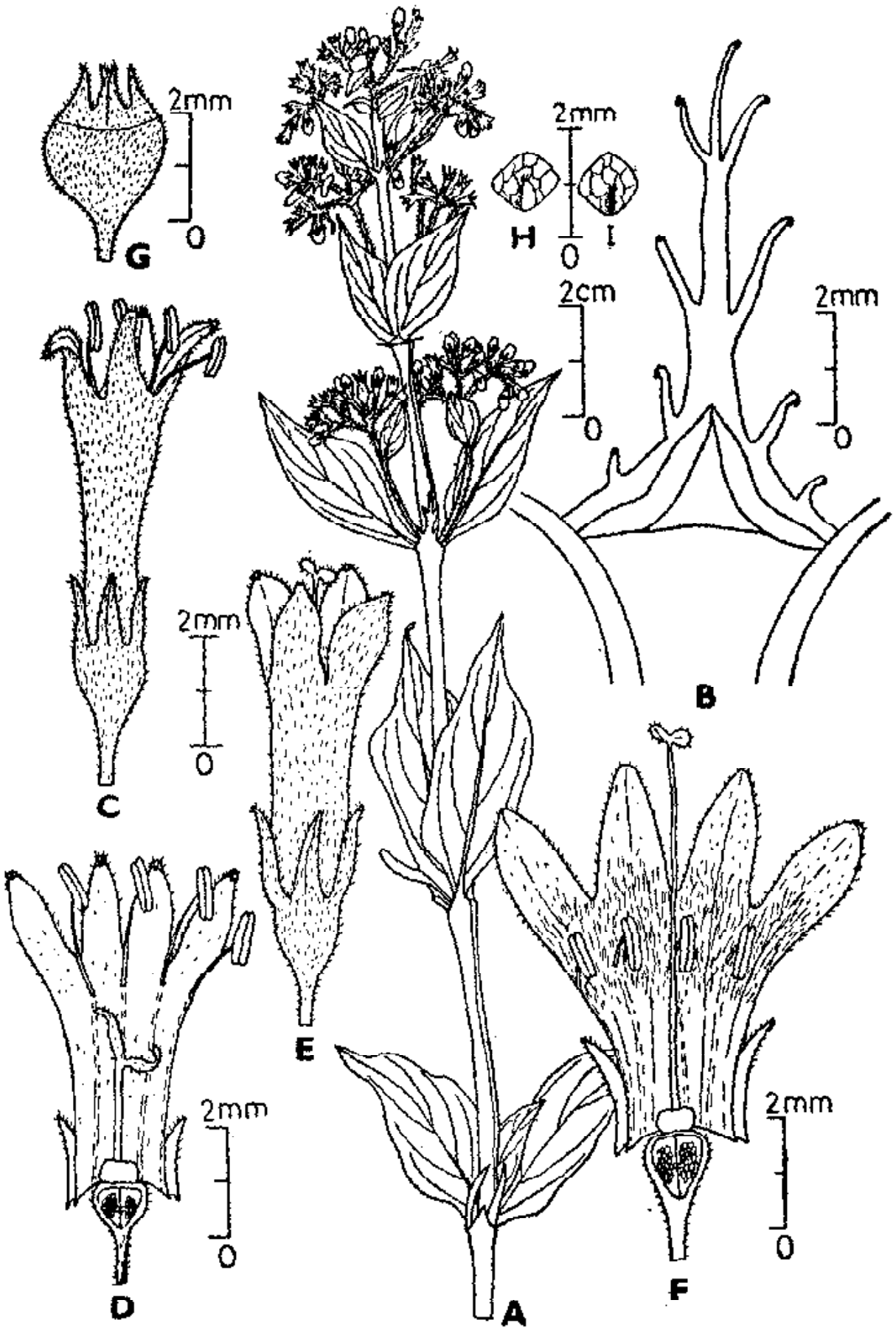
References:

1. Gamble, J. S. (1921). *Fl. Pres Madras*, p. 598.

2. Hooker, J. D. (1880). *Fl. Brit. India* 3:51.

3. Kuntze, C. E. O. (1891). *Rev. Gen. Pl.* 1 : 292.

The material for this sheet was supplied by D. B. Deb and Mrs. Ratna Dutta, Botanical Survey of India Howrah.



Hedyotis swersioides Hook.f. A. Habit. B. Stipule. C. Flower—short styled. D. Flower split open. E. Flower—long styled. F. Flower split open. G. Fruit. H. Seeds.

Status: Indeterminate. It has not been seen after the original discovery made more than a century ago. Since the area is not fully explored, there could be pockets of habitats where the species could possibly be found.

Distribution: Nagaland (Kohima) and Burma (Tenasserim).

Habitat and Ecology: On the forest floors in the high altitudes.

Conservation Measures Taken: None.

Conservation Measures Proposed: Efforts should be made to collect the plant from the type localities and cultivate in botanic gardens.

Biology and Potential Value: A plant of academic interest, not known thoroughly.

Cultivation: Not taken up anywhere.

Description: Small annual herb with simple glabrous erect stem. Leaves opposite, 6.5-22.5×2-4 cm, lanceolate or elliptic-lanceolate, caudate-acuminate at apex, tapering at base, membranous, glabrous, pale beneath; lateral nerves 6-10 pairs; petiole 1-2.5 cm long, slender, glabrous; stipules interpetiolar, caducous, 3-12 mm long, subulate, bifid, glabrous. Inflorescence terminal cymes, 1-1.5 cm across; peduncles 2.75-3.2 cm long, glabrous. Flowers subsessile, bracteate, epigynous, 7-8 mm long, white or purplish; bracts caducous, linear, glabrous. Calyx obovoid, glabrous; lobes 5, triangular, actute, glabrous. Corolla gamopetalous, 6-6.8 mm long, funnel shaped, glabrous; lobes 5, ovate, obtuse. Stamens 5, adnate to the base of corolla or slightly above, inserted; filaments 2-2.2 mm long; anthers 2 mm long, narrowly oblong. Ovary obovoid; disc 0.4-0.5 mm high; style 2-2.25 mm long, glabrous; stigma bilobed, glabrous. Fruit not seen.

References:

1. Clarke, C. B. (1889). *Journ. Linn. Soc. Bot.* 25 : 31.

2. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 80.

3. Kurz, S. (1872). *Journ. Asiat. Soc. Bengal* 41 (4) : 311.

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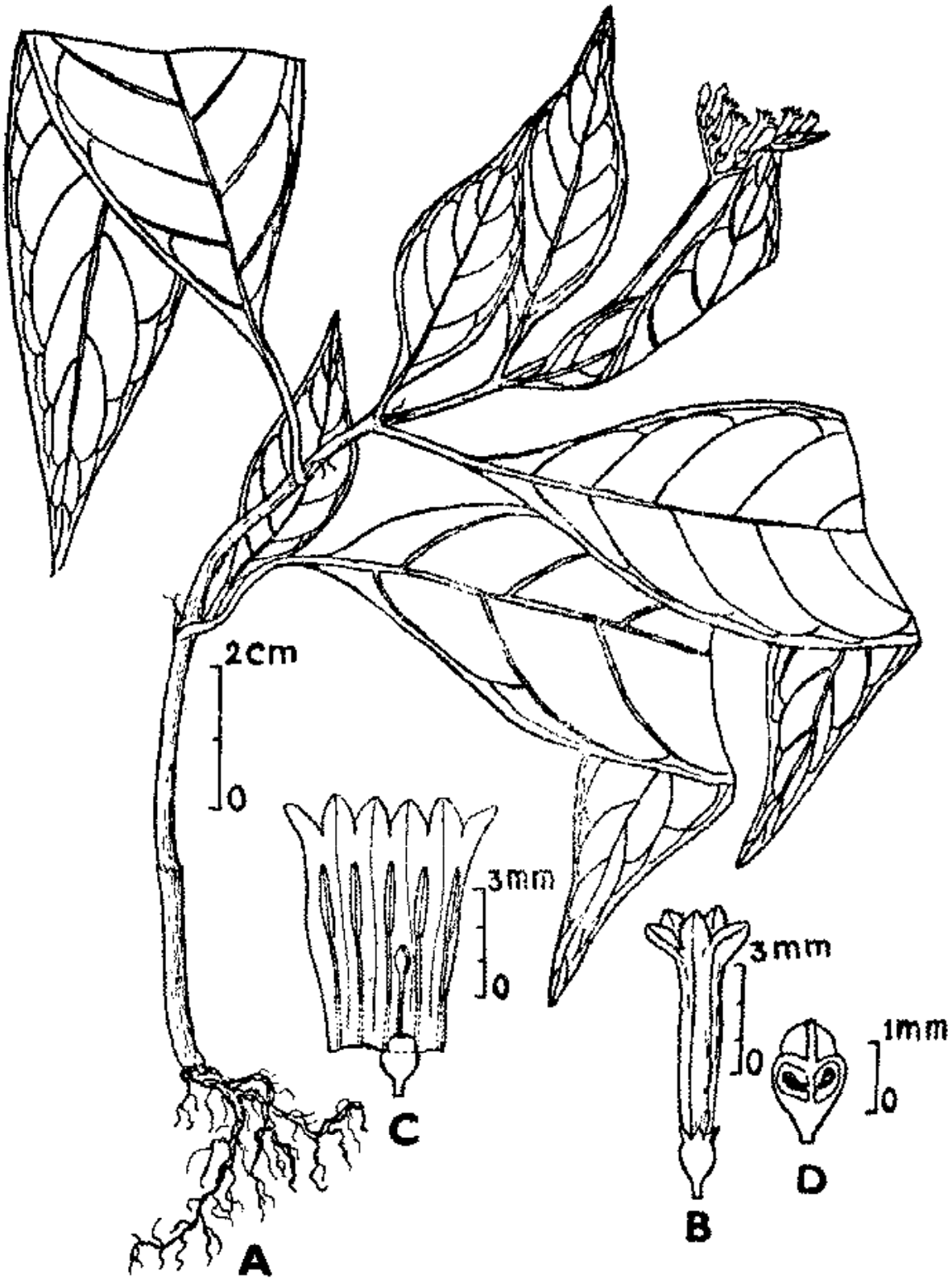


Ophiorrhiza gracilis Kurz. A. Habit. B. Flower. C. Flower split open. D. L.S. of ovary.

Status. Indeterminate. This species is based on two gatherings made in 1837. After that it has not been collected by anybody even after a lapse of 150 years. Since this area is not fully explored there could be pockets of habitats where this species may be located.

Distribution: Nagaland and Burma.

Habitat and Ecology: In forest floors in rocky situations

Conservation Measures Taken: Nil.

Consersation Measures Proposed: Efforts should be made to collect the species from its original habitats in Nagaland and if avaliable attempts should be made to protect that locality; introduction of the plants in botanic gardens.

Biology and Potential Value: A plant of academic interest, not known thoroughly. Flowers in March-April.

Cultivation: Not taken up.

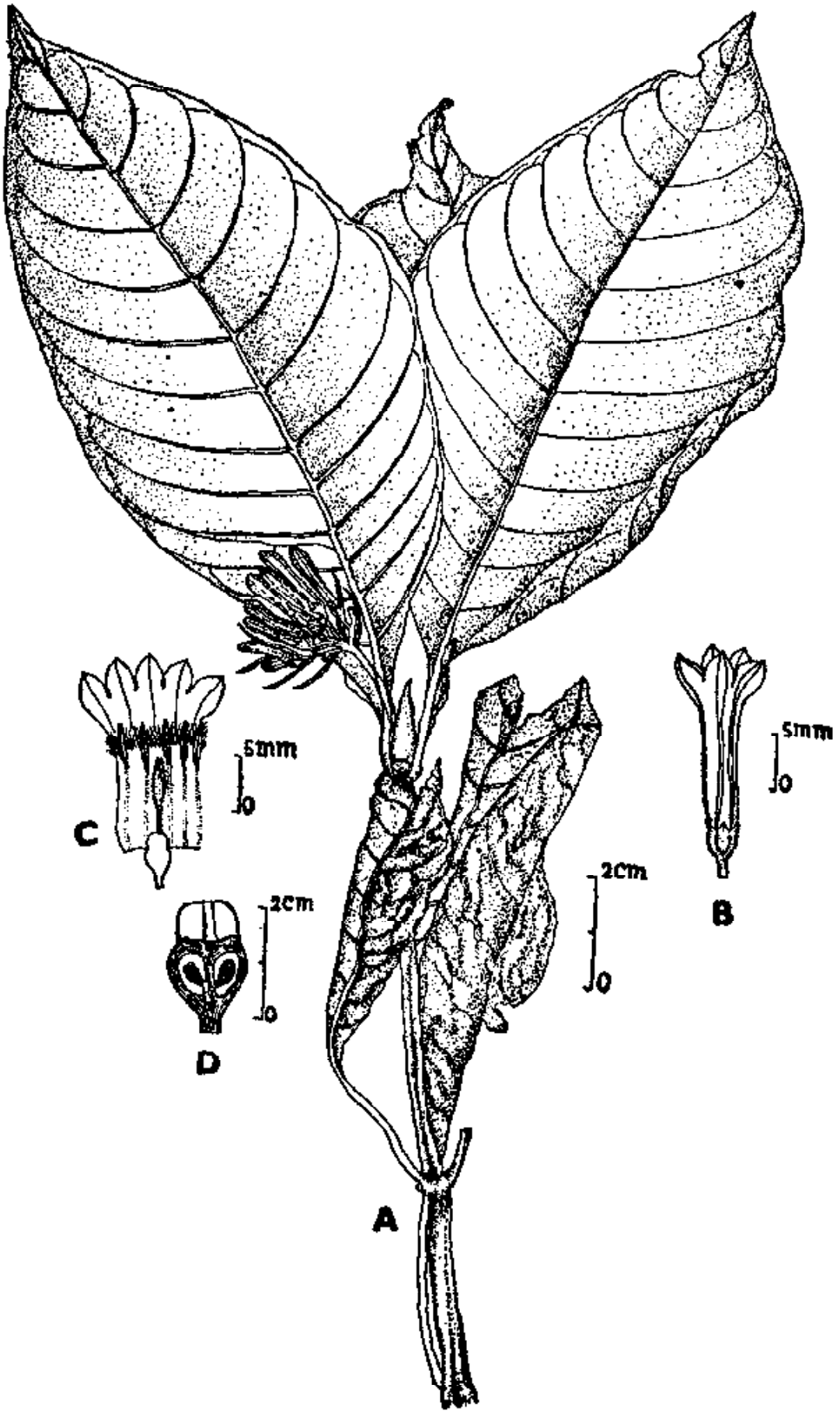
Description: Small erect herbs, young parts puberulous. Leaves opposite, 7.5-15 × 6-7cm, broadly elliptic, acute at apex and base, glabrous, pale greenish on drying; lateral nerves 12-15 pairs; petiole 1.5-5 cm long, glabrous or slightly puberulous; stipules interpetiolar, 7-15 mm long, upper oblong, lower broadly lanceolate, entire, acute, glabrous. Inflorescence a terminal, corymbose cyme, 2-3.5 cm across, puberulous; pedunicle 1-2 cm long, erect, glabrous or slightly puberulous. Flowers bracteate, bracteolate, pedicellte, epigynous, 19-22 mm long, purple; bracts persistent, 9-11 mm long, linear-lanceolate, acute, pubescent on the midrib; pedicel 1.5-2.25 mm long, puberulous. Calyx tube broadly obovoid, pubescent; calyx lobes 5, 1-1.25 × 1 mm, triangular, glabrous. Corolla 17-29 mm long, funnel shaped, glabrous outside, villous at the middle within; corolla lobes 5, broadly ovate, 2-2.25 × 2.75-5 mm, winged at back. Stamens 5, adnate to the middle of corolla tube, inserted; filaments 1.25-1.5 mm long; anthers 2.25-3.5 mm long, linear-oblong. Ovary inferior, obovoid; disc 1.25-1.5 mm long; style about 4 mm long; pubescent; stigma 2-lobed, pubescent. Capsule 2-lobed, pubescent.

References:

2. Hooker, J. D. (1880). *Fl. Brit. India* 3:82.

3. Kanjilal, U. N., *et. al.* (1934). *Fl. Assam* 3 : 42.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza griffithii Hook. f. A. Habit. B. Flower. C. Flower split open. D. L.S. of ovary.

Status: Endangered. It is known from several gatherings, the last one being made in 1911. It has not been collected during the last seventyfive years. Since the area is not fully explored there could be pockets where this species may be still located.

Distribution: Meghalaya and Assam; Burma.

Habitat and Ecology: Grows on damp, shady places near streams at 90-1800 m in dense forests.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Search for the plant in the places of earlier collection should be made, and if rediscovered, that locality should be protected and reserved, and it should also be cultivated in botanic gardens.

Biology and Potential Value: A plant of academic interest, not studied thoroughly.

Cultivation: Not taken up anywhere.

Description: A procumbent herb, hispid all over, branches 10-35 cm long. Leaves opposite, ovate-lanceolate, lateral nerves 6-12 pairs; petiole 0.5-1.8 cm long, stipules interpetiolar, 5-7 mm long, oblong-lanceolate, acuminate. Inflorescence terminal capitate cymes, 1-2 cm across, subglobose, peduncles 0.5-1.5 cm long, stout. Flowers bracteate, bracteolate, epigynous, pedicellate, 5-6.5 mm long, greenish-white or reddish; bracts and bracteoles similar, persistent, concealing the flowers, 4-6.5×1.5-2 mm, linear-lanceolate, acute, ciliate; pedicels 0.75-1 mm long. Calyx obovoid, lobes 5, 0.75-1.25×0.5-0.75 mm, ovate-lanceolate, acute. Corolla 4-5.25 mm long, shortly funnel shaped, broad at base, narrowing upwards, hispid outside, villous at the throat within; lobes 5, 1.25-1.5×0.75-1.25, ovate-oblong, spreading, acute. Stamens 5, adnate to the throat of corolla or slightly below, inserted or slightly exerted; filaments 0.8-1 mm long, glabrous; anthers 1-1.25 mm long, linear-oblong. Ovary 0.75-1×0.6-0.8 mm, glabrous; anthers 1-1.25 mm long, linear-oblong. Ovary 0.75-1×0.6-8. mm, obovoid to subglobose; disc 0.5 mm high, style 1-1.5 mm long, glabrous; stigma 2-lobed. Capsule 1.5-2.5—3.5-6 mm, hispid, 2-locular; locules ovate-oblong with straight tips. Seeds 0.3-0.4×0.25-0.3 mm, 5-7 angular, glabrous, brown; testa areolate, wall thin, tubercled.

References :

1. Balakrishnan, N.P. (1981). *Fl. Jowai* 1 : 249. Botanical Survey of India, Howrah.

2. Hooker, J.D. (1880). *Fl. Brit. India* 3 : 83.

3. Kanjilal, U.N., *et al.* (1939). *Fl. Assam* 3 : 42.

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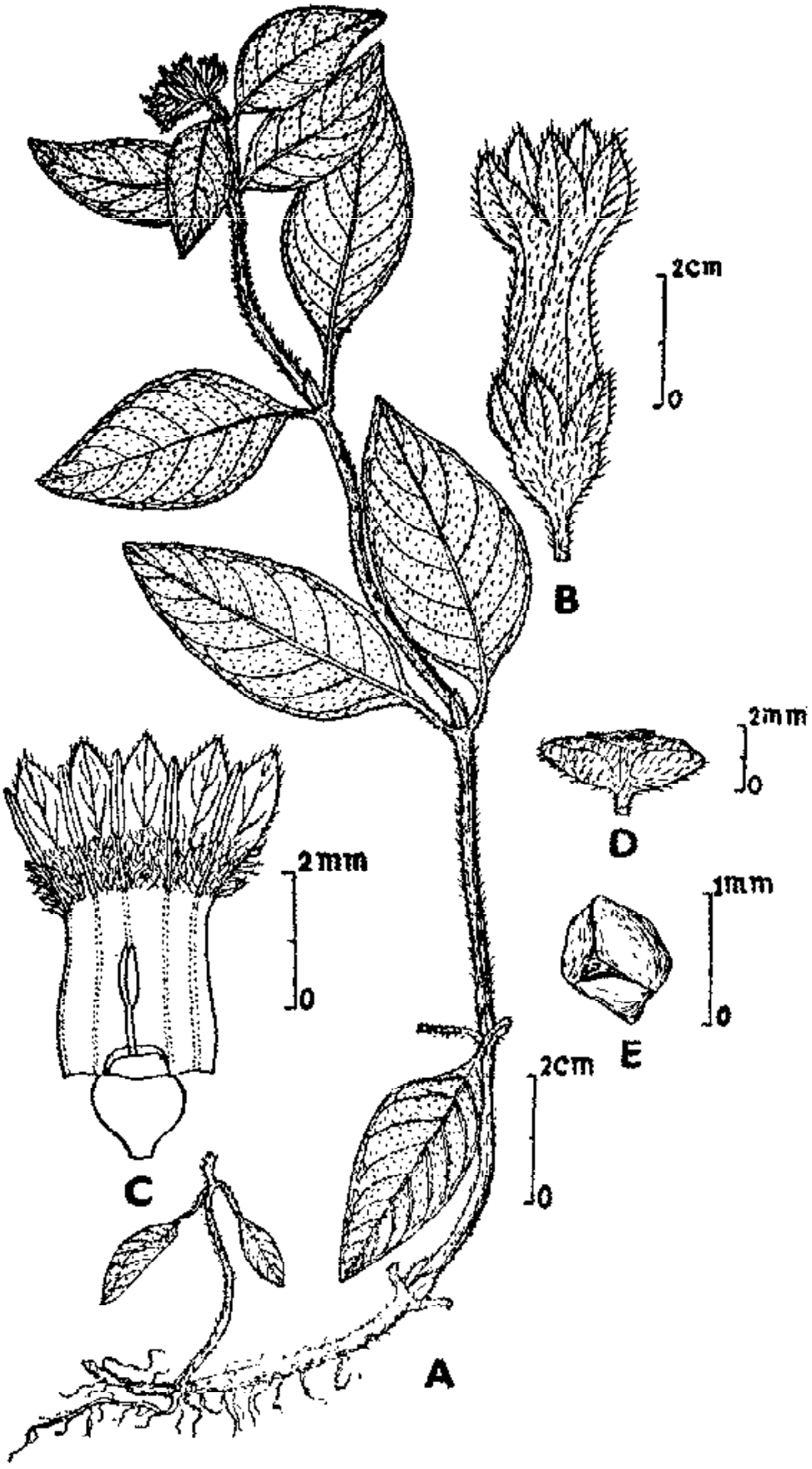

Ophiorrhiza hispida Hook. f. A. Habit. B. Flower. C. Flower split open. D. Fruit. E. Seed.

Status : Rare (in India). In recent years it has been scarcely collected. Rapid changes in its original habitats have been a source of threat to the species rendering it very scarce in India.

Distribution : Sikkim, West Bengal (Darjeeling) to Manipur; also in Eastern Tibet and S.W. China.

Habitat and Ecology : Grows on damp shady mountain slopes at 300-1500 m in alt.

Biology and Potential Value : A plant of academic interest. Flowers and fruits during May-November.

Conservation Measures Taken : Nil.

Conservation Measures Proposed : Efforts to relocate the species in its distribution range in India for future conservation steps are suggested.

Cultivation : Not taken up.

Description : Small herbs copiously rooting at the base. Leaves opposite, 1.25-10 × 0.8-4.5 cm, elliptic-oblong, rarely ovate, glabrous above, puberulous on the nerves beneath; lateral nerves 6-14 pairs; petiole 0.5-3 cm long, puberulous; stipules interpetiolar, 2.5-8 mm long, linear with broad base, glabrous. Inflorescence terminal corymbose cymes, contracted, 0.5-2.5 cm across, glabrous or puberulous; peduncles 1.5-7 cm long, slender, glabrous or puberulous. Flowers epigynous, 5-10 mm long, white; bracts and bracteoles similar, persistent, 3-8 mm long, lanceolate or linear-lanceolate, acute; glabrous; pedicels 1-1.5 mm long, glabrous or puberulous. Calyx tube obovoid, pubescent; calyx lobes 5, subulate, pubescent. Corolla 4.5-9.25 mm long, funnel shaped, glabrous; lobes 5, 1.25-1.75 × 0.75-1.25 mm, ovate, acute, glabrous. Stamens 5, adnate to the middle of corolla tube, inserted; filaments 1.25-2 mm long; anthers 1-1.5 mm long, linear-oblong. Ovary obovoid; disc 0.25-0.4 mm high; style 1.25-1.5 mm long, glabrous; stigma bilobed, glabrous. Capsule 1.5-3 × 5-8 mm, glabrous or puberulous, 2-locular; locules ovate-oblong with straight tips. Seeds 0.4-0.5 × 0.3-0.4 mm, 5-7 angular, glabrous, brown; testa areolate with thick tubercled wall.

References :

1. Deb, D.B. (1983). *Fl. Tripura State* 2 : 76.

2. Hooker, J.D. (1880). *Fl. Brit. India* 3 : 82.

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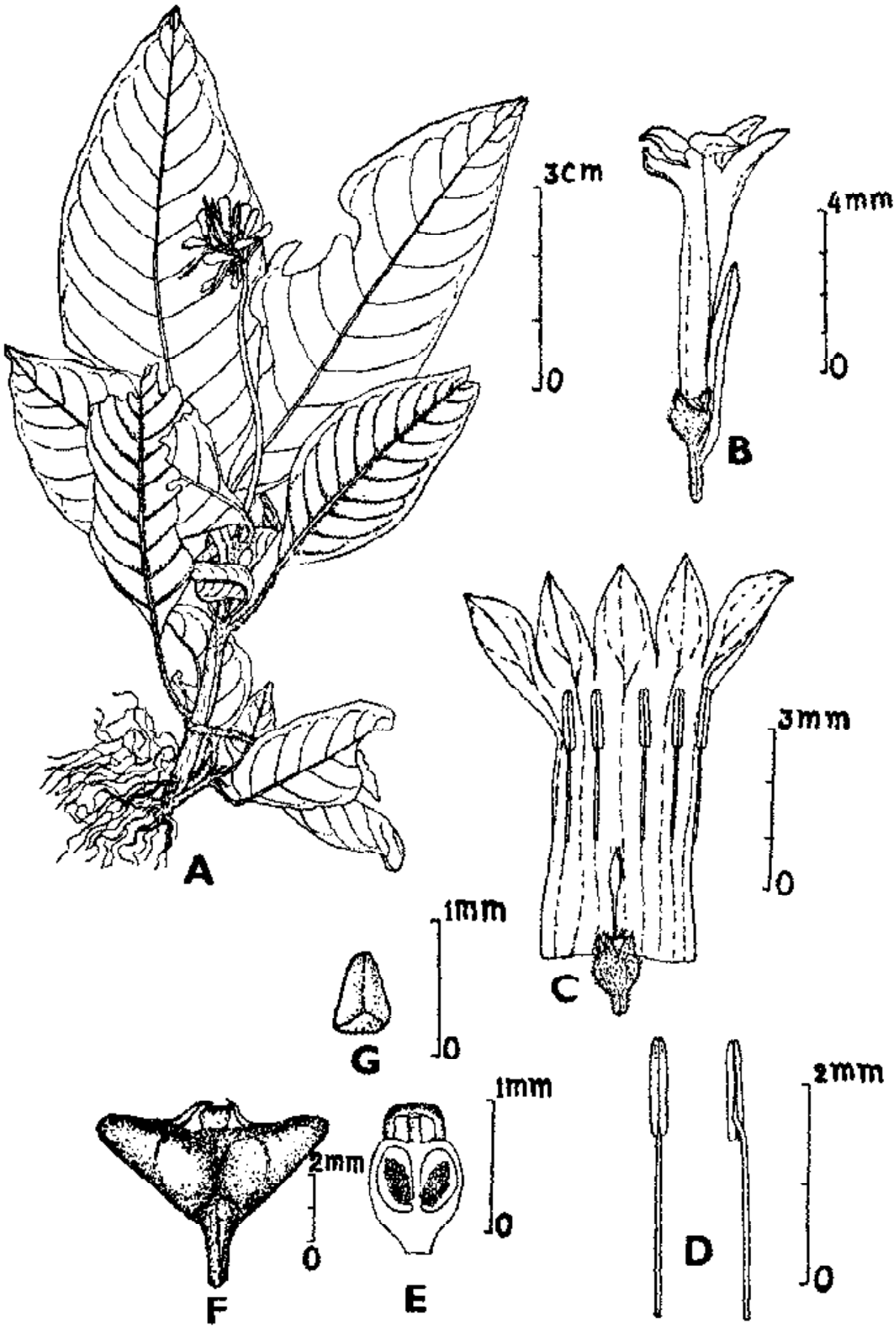

Ophiorrhiza lurida Hook. f. A. Habit. B. Flower. C. Flower split open. D. Stamens. E. L. S. of ovary. F. Fruit. G. Seed.

Status : Possibly Extinct. It has not been collected in India after 1893, though Kerala and adjoining areas have been fairly well explored in recent years.

Distribution : Kerala and Sri Lanka.

Habitat and Ecology : On damp rocky soils in forests.

Conservation Measures Taken : Possible distribution areas like the Silent Valley in Kerala are declared as protected and hopefully the species may be surviving.

Conservation Measures Proposed : Efforts should be made to collect the plants and cultivate in botanic gardens.

Biology and Potential Value: A plant of academic interest. Flowers and fruits from November to January.

Cultivation: Not taken up anywhere.

Description: Creeping herbs, rooting at nodes, branches densely pubescent. Leaves 1.3-4 × 1-2.5 cm, ovate or ovate-orbicular, obtuse or acute at apex, rounded or cordate at base, glabrous above, pubescent on the nerves beneath; lateral nerves 3-5 pairs; petioles 0.5-1.5 cm long, pubescent; stipules persistent, subulate, pubescent. Inflorescence terminal corymbose cymes, few-flowered; peduncle 2-2.2 cm long, slender, pubescent. Flowers bracteate, bracteolate, pedicellate, epigynous, gamopetalous, white; bracts and bracteoles similar, caducous, linear, puberulous; pedicels very short, puberulous. Calyx obovoid, lobes 5, subulate, puberulous. Corolla 4.25-6 mm long, funnel shaped, glabrous outside, villous at the middle within; lobes 5, ovate, slightly curved inwards, acute, shortly keeled at back. Stamens 5, adnate to the base of the corolla or slightly above, inserted; filaments 1 mm long; anthers 1 mm long. Ovary obovoid; disc 0.3 mm high; style 1-1.25 mm long, glabrous; stigma 2-lobed. Capsule 2-locular, glabrous. Seeds 5-7 angular, 0.3-0.4 × 0.3-0.4 mm, wall tubercled.

References:

1. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 80.

2. Thwaites, G. H. K. (1864). *Enum. Pl. Ceylon*, p. 139.

3. Trimen, H. (1895). *Handbook, Fl. Ceylon* 2 : 321.

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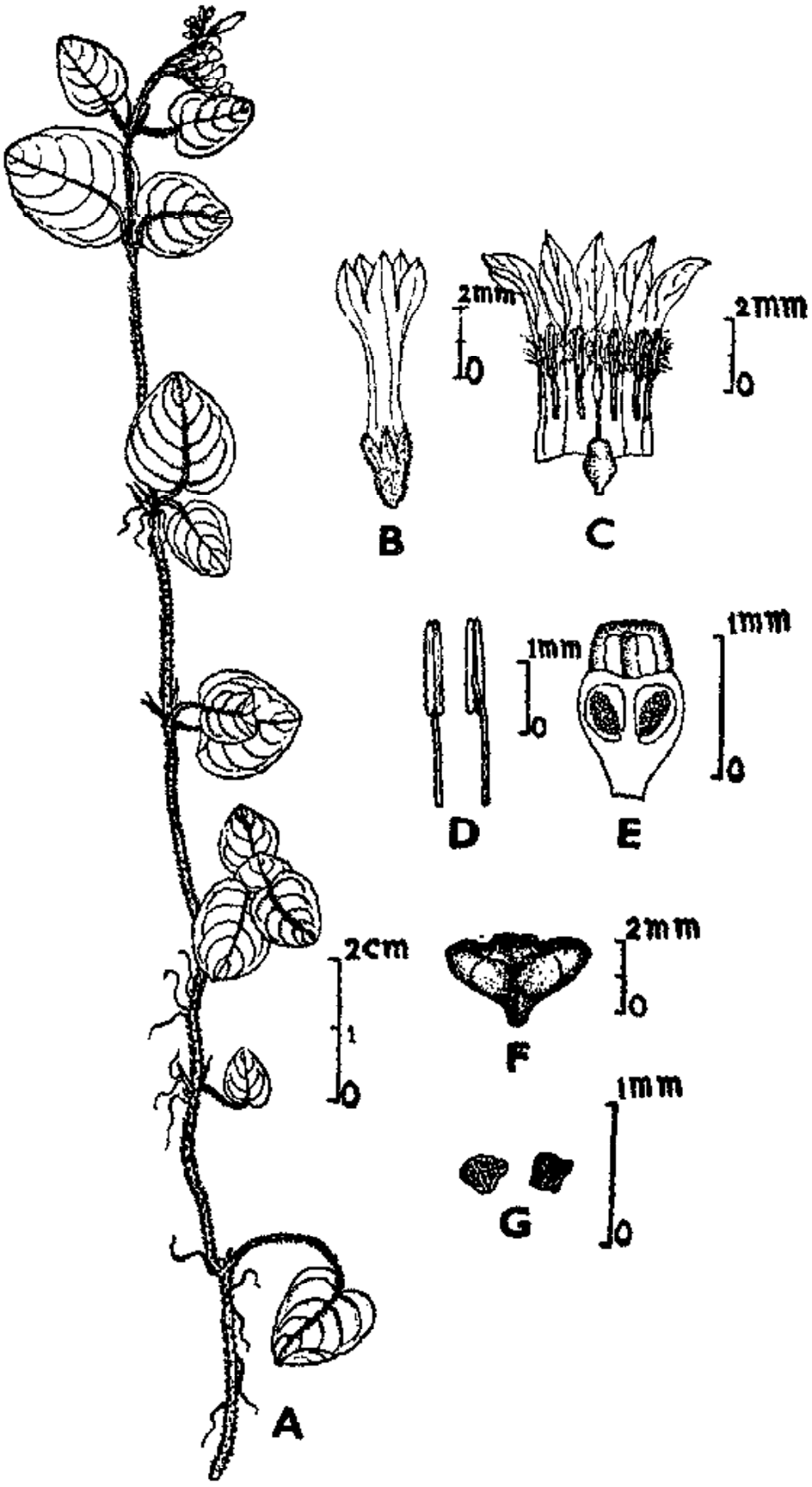

Ophiorrhiza radicans Gardn. A. Habit. B. Flower. C. Flower split open. D. Stamens. E. L.S. of ovary. F. Fruit. G. Seeds.

Status: Endangered, due to destruction of its natural habitats.

Distribution: Meghalaya (Khasi and Jaintea Hills). Endemic.

Habitat and Ecology: On moist shady forest floors near streams at 900-1600 m in alt.

Biology and Potential Value: A plant of academic interest, and of restricted occurrence.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: It should be cultivated in botanic gardens. Plant diversity areas in Khasi-Jaintea Hills should be identified and declared as protected reserves as the flora of this region is rich in endemics and threatened species.

Description: A slender hirsute herb with creeping base and ascending branching stem. Leaves opposite, 3.5-15×1.5-5 cm, elliptic to elliptic-lanceolate, acuminate at apex, cuneate at base, lateral nerves 5-14 pairs; petiole 1-2.5 cm long, hirsute; stipules interpetiolar, 5-7 mm long, ovate, acuminate, entire, hirsute at margin and on midrib. Inflorescence terminal subcapitate cymes, 0.8-1.8 cm across, contracted, peduncles 2-5.5 cm long, slender. Flowers bracteate, bracteolate, pedicellate, 5-7 mm long, white or pale-green; bracts and bracteoles similar, persistent, 5.5-9×2-3.5 mm, lanceolate, obtuse, pinkish when dry, ciliate; pedicels 1-1.25 mm long. Calyx obovoid, hirsute; lobes 5, 0.8-1.2×0.5-0.6 mm, ovate-lanceolate, acute, ciliate. Corolla 4-5.25 mm long, broad at base, narrowing upwards, glabrous outside, villous at the throat within; lobes 5, 1-1.3×0.7-0.9 mm, ovate-lanceolate, spreading hirsute at back. Stamens 5, adnate to the throat of corolla or slightly below, scarcely exserted; filaments 1-1.3 mm long; anthers 0.9-1.2 mm long, linear-oblong. Ovary 0.8-1×0.6-0.8 mm, obovoid; disc 0.5 mm high; style 1.8-2.2 mm long, glabrous; stigma capitate, hirsute. Capsule 1.5-1.75×4-4.75 mm, glabrous, 2-locular, locules ovate-oblong, with straight tips. Seeds 0.35-0.5×0.5-0.5 mm, 5-6 angular, glabrous, brown; testa areolate, wall areoled, thick, tubercled.

References:

1. Balakrishnan, N. P. (1981). *Fl. Jowai* 1 : 148. Botanical Survey of India, Howrah.

2. Hooker, J. D. (1880). *Fl. Brit. India* 3 : 83.

3. Kanjilal, U. N., *et al.* (1939). *Fl. Assam* 3 : 42.

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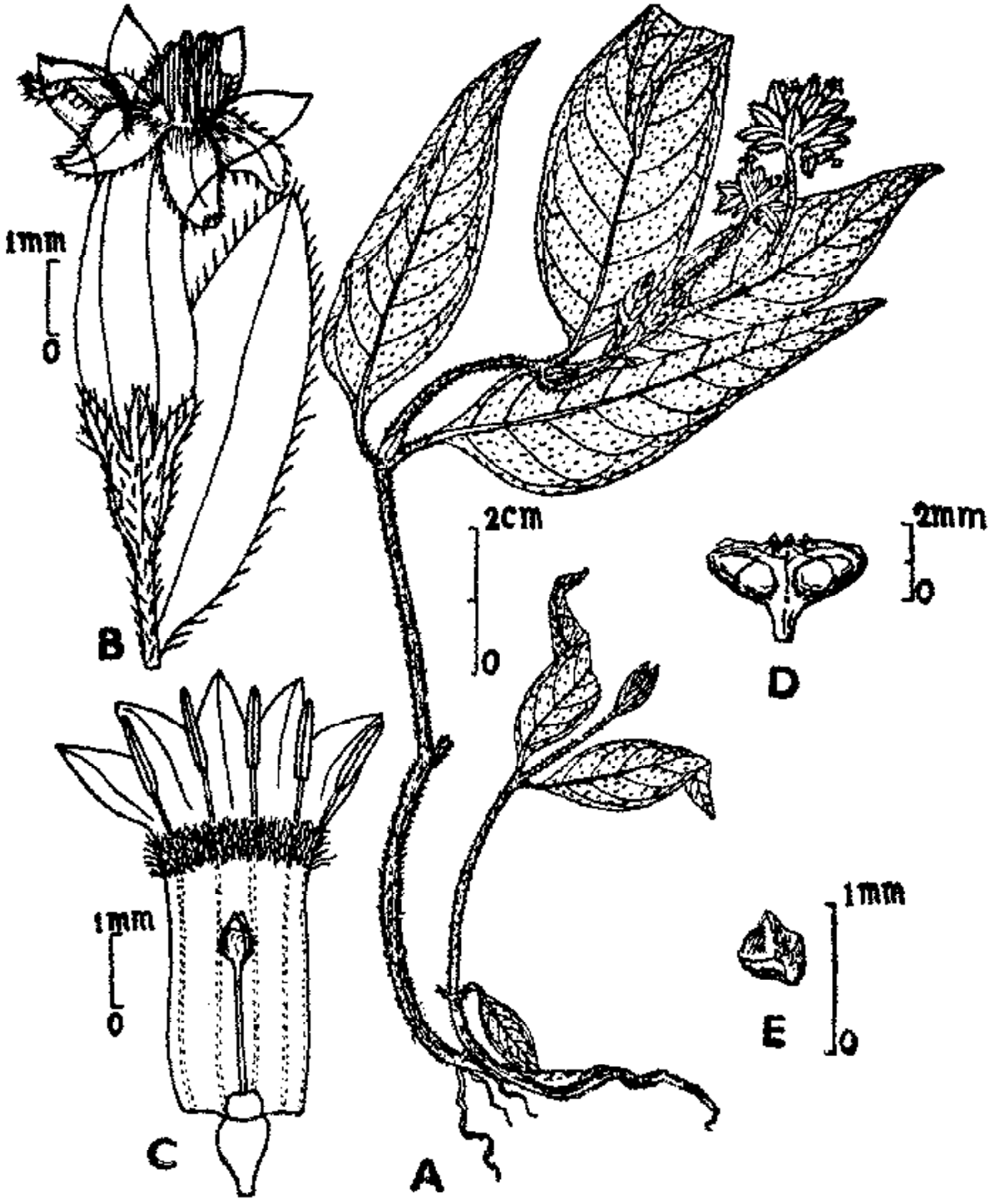


Ophiorrhiza subcapitata Wall. ex Hook. f. A. Habit. B. Flower. C. Flower split open. D. Fruit. E. Seed.

Status: Vulnerable. Developmental activities and jhum cultivation are leading to changes in its habitats rendering many species of flora threatened in the distribution range of this species.

Distribution: Meghalaya, Assam, Tripura state, Nagaland; Burma.

Habitat and Ecology: In crevices of rocks filled with moist soils along forest streams in the altitudes of 150-1800 m.

Conservation Measures Taken: None.

Conservation Measures Proposed: Cultivation in botanic gardens.

Biology and Potential Value: A plant of academic interest, not yet studied thoroughly. Flowers and fruits during April-September.

Cultivation: Not undertaken anywhere.

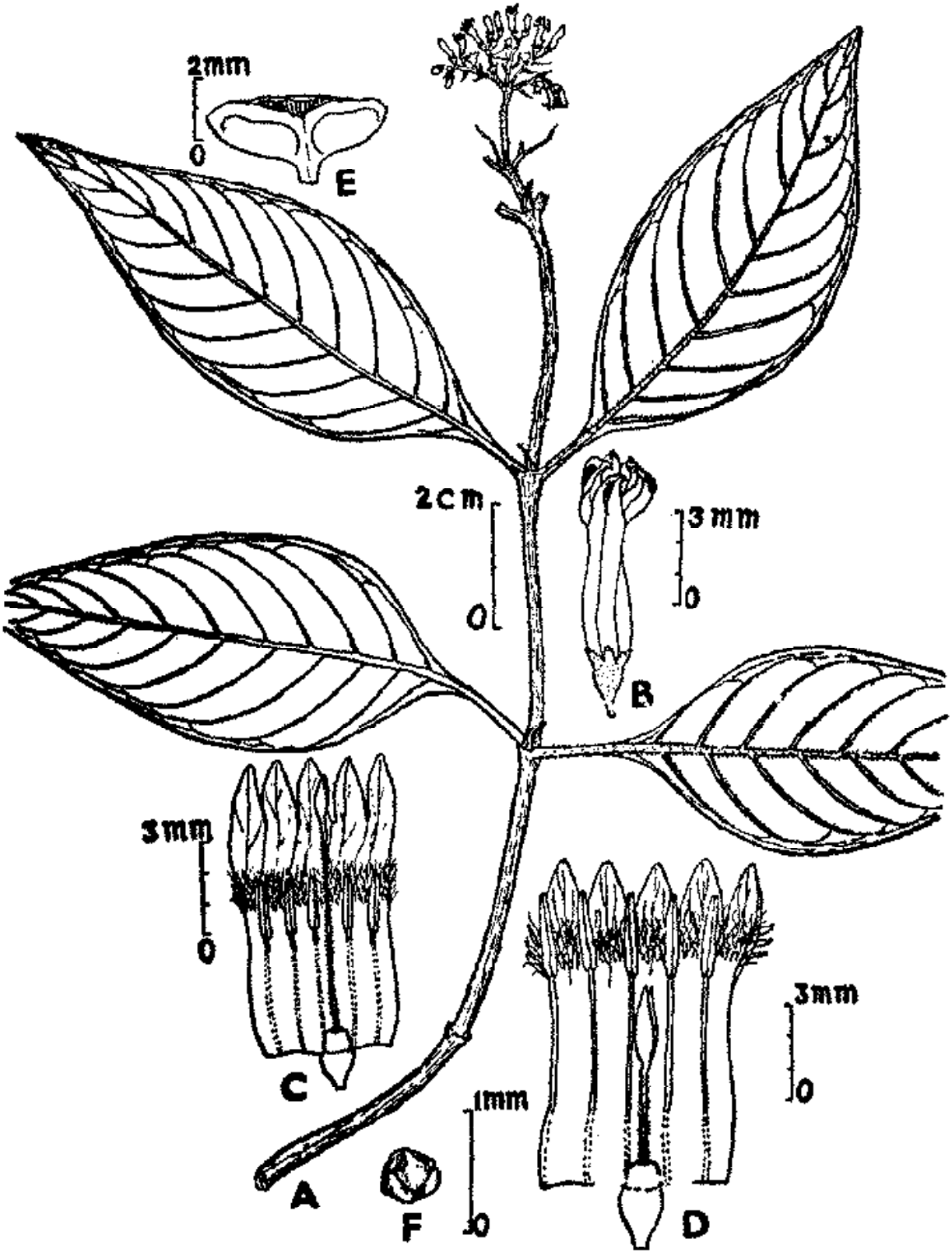
Description: Herbs or undershrubs with erect or trailing, simple or branching stem, pubescent above. Leaves 2.5-17 × 1-6 cm, lanceolate or broadly ovate-lanceolate, acute to caudate-acuminate at apex, decurrent at base, glabrous or scattered short hairy above, pale or reddish, puberulous on the nerves beneath, lateral nerves 7-14 pairs; petiole 1.5-4 cm long, bubescent; stipules interpetiolar, persistent, linear-lanceolate, entire or 2-fid, puberulous. Inflorescence terminal corymbose cymes, spreading, puberulous; peduncles elongating on fruiting, stout, pubescent. Flowers bracteate, bracteolate, pedicellate, epigynous,heterostylous, 6-10 mm long, purple or white; bracts and bracteoles deciduous, linear; pedicel about 1 mm long, puberulous. Calyx obovoid, puberulous; lobes 5, ovate-lanceolate, acute, puberulous. Corolla 5-9 mm long, funnel shaped, broader at base and mouth, glabrous outside, villous at the throat within or slightly below; lobes 5, oblong-lanceolate, slightly curved inwards, keeled at back. Stamens 5, adnate to the middle of corolla tube or slightly below, inserted or slightly exserted; filaments 0.5-1.5 mm or 3-5.5 mm; anthers 1.6-2.3 mm long. Ovary obovoid; disc 0.5-1 mm high, style 2.5-3 mm or 4.5-8.3 mm long, slender, pubescent; stigma 2-lobed. Capsule 2-locular, glabrous. Seeds irregularly angular.

References:

1. Deb, D. B. (1983). *Fl. Tripura State* 2 : 76.

2. Fischer, C.E.C. (1940). *Kew Bull.* 1940 : 33.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza tingens Cl. ex Fisch. A. Habit. B. Flower. C. & D. Flower split open. E. Fruit. F. Seed.

Status: Endangered. Its natural habitats have undergone considerable changes in the recent years resulting in depletion of its populations.

Distribution: Tamil Nadu, Courtallum distr. Endemic.

Habitat and Ecology: In forest floors at lower altitudes.

Conservation Measures Taken: None.

Conservation Measures Proposed: The forests at Courtallam falls and in the vicinity harbour several threatened endemics and need protection. The plant should be cultivated in botanic gardens.

Biology and Potential Value : A plant of academic interest and could be popularised as a hedge plant in gardens. Flowers and fruits during August-September.

Cultivation: Not cultivated anywhere.

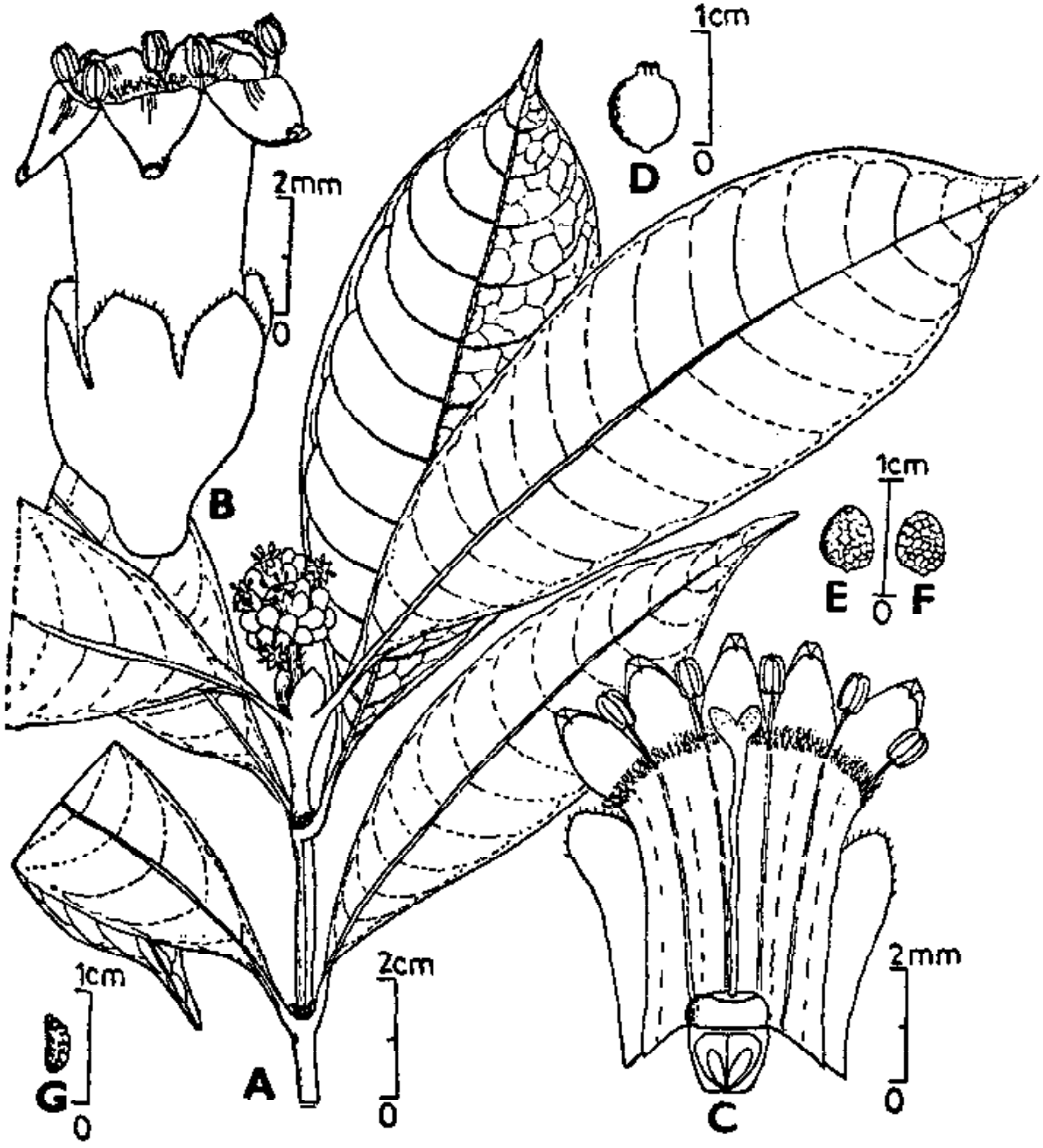
Description: Glabrous shrubs. Leaves opposite, 10-14×3-5 cm, oblong-lanceolate or oblong-elliptic, acuminate at apex, attenuate at base, membranous, glabrous above, puberulous beneath; midrib slender, channelled above; lateral nerves 12-18 pairs, subopposite, parallel, arcuate, without domatia; nervules reticulate beneath; petiole 1-2 cm long, glabrous; stipules interpetiolar, deciducus; 5-7×6-7 mm, broadly ovate, ferruginous villous beneath at base. Inflorescence a terminal peduncled globose head, 1-2 cm across, with ferruginous hairs; peduncles 1-2.5 cm long, pubescent; bracteoles 1-2 mm long, ovate, obtuse. Flowers sessile, 7-8 mm long, tubular. Calyx *ca* 4×4 mm, cupular, glabrous; hypanthium *ca* 0.5 mm long, oblong, glabrous; lobes 5, ovate or obovate, acute at apex, ciliate at margins. Corolla tube 3-5 mm long, glabrous above, villous at throat within; lobes 5, 1-2 mm long, ovate, inflexed, glabrous. Stamens 5, exserted; filaments *ca* 1 mm long, adnate at throat; anthers *ca* 0.5 mm long, oblong, dorsally convex. Ovary inferior, *ca* 0.5 mm long; style *ca* 5 mm long, thin, wider above, glabrous; stigma 2-lobed, papillose; disc subglobose or flattened, glabrous. Fruits sessile, 7-10×5-7 mm, ellipsoid-ovoid, crowned with persistent calyx lobes, faintly striped; pyrenes 2, ovoid, plano-convex, without ridges and furrows, thin walled. Seeds 6-8×4-6 mm, ovoid, obtuse at apex, cuneate at base, plano-convex; albumen ruminate; embryo minute.

References:

1. Gamble, J. S. (1920). *Kew Bull.* 1920 : 249.

2. Gamble, J. S. (1921). *Fl. Pres. Madras,* p. 640.

The material for this was supplied by D. B. Deb and M. Gangopadhyay, Botanical Survey of India, Howrah.



Psychotria globicephala Gamble. A. Habit. B. Flower. C. Flower split open. D. Fruit. E. & F. Seeds dorsal and ventral views.

Status: Vulnerable, due to developmental activities leading to depletion of its natural habitats.

Distribution: Western Himalaya.

Habitat and Ecology: Along the forest margins.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: To collect seeds and cultivate the plant in botanic gardens.

Biology and Potential Value: Allied species yield dye. A plant of academic interest. Flowers during September-October.

Cultivation: Not taken up anywhere.

Description: Pubescent herb with ascending branches and densely scabrid 8-ribbed stems. Leaves petiolate, membranous, 4 in a whorl, 4-5.5×1-2-1.5 cm, lanceolate, acute or acuminate at apex, attenuate at base , veins 3-5, converging upwards, deeply impressed on the upper surface; petiole short, 4-5 mm long. Inflorescence axillary and terminal panicle of cymes; peduncle long, scabrid. Flowers bracteate, pedicellate, minute, 2-2.5×1.75-2 mm, pedicels 2–5 mm long, scabrid; bracts in pairs. Hypanthium globose, scabrid. Calyx lobes absent. Corolla gamopetalous, 2-2.5×1.75-2 mm, scabrid above; tube very short; lobes 5 or 4, lanceolate. Stamens 5 or 4, epipetalous; filaments 0.5-0.75 mm, longer than the anthers; anthers ellipsoid, 2-lobed, basifixed. Pistil bicarpellary, syncarpous; stigma globose; styles 2, short, united below; disk annular, thin; ovary 0.75-1×0.75-1 mm, 2-celled; ovule one in each cell, attached to the base of the septum. Fruit glabrous.

References:

1. Deb, D. B. & Mallick, K. C. (1968). *Bull. Bot. Surv. India* 10 : 1-16.

2. Hooker, J. D. (1881). *Fl. Brit. India* 3 : 203.

The material for this sheet was supplied by D. B. Deb and K. C. Mallick, Botanical Survey of India, Howrah.

Status: Vulnerable, due to developmental activities and consequent natural habitat changes.

Distribution: Western Himalayas, Kashmir; Pakistan ; Afghanistan.

Habitat and Ecology: In open situations and along forest margins in subtropical forests.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: It should be cultivated in botanic gardens.

Biology and Potential Value: A plant of academic interest. Some of the allied species yield dye. Flowers and fruits from June-September.

Cultivation: Not known to be cultivated anywhere.

Description: Climbing herbs with long, slender branches and quadrangular prickly stem. Leaves 2, opposite or 4 in a whorl, one pair being larger than the other, 2-6.6 × 1.1-2.7 cm, elliptic-ovate or obovate, subacute or apiculate at the apex, prickly at margin on the undersurface ; lateral nerves obscure ; petiole 3-9 mm. Flowers pedicellate in axillary and terminal panicle of cymes, bracteate ; peduncles long ; bracts paired, sessile, foliaceous, 5-7 × 2-4 mm, ovate-elliptic, prickly at margin. Hypanthium globose ; calyx lobes absent. Corolla gamopetalous, 2.5-3 mm long ; lobes 5, oblong. Stamens 5, epipetalous, alternating with petals ; filament *ca* 0.5 mm long ; anthers at the throat of the corolla, 0.75-1 mm long, oblong, 2-lobed, dorsifixed ; disc annular, thin, around the style. Pistil bicarpellary, syncarpous ; stigma globose, sometimes unequal ; styles 2, partly united below ; ovary ovoid, 2-celled, ovule one in each cell, attached to the base of the septum. Fruit 4-5 mm, globose, sometimes didymous. Seeds curved, albuminous ; embryo with 2 large cotyledons and one straight axis.

References:

1. Deb, D. B. & Mallick, K. C. (1968). *Bull. Bot. Surv. India* 10 : 1-16.

2. Hooker, J. D. (1881). *Fl. Brit. India* 3 : 203.

3. Koie & Rechinger (1958). *Symb. Afgh.* 4 : 140.

The material for this sheet was supplied by D. B. Deb and K. C. Mallick, Botanical Survey of India, Howrah.

Status: Vulnerable. Cause of its decline is due to habitat loss. In nature, it is scarce, scattered and nowhere abundant.

Distribution: Endemic to Karnataka and confined to Chikmagalur, Hassan, Shimoga and South Kanara districts. It was first reported from Shimoga district and later from Shimoga-Chikmagalur border areas. Saldanha collected it from Hassan district and the last collection was during 1977 by the author from Kodachadri in South Kanara. It has not been since collected and likely to be extinct unless protected.

Habitat and Ecology: It occurs in evergreen and semievergreen forests along forest paths and outskirts between 600-800 m altitude, thriving well in regions of high rainfall. It is associated with species of *Humboldtia, Chasalia, Maesa, Ixora* etc. This is often mistaken for *Tarenna nilagirica* (Bedd.) Bremek. but is readily distinguished by leaves drying black, club shaped globose buds, corolla lobes pointing upwards and style hardly exerted beyond the corolla throat.

Conservation Measures Taken: None.

Conservaton Measures Proposed: Introduction of the species in experimental gardens, where it could be successfully raised is the only solution to conserve it.

Biology and Potential Value: An elegant species with showy, white, large, fragrant flowers is worth introducing in gardens.

Description: Woody, profusely branched shrubs 1.5-3 m tall, branches corky, puberulous but early glabrescent. Leaves lustrous, glabrous, elliptic, obovate-elliptic or elliptic-oblong, 5.5-13×3-6.5 cm, dark green but drying black, base acute to sharply attenuate, apex abruptly caudate-acuminate, nerves 5-8 pairs; petiole 1.5 -4 mm long. Inflorescence terminal compact cymes, subsessile to shortly peduncled,pubescent, 8-12-flowered. Flower buds shortly pedicelled, clavate, globose, somewhat abruptly swollen near apex; mature flowers white, showy, fragrant, infundibuliform, 1.5-1.8 cm across. Calyx 6.5×3 mm, turbinate, pubescent, 5-toothed, teeth triangular. Corolla white, glabrous, limb infundibuliform, throat hairy; corolla tube narrow-cylindric, 3.2-3.6 ×0.2 cm; lobes 5, imbricate, broadly ovate to ovate-elliptic, 8-10×5-7 mm, lobes pointed upwards when fully open. Stamens 5, inserted near throat. Ovary inferior, 2-celled with one ovule in each, pendent and embedded amidst a cluster of hairy appendages; style slender 3.8-4.0 cm long, barely exerted beyond corolla throat, included within corolla lobes; stigmatic lobes slender, neither thickened nor fusiform. Drupe 1-2-seeded, globose.

Reference:

1. Sundararaghavan, R. (1968). A new species of *Tarenna* Gaertn. (Rubiaceae) from Shimoga district, Mysore State. *Bull. Bot. Surv. India* 10 : 341-343. figs. 1-9.

The material for this sheet was supplied by R. S. Raghavan and B. D. Sharma, Botanical Survey of India, Western Circle, Pune.

Status: Rare.

Distribution: Maharashtra. Endemic.

Habitat and Ecology: Moist deciduous forests.

Conservation Measures Taken: None.

Conservation Measures Proposed: The type locality and neighbouring areas to be searched for this species. The seeds should be collected and grown in the experimental gardens.

Biology and Potential Value: Not known.

Cultivation: None.

Description: Scandent shrubs, bark dotted with red lenticels, young parts minutely puberulous; leaves 3-foliate, subcoriaceous, glabrous, greyish-green above, reddish beneath; central leaflet elliptic, 12-18 cm long, lateral leaflets ovate-lanceolate, much shorter than the central one, all the leaflets shortly acuminate at apex, base narrow, margins faintly crenulate or subentire; petioles 10-25 cm long, petiolules 0.4-0.5 cm long. Inflorescence a much branched panicle, upto 10 cm long, rachis minutely puberulous. Flowers short pedicelled, sepals puberulous below, petals villous, disc pilose. Fruits black.

References:

1. Radlkofer, T. (1932). *In :* Engler, A. (ed.). *Pflanzenr.* 98B : 598.

2. Mukherjee, S. K. (1972). Indian *Allophylus* (Sapindaceae). *Ind. For.* 98(8) : 496.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.

Status : Indeterminate. The species is known only from one other collection besides its type collection made in 1895. The cause of its rarity and subsequent depletion is obviously the large scale destruction of its natural habitats and ecosystems due to various anthropogenic factors.

Distribution : Endemic to southern W. Ghats. The species is based on Bourdillon's collection made from Kulathupuzha in Strathmore Estate, Quilon district, in April 1895. The only other known collection is that of Beddome from Tirunelveli hills. No later-day collections from the vicinity of these localities could be made or traced.

Habitat and Ecology : Evergreen forests at *ca* 1300 m altitude.

Conservation Measures Taken : None whatsoever.

Conservation Measures Proposed : Intensive plant surveys should be undertaken in the known localities for the purpose of status evaluation. Attempt to locate this possibly extinct (?) tree species from adjacent habitats with similar ecological conditions could be worthwhile. If any extant population is perchance found its threat factors must be assessed and steps be taken to ensure its survival.

Biology and Potential Value : Nothing much is known of its biology except that it flowers in April. The other species of the genus yield 'Gutta-Percha' of commerce, a latex coagulum.

Description : Small trees. Leaves conferted at the apices of branchlets, 11.0-17.5×3.5-6 cm, obovate-elliptic or elliptic, narrowly cuneate; glabrous above but finely scattered puberulous along the midrib, sparsely puberulous above. Flowers solitary or very few-flowered axillary clusters; pedicels *ca* 10 mm long, terete, ferruginously woolly. Corolla 5.5-6.0 mm long, petals spathulate-oblong. Fruits 3.0×13.0 cm, ovoid, glabrous, single-seeded.

References :

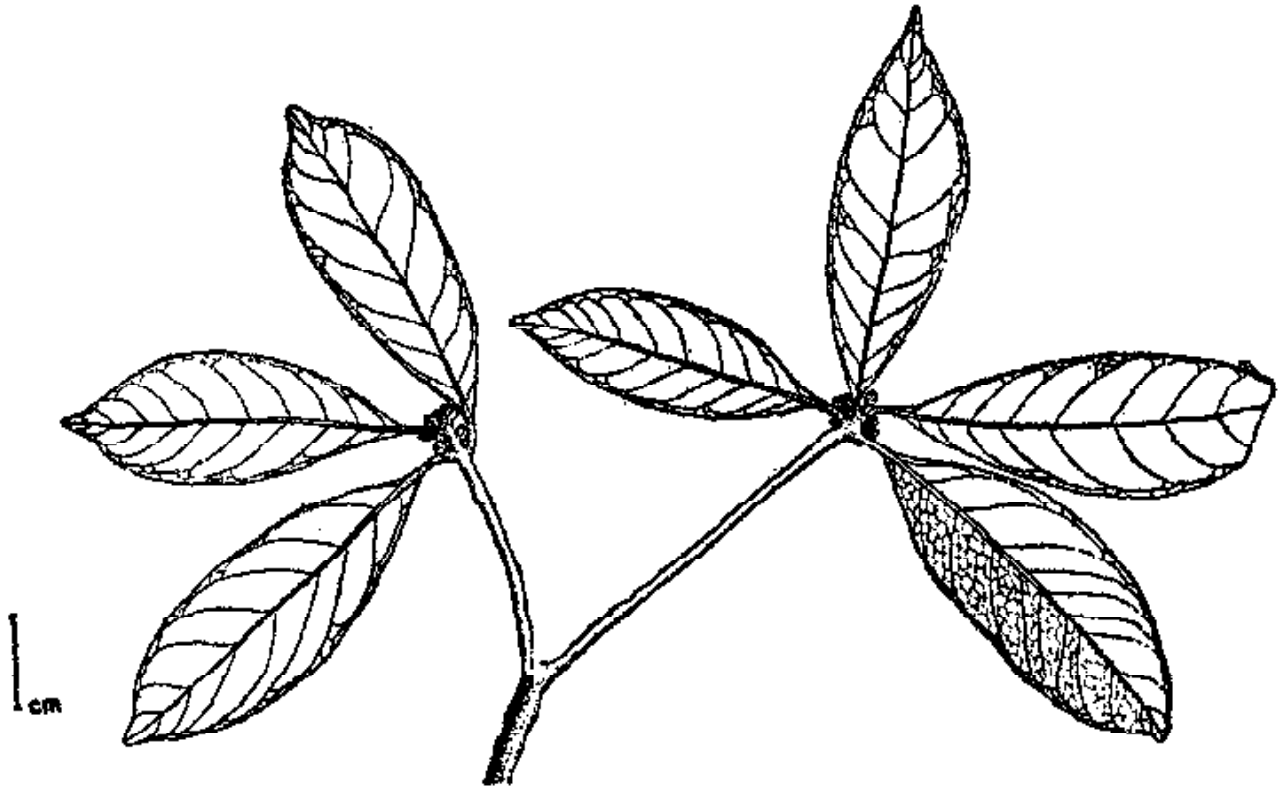
1. Brandis, D. (1906) : *Indian Trees*, p. 424.

2. Bourdillon, T. F. (1908). *Forest Trees of Travancore*, p. 240.

3. Gamble, J. S. (1921). *Fl. Pres. Madras* 4 : 765.

4. van Royen, P. (1960). Revision of the Sapotaceae, XXIII. *Palaquium* Blanco. *Blumea* 10(2):572.

The material for this sheet was supplied by M. P. Nayar, M. Ahmed and Rakesh Kumari, Botanical Survey of India, Calcutta.



Palaquium bourdillonii Brandis

Status : Rare. The species is so far known from a solitary locality in Gujarat in India and from Sind in Pakistan. The species is becoming rare due to habitat destruction.

Distribution : Gujarat (Kutch : Chadua Rakhal in Bhuj) ; Pakistan (Sind).

Habitat and Ecology : It occurs on sand-stone formations in Chadua Rakhal area of Kutch and on Lime-stone hills at Hyderabad in Sind, Pakistan.

Conservation Measures Taken : The species grows naturally in 'Chadua Rakhal', a protected forest area of the erstwhile Kutch State.

Conservation Measures Proposed : (i) Protection of habitat, (ii) introduction in botanic/ experimental gardens.

Biology and Potential Value : It flowers during November-January. Phyto-chemically, its stem and roots are reported to contain alkaloids.

Cultivation : None so far.

Description : Erect, much branched, spiny shrubs. Leaves alternate, fleshy, linear-oblong or spathulate, obtuse, villous. Flowers in sub-corymbose, terminal, few-flowered racemes; calyx campanulate, lobes lanceolate, acute; corolla tube curved, lobes ovate, veined. Capsules orbicular, compressed, glabrous, valves 2-partite.

References :

1. Cooke, T. (1958). *Fl. Pres. Bombay* 2 : 372. (repr. ed.)

2. Kothari, M. J. & Hajra, P. K. (1983). *In :* Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 47.

3. Sabnis, S. D. & Rao, K. S. S. (1983). *In :* Jain, S. K. & Rao, R.R. (ed.). *An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. p. 73.

4. Wight, R. (1850). *Ic. Plant. Ind. Orient.* 4 : t. 1416.

The material for this sheet was supplied by M. J. Kothari, Botanical Survey of India, Pune.

Status : Rare. Developmental activities and Jhum cultivation are the main threat factors. It has not been reported after the original discovery in 1963 and the area is not fully explored.

Distribution : Arunachal Pradesh : Tirap district.

Habitat and Ecology : At the outskirts of forest at about 2000 m in altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : Efforts should be made to collect seeds and cultivate the plant in botanic gardens.

Biology and Potential Value : Ripe fruit of the plant is not yet known. It contains some properties like those of belladonna. It is also of academic interest. Flowers during July-September.

Cultivation : Not taken up anywhere.

Description : A herb with perennial base, branching dichotomuosly. Leaves simple, subopposite, petiolate, 8-30 × 5.5-20 cm; petiole 1-4 cm long, glabrous; lamina ovate or ovate-elliptic, membranous, slightly undulate, minutely ciliate at the margin, acuminate at apex, attenuate at base, surface with small scurfy scales, more on the upper, falling off in age; midrib distinct; lateral nerves 5-8 pairs, bending gradually downwards. Flowers solitary, axillary, pedicellate, regular, bisexual, pedicel 2.5-7 cm long, scarcely hairy. Calyx gamosepalous, tubular, unlobed, sparsely lepidote, densely punctate, frequently with glands containing brown fluid; tube fleshy, thin on drying, 10-20 mm long, with 5 short teeth, traingular, ciliate at the margin. Corolla gamopetalous, tubular, 2.5-5 cm long, imbricate in bud, densely covered with long multicellular hairs outside, less so inside; teeth 4-5 mm long, deltoid-lanceolate. Stamens 5, attached just at the base of the corolla tube; filaments broad below, gradually tapering to a fine apex, *ca* 13 mm long, hairy; anthers *ca* 6.5 mm long, large, 2-lobed, dorsifixed, ovate-lanceolate, mucronate, dehiscing by apical pores; ovary clavate, glabrous, 2 locular with many ovules in axile placentation; style stout, 12-14 mm long, glabrous; stigma 2-lobed. Fruit a berry, oblong, many seeded. Seeds compressed, ovoid, *ca* 2.5 mm ; testa crustaceous, reticulate, brown; embryo peripheric, cylindric.

Reference :

1. Deb, D. B. & Dutta, R. (1965). *Ind. For.* 91(6): 363-366.

The material for this sheet was supplied by D. B. Deb, Botanical Survey of India, Howrah.

Status : Rare in India. The habitats of the species in its distrubution range are under stress due to shifting cultivation resulting in clear-felling of vast forest tracts. The species has been first collected in India from Subansiri district, Arunachal Pradesh in 1965. It has not been reported from other areas in Arunachal Pradesh.

Distribution : India, Arunachal Pradesh, Subansiri distrct, Begi-Amjee; China.

Habitat and Ecology : The species grows in dense sub-tropical and temperate forests in the altitude of about 1600 m. The area receives an annual rainfall of about 3000 mm and experiences heavy frost in winter months. Soils are loamy and rich in humus.

Conservation Measures Taken : None.

Conservation Measures Proposed: Introduction of the species into sutiable botanic gardens, and storage of seeds in seed-banks. Certain virgin forest areas in Subansiri district having rich plant diversity should be considered for preservation as protected forests.

Biology and Potential Value : The species flowers in profusion and looks attractive with its white flowers and green foliage for cultivation in botanic gardens. This is the only species of the genus known so far.

Description : Small trees, upto 10 m tall, much branched, young parts stellate-tomentose. Leaves alternate, oblong-elliptic, 6.5-19.5×3-9.5 cm, subcoriaceous, margins callose-denticulate, sparsely stellate hairy on the back. Inflorescence a lax panicle, axillary or terminal, 6-13-flowered, upto 8.5 cm long, stellate-hairy. Flowers white, *ca* 2 cm long; calyx cupular, 5-lobed; corolla 1.5 cm, 5-lobed, oblong, stellate-hairy without silky puberulous within, united at base to a short tube; stamens 10, unequal, alternately long and short, united at base; ovary semi-inferior, ovoid, 3 mm long, densely stellate-hairy, 5-locular, ovules many on axile placentation; style 1 cm long, stellate-hairy, stigma discoid, 5-lobed. Capsule oblong, 5-celled, seeds 2-winged.

References :

1. Hemsely, W. B. (1889). *J. Linn. Soc.* 26 : 75. (as *Helesia? fortunei*).

2. Makino, T. (1906). *Bot. Mag. Tokyo* 20 : 93.

3. Perkins, J. (1907). Styracaceae. *In* : Englet, A. (ed.). *Das Pflanzenr.* 30 : 91.

4. Sastry, A. R. K. (1967). *Alniphyllum* Mats. and *Huodendron* Rehder—Two additional generic records to the Indian Styraceae. *Bull. Bot. Surv. India* 9 : 297-298. Fig. 1.

The material for this sheet was supplied by A. R. K. Sastry and Doli Das, Botanical Survey of India, Howrah.

Status: Rare in India. The habitats of the species are under stress due to clear felling of forests for shifting cultivation. The species was first collected in India from Subansiri district, Arunachal Pradesh in 1965, and has not yet been reported from other parts of Arunachal Pradesh.

Distribution: In India this species is so far recorded from Subansiri district, Arunachal Pradesh. Earlier known from China, Northern Burma and Tonkin.

Habitat and Ecology: Grows in dense subtropical and temperate forests in the altitude of about 1700 m. The area receives about 3000 mm of rainfall annually, with heavy frost in winter months. Soils are loamy and rich in humus.

Conservation Measures Taken: None.

Conservation Measures Proposed: Introduction of the species into suitable botanic gardens; collection and preservation of seeds in seed banks and preservation of plant diversity areas in the region as protected forests and Biosphere Reserves are suggested.

Biology and Potential Value: The species with its corymbs of white flowers during May looks elegant and could be grown as an ornamental shrub.

Cultivation: Not known.

Description: Twiggy shrubs upto 3 m high, young parts stellately hairy. Leaves alternate, elliptic-lanceolate, 11.5-14 cm long, 3-4 cm broad, caudate-acuminate, minutely denticulate, venation finely reticulate. Flowers white, in axillary corymbose panicles, stellate-hairy, *ca* 6 mm long; calyx cupshaped, 5-dentate, adnate to the ovary; corolla 5×2 mm, 5-lobed, lobes free; stamens 10, free, *ca* 4 mm long, anthers 2-lobed, 3-dentate-crested; ovary semi-inferior, 1.5 mm long, 3-celled, ovules many, axile; style 3.5 mm long, minutely pubescent, apex 3-lobed. Capsule ovoid, 3-valved, stellate-hairy.

References:

1. Rehder, A. (1935). *Huodendron*, a new genus of Styracaceae. *J. Arn. Arb.* 16 : 344-345.

2. Sastry, A. R. K. (1967). *Alniphyllum* Mats. and *Huodendron* Rehder-Two additional generic records to the Indian Styraceae. *Bull. Bot. Surv. India* 9 : 297-298. Fig. 2.

3. Smith, W. W. (1920). *Styrax biaristatus* W. W. Sm. *Notes Roy. Bot. Gard. Edinburgh* 12 : 233.

The material for this sheet was supplied by A. R. K. Sastry and Doli Das, Botanical Survey of India, Howrah.

Status: Vulnerable, and much depleted due to over-exploitation of rhizomes for medicinal properties, and also due to habitat degradation and other biotic interferences in its distribution range.

Distribution: Himalayas. Himachal Pradesh to Bhutan; also extending into Tibet and W. China.

Habitat and Ecology: Dwarf hairy herbs with a long tap root, inhabiting alpine Himalayas at an altitude of 3000 to 5000 m.

Conservation Measures Taken: None.

Conservation Measures Proposed: Collection of this plant should be banned. Attempts should be made to cultivate this plant for its commercial exploitation. Some of its habitats should be conserved.

Biology and Potential Value: The plant is propagated by cuttings of rhizomes which are used in medicine and perfumery. Rhizomes are also used as tonic, stimulant, laxative, diuretic, spasmodic, stomachic, etc. Medicinal oils prepared from rhizomes are reported to promote the growth of hairs and also to impart black colour.

Cultivation: Not known in cultivation.

Description: Root-stock thick, long, covered with fibres from the petioles of withered leaves. Stem 10-60 cm, generally pubescent upward, glabrate below, subscapose. Radical leaves 15-20 × 2.5 cm, longitudinally nerved, glabrous or slightly pubescent, narrowed into the petiole; cauline 1-2 pairs, 2.5-7.5 cm long, sessile, oblong or subovate Flower-heads usually 1, or upto 5; bracts 4-6 mm long, pubescent. Corolla tube 6 mm long, somewhat hairy within. Fruit 4 mm long, covered with ascending white hairs, crowned by the ovate, acute, often dentate calyx-teeth.

References:

1. Anon. (1966). *The Wealth of India : Raw materials* 7 : 3.

2. Basu, B. D. (1918). *Indian Medicinal Plants,* Part. II. Plate 509 B.

The material for this sheet was supplied by H. J. Chowdhery. Botanical Survey of India, Dehra Dun.

Nardostachys grandiflora DC. A. Habit. B. Flower.

Status: Rare. This variety was described by J. S. Gamble (3) based on his collection made in 1886 from the Nilgiris and was located again in the Nilgiris in recent years. (Type in K.).

Distribution: Endemic to the Nilgiris.

Habitat and Ecology: Occurs in tropical to subtropical evergreen forests between 800-2200 m altitudes.

Conservation Measures Taken: The Nilgiri Biosphere Reserve includes its distribution localities and is also likely to help in conserving the rich flora diversity in the region (1).

Conservation Measures Proposed: The tropical evergreen forests in the Nilgiris harbour a large number of endemic, rare and interesting plants (4) and prevention of further destruction of this vegetation should be ensured to safeguard a large number of plants from extinction, in this Biosphere Reserve.

Biology and Potential Value : It is an endemic confined to the Nilgiri mountains.

Cultivation : So far none.

Description : A large but weak climbing shrub. Tendrils leaf-opposed, branched, wiry. Leaves 5-7-foliate, pedate, glabrous; petioles 2.5-6.6 cm long, terminal leaflets 5.0-11.5×2.5-5.5 cm, ovate-lanceolate to elliptic, truncate to cuneate at the base, serrate, acuminate at the apex, petiolules 1.0-2.2 cm long, lateral leaflets 2.5-9.5×1.5-5.0 cm, oblique at the base, margins and apex as in the terminal leaflets, petiolules upto 1 cm long. Inflorescences upto 10 cm long of axillary, dichasial cymes; peduncles upto 4.5 cm long. Flowers bisexual, 4-merous, glabrous. Calyx cupular. Petals *ca* 2.5×2.0 mm long, hooded at the apex. Disc cupular, 4-lobed, fleshy, covering the ovary.

References :

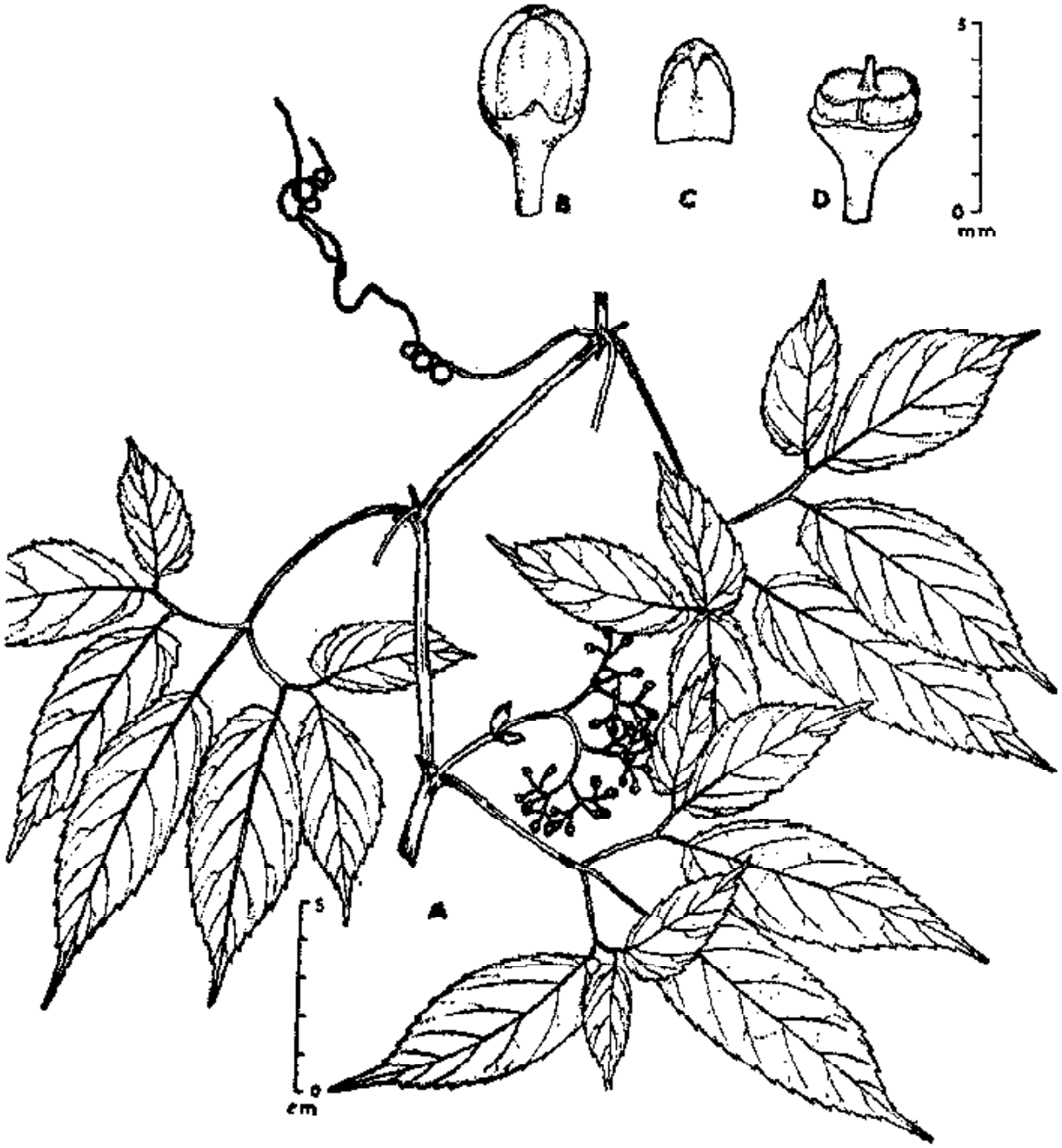
1. Anon. (1980). *The Nilgiri Biosphere Reserve Project Document* 1. Indian National Man and Biosphere Committee, Department of Environment. Govt. of India.

2. Fyson, P. F. (1932). *The Flora of the South Indian Hill Stations* 1 : 125, 2 : t. 97.

3. Gamble, J. S. (1918). *Fl. Pres. Madras* 1 : 236.

4. Shetty, B. V. & Vivekananthan, K. (1981). Endemic, primitive, temperate elements and the relict vegetation of Kundha range, Nilgiris, Tamil Nadu. *Bull. Bot. Surv. India* 23 : 254-264.

The material for this sheet was supplied by B. V. Shetty and C. P. Malathi, Botanical Survey of India, Coimbatore.



Cayratia pedata (Lam.) Juss. ex Gagnep. var. *glabra* Gamble. A. Habit. B. Flower bud. C. Petal. D. Disc and ovary.

Status : Rare; confined to a small area.

Distribution : Anamalai hills, Tamil Nadu. Located recently in Palghat hills, Kerala. Endemic to South Western Ghats.

Habitat and Ecology : It occurs in shady moist localities at higher altitudes.

Conservation Measures Taken : None.

Conservation Measures Proposed : Its habitats should be protected. Efforts should be made to locate the species in other adjoining areas/habitats for protection in the wild as well as for introduction in Botanic Gardens.

Biology and Potential Value : It is of botanical interest and should be introduced in botanic gardens as an ornamental plant.

Description : Tall, rhizomatous herbs upto 2 m. Leaves 60-75×10-18 cm, lanceolate, acuminate, attenuate at base, silky tomentose beneath. Spikes many flowered; ligule linear; exterior bracts few, oblong, glabrous. Corolla lobes linear-oblong. Lip obovate. Capsule with 9 undulating ribs or wings.

References :

1. Baker, J. G. (1892). *In :* Hooker, J. D, *Fl. Brit. India* 6 : 239.

2. Fischer, C. E. C. (1957). *Fl: Pres. Madras* 3 : 1039 (repr. ed.).

The material for this sheet was supplied by E. Vajravelu, Botanical Survey of India, Coimbatore.

Status : Vulnerable, and restricted in distribution to one small area only. The species has not been collected from any other area and its habitats are vulnerable due to eco-degradation.

Distribution : South Kanara Distt., Manipal (Taluka—Udipi), Karnataka. Endemic.

Habitat and Ecology : Observed during monsoon in moist, rocky crevices.

Conservation Measures Taken : None.

Conservation Measures Proposed : The type locality and neighbouring areas are to be searched for this species. If located the plants should be protected *in situ* and the plants should also be introduced in experimental gardens, for *ex situ* conservation.

Biology and Potential Value : The characters of the genus indicate it to be a probable link between other genera in Zingiberaceae—Hedychieae with versatile and non-versatile anthers, and thus is of evolutionary significance.

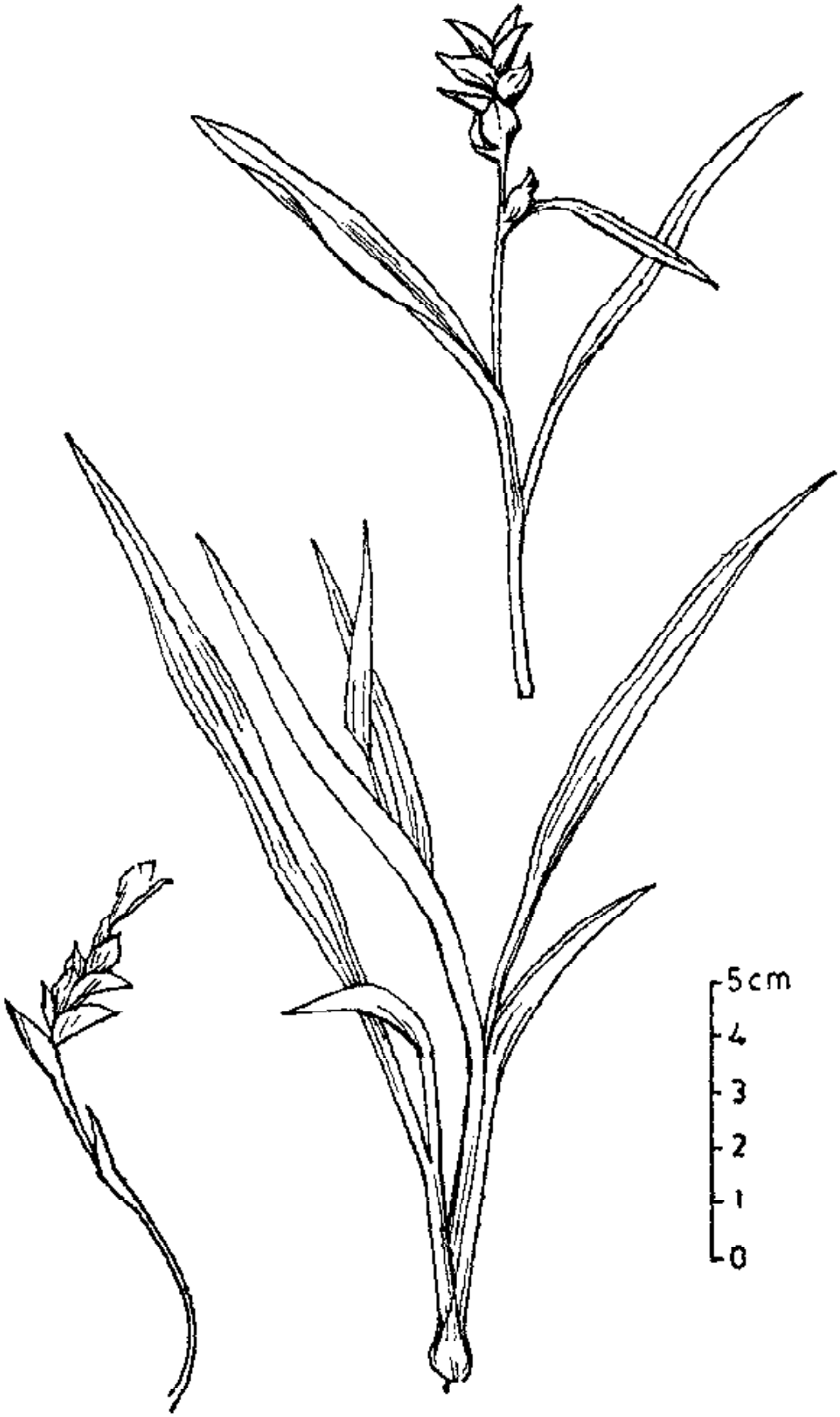
Cultivation : None.

Description : Rhizomatous herbs, upto 18 cm tall, no true stem present; leaves linear-lanceolate, 10-14×1 cm, caespitose, apex acute, base narrow and sheathing ; ligule present, 0.1 cm long, membranous. Peduncles naked, slender, arising in a tuft of leaves, 9 cm long. Inflorescence cylindric, 3.5 cm long; flowers yellow, sessile, subtended by ovate, green bracts; calyx campanulate, corolla tube 1 cm long, dorsal petal elliptic, lateral short; staminodes petaloid. Capsules subglobose.

Reference :

1. Smith, R. M. (1977). A new genus of Zingiberaceae from S. India. *Notes Roy. Bot. Gard. Edinburgh* 35(3): 365-368.

The material for this sheet was supplied by B. D. Sharma and B. G. Kulkarni, Botanical Survey of India, Pune.



Paracautleya bhatii Smith

Status: Possibly extinct in Indian localities due to habitat destruction. Holttum(3) reports it to be rare in Malaya.

Distribution: The species was described by Hooker(4) from Malaya. Beddome (1) reported it from Travancore mountains in South India and from Burma. Ghosh (2) reported it from Eastern India on the basis of old collections of N. Gill and H. Collet from Assam and Naga hills respectively. Last collection was made by N. Gill in 1901. Non-collection of this species either from South India or from Eastern India after 1901 till now by the Regional circles of Botanical Survey of India at Shillong and Coimbatore may indicate the possible extinction of this species from Indian region.

Habitat and Ecology: Grows in dense evergreen forests, in between 300-600 m altitude.

Conservation Measures Taken: None.

Conservation Measures Proposed: To obtain the spores from the living specimens from Malaya for germination and replanting the plants in hilly areas in South India and Eastern India.

Biology and Potential Value: No information; of botanical interest. Some other species of the genus are grown in ferneries and for interior decoration.

Description: Rhizome erect, bearing tufts of fronds, scaly; scales lanceolate, brown, margins entire; stipe black, scaly at base, smooth above, winged throughout, rachis black, wing 5 mm wide, wing of stipe and rachis plane. Lamina lanceolate, pinnate, terminated by deltoid apical pinna, lateral pinnae stalked, subdimidiate, glabrous, stalk of pinnae winged, wing of stalk somewhat crisped; lateral pinnae broader, less crescent-shaped, outer edge lobed to ½ of pinnae, sterile lobe denticulate, texture submembranaceous, veins free, dichotomously branched, raised on upper surface. Sori marginal, confined to lobes. Lobes reflexed along margins to form indusium.

References:

1. Beddome, R. H. (1883). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula*, p. 83-84.

2. Ghosh, S. R. (1983). The rare and threatened fern: *Adiantum soboliferum* Wall. ex Hk.—A new find for Eastern India. *J. Bombay Nat. Hist. Soc.* 79(3) : 716-717.

3. Holttum, R. E. (1954). *A revised Flora of Malay* 2 : 598.

4. Hooker, W. J. (1851). *Sp. Fil.* 2 : 13, t. 74A.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status: Vulnerable. Causes for its decline and possible extinction are mainly due to loss of its habitat. It has not been collected since 1955.

Distribution: India: North-west and Eastern Himalayas. Endemic.

Habitat and Ecology: Terrestrial; growing along the margins of forests in semi-shaded situations along streams, rivers and water courses.

Conservation Measures Taken: None.

Conservation Measures Proposed: Extensive field exploration by the specialists for locating the species and collection of live plants from the field and its cultivation in botanic gardens and conservatories may be undertaken.

Biology and Potential Value: It is of academic interest. Confined to the Indian region only.

Cultivation: Not known. It can be planted as a pot plant in shaded cool parts in botanic the gardens and can be easily cultivated, like many other ferns.

Description: Rhizome long-creeping, black, almost naked; stipes 8-10 cm, furnished with a few scales in the basal part; scales pinkish, ovate-lanceolate, deciduous; lamina ovate-lanceolate, 20-30×7-10 cm; pinnae alternate, lanceolate, *ca* 20 pairs, lower ones gradually reduced, the larger ones 3-5×1.5-2 cm, pinnatifid in the apical part, texture herbaceous, rachis pinkish, clothed with a few scales, both the surfaces glabrous; veins forked; sori 6-8 per pinnule, mid-way in between midrib and margins.

References:

1. Beddome, R. H. (1883). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula.*

2. Dixit, R. D. (1983). Rare and interesting Pteridophytes of India-II. *In:* Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India,* p. 331. Botanical Survey of India, Howrah.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

Status: Rare. This species has been originally described from South India (1) and later collected from Sri Lanka (2). It is represented in MH by a single sheet (*Beddome s.n.*, Acc. No. 59550). The main cause of its depletion in India may be due to the destruction of its natural habitat.

Distribution: South India and Sri Lanka.

Habitat and Ecology: Along marshy places near streams in association with other species of *Diplazium* and tree ferns, under the shade of forests.

Conservation Measures Taken: None on record.

Conservation Measures Proposed: Intensive search to relocate and propagate the species in experimental gardens should be made.

Biology and Potential Value: A magnificent plant and can be introduced in ferneries and gardens.

Cultivation: Not known.

Description: Large fern about 1-1.5 m, rhizome erect, stipes 40-70 cm, tufted, scaly at base, scales narrowly lanceolate, acuminate, margins toothed. Lamina 60-100×40-50 cm, bipinnate with 10-15 pairs below the pinnae-like apex, largest pinnae 25-40×10-15, stalked, lanceolate, attenuate at base, pinnules sessile or subsessile, becoming adnate then decurrent, lower 2 or 3 smaller than the adjoining ones; upper pinnae entire or nearly so; fronds terminating in a pinnae like apex about 10-15 cm long. Veins 15-20 pairs, forked. Sori diplazioid. Spores reniform with a winged perispore.

References:

1. Beddome, R. H. (1892). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula with supplement* (repr. ed. 1976). New Delhi.

2. Sledge, W. A. (1962). The Athyrioid ferns of Ceylon. *Bull. Brit. Mus. (Nat. Hist.) Bot.* 2(11): 305.

The material for this sheet was supplied by N. C. Nair and P. Bhargavan, Botanical Survey of India, Coimbatore.

Status: Vulnerable in India, due to clearing of forests and destruction of habitat in its distribution range. The species has been collected after a lapse of more than one hundred years from Arunachal and Cachar Hills in 1984.

Distribution : Described from Assam, Eastern India by Griffith(1). Reported also from Southern China (2). Now a days, it is rarely found and collected in Eastern India (3).

Habitat and Ecology : Grows in dense forests in moist places upto 100m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : Introduction of live plants into Botanic Gardens for *ex situ* conservation.

Biology and Potential Value : No information.

Description : Plants upto 85 cm long; rhizome horizontally creeping, fleshy, 2.5 mm thick, stipe succulent, with two fleshy stipules at base, 14-50 cm long. Fronds upto 85 cm long, simple or partially lobed when young, mature fronds ternately compound, consisting of three leaflets, leaflets subsessile or shortly stalked, stalk of middle leaflets upto 1 cm long, middle leaflet largest, 13-20 cm long, 7-12 cm wide, oblong-ovate or elliptic, cuneate at base, apex subacuminate to acuminate, margins entire, sometimes broadly crenate or dentate, thick, dark green above and whitish green beneath, glabrous, under surface provided with roundish pores, main vein and lateral veins distinct, 9-10 pairs, lateral leaflets small, 11-15 cm long, oblong to elliptic, lateral veins curved, venation reticulate with free included veinlets in areola. Sori at vein junction, in two irregular rows between main veins, each consisting of a group of 10-15 sporangia jointed together laterally; spores globose, rarely oblong.

References :

1. Griffith, W. (1836). *Asiat. Researches* 19 : 108, t. 18.

2. Ching, R. C. (1959). *Fl. Reip. Pop. Sinica* 2 : 65.

3. Pal, G. D. (1982). *Christensenia aesculifolia* (Bl.) Maxon—First report of a poorly known fern from Subansiri Dist., Arunachal Pradesh. *Bull. Bot. Surv. India* 24(1-4) : 180-182.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Sphaeropteris albosetacea (Bedd.) Tryon

(*Cyathea albosetacea* (Bedd.) Copel.)

CYATHEACEAE

Status : Vulnerable. The species is insular in distribution and rapid habitat alterations in the islands have rendered it vulnerable.

Distribution : India : Endemic to Nicobar Islands. Beddome (1, 2) described it on a collection of Kurz. Thothathri (5) reported it from Car Nicobar and Nancoury Islands in Nicobar Islands and reported it to be common in those islands only. Botanical Survey of India expedition and collection trips in the year 1984, located the species in these islands.

Habitat and Ecology : "Here and there in the tropical and coral-reef forests of Kamarta and Katchall" (3 & 4).

Conservation Measures Taken : None.

Conservation Measures Proposed : Some islands/areas rich in endemics and plant diversity in the Nicobar islands need to be declared as 'protected'. The species should be introduced into botanic gardens as a measure of *ex situ* conservation.

Biology and Potential Value : Of botanical interest.

Description : Trunk upto 3 m tall. Fronds bipinnate—tripinnatifid ; stipe scaly, muricated ; scales brown, 2 cm long, about 2 mm broad, shining, with copious irregular concolorous setae. Main rachis pale, bearing rather many short spines and scattered narrow setiferous scales. Primary pinnae upto 70 cm long, rachis pale, finely warty, bearing stout hairs and narrow shinning scales to 6 mm long. Secondary pinnae upto 10 cm long, 1.5 cm wide, sessile, acuminate, 1-2 basal segments of secondary pinnae almost free, rest of pinnae lobed almost to the costa, costules 7 mm apart on largest pinnules ; veins upto 10 paris, usually forked twice, basal basioscopic veins from costa, ultimate segments thin, sinus wide, crenate, costa with long setaceous hairs, similar hairs also present on both surfaces of costules, pale bullate scales also present on costules. Sori near the costule at the junction of the veins.

References :

1. Beddome, R. H. (1876). *The Ferns of British India*, suppl. 2.

2. Beddome, R. H. (1883). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula*, p. 16.

3. Holttum, R. E. (1965). Tree ferns of the genus *Cyathea* Sm. in Asia (excluding Malaysia). *Kew Bull.* 19(3) : 483.

4. Kurz, S. (1876). A sketch on the vegetation of Nicobar islands. *J. Asiat. Soc. Beng.* 45(2) : 162.

5. Thothathri, K. (1960). Botanical exploration in Car Nicobar and Nancoury Islands. *Bull. Bot. Surv. India* 2 : 341-346.

6. Tryon, M. (1970). The classification of *Cyatheaceae*. *Contr. Gray Herb.* 200 : 21.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Sphaeropteris crinita (Hook.) Tryon

(*Cyathea crinita* (Hook.) Copel.)

CYATHEACEAE

Status : Endangered tree fern. Habitat destruction and clearing of forests have caused depletion of the species in India and perhaps in Sri Lanka also.

Distribution : The species was described by Hooker (4) on Mrs. Walker's collection nos. 34 & 41 from Sri Laka. Beddome (1) reported it from the Nilgiris, Tamilnadu and Anamallays, Kerala. The species is confined to Sri Lanka and South India. Last colletion of this species in South India was made by A. Meebold in 1910. From herbarium collections and Holttum's (3) works, it is seen that this species was last collected from Sri Lanka in the last century only. No recent collections either from South India or from Sri Lanka have been made.

Habitat and Ecology : Grows on forested hill slopes between 1500-2100 m altitudes and perhaps near water sources in cool shady areas.

Conservation Measures Taken : Of late, the Nilgiri region is declared as a Biosphere Reserve.

Conservation Measures Proposed : Concerted efforts for its rediscovery in India and Sri Lanka and if rediscovered, efforts to protect the plants *in situ* and also in botanic gardens should be made.

Biology and Potential Value : Of botanical and horticultural interest only.

Description : Trunk ?. Fronds bipinnate, stipes 40 cm or more long, dark purple near base, distinctly warty, covered throughout with scales; scales 3.5 cm long, 2.5 mm wide, long acuminate, thin, pale with dark short marginal setae, main rachis similarly scaly and warty. Primary pinnae upto 60 cm long, lower surface of pinnae, rachis pale, warty, covered with thin felt of small pale long-fringed scales. Secondary pinnae 10-12 cm long, upto 2.4 cm wide, lobed almost to costa, basal segments not free, costules 3.5-4 mm apart; veins upto 12 pairs, usually forked, ultimate segments thin, falcate, margins finely crenato-serrate, costa and costular scales abundant, scales bullate with marginal flexuose hairs, scales are attached to thick hair like bases, pale hairs present on costa and costule beneath and also on veins. Sori exindusiate, nearer to costules; paraphyses slender, as long as sporangia.

References :

1. Beddome, R. H. (1863). *The Ferns of South India*, p.20.
2. Holttum, R. E. (1963). Cyatheaceae. *Flora Mal.* ser. 2. 1(2) : 132.
3. Holttum, R. E. (1965). Tree ferns of the genus *Cyathea* Sm. in Asia (excluding Malaysia). *Kew Bull.* 19(3) : 482.
4. Hooker, W. J. (1844). *Ic. Pl.* 7, t. 671.
5. Tryon, M. (1970). The classification of *Cyatheaceae*. *Contr. Gray. Herb.* 200 : 21.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status: Possibly extinct in its type locality. Causes are clearing of forest and destruction of habitat. This species was described by Baker (1) on H. J. Elwes collection from Lachen, North Sikkim. Beddome (2, 3) and Clarke (4) cited the same specimens. Mehra and Bir (7) could not collect the species. Tagawa (8, 9) and Iwatsuki (6) were not able to collect the species from that locality. Its last collection was made by H. C. Levinge in 1889. Ching (5) reported its occurrence from Tibet, China.

Distribution: India : Lachen, North Sikkim; Tibet in China.

Habitat and Ecology: Grows in hill slopes at an altitude of *ca* 2700 m.

Conservation Measures Taken: None.

Conservation Measures Proposed: Attempts to grow the species from live plants and spores obtained from China in botanical gardens and reintroduction of the species in its original habitat at Lachen in North Sikkim be made.

Description: Rhizome ?. Fronds large, lanceolate, tripinnatifid, stipe upto 35 cm long, base black, upper portion brown, glabrous. Lamina upto 60 cm long, rachis stramineous, glabrous, pinnae lanceolate, nearly sessile, upto 6 cm long, pinnae rachis flattened, pinnules 20-30-jugate, lanceolate, sessile, cuneate at base, deeply pinnatifid, ultimate segments erecto-patent, entire, lowest on upper side bifid, both surfaces glabrous, veins solitary in each segment. Sori covering the entire apex of segments.

References:

1. Baker, J. G. (1874). *Synopsis Filicum*, p. 54. (2nd ed.).

2. Beddome, R. H. (1876). *The Ferns of Brit. India, suppl.* 2. t. 347.

3. Beddome, R. H. (1883). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula*, p. 26.

4. Clarke, C. B. (1880). A review of ferns of North India. *Trans. Linn. Soc.* ser. 2. Bot. 1 : 436.

5. Ching, R. C. (1959). *Fl. Reip. Pop. Sinica* 2 : 200.

6. Iwatsuki, K. (1975). *Pteridaceae. In:* Hara, H.(ed.). *Fl. East. Himal.*, vol. 3.

7. Mehra, P. N. & Bir, S. S. (1964). The pteridophytic flora of Darjeeling and Sikkim Himalayas. *Res. Bull. Punjab Univ.* (N. S.), p. 15.

8. Tagawa, M. (1965). *Pteridaceae. In :* Hara, H. (ed.). *Fl. East. Himal.*, vol. 1.

9. Tagawa, M. (1971). *Pteridaceae. In :* Hara, H.(ed.). *Fl. East. Himal.*, vol. 2.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status: Rare, due to destruction of its habitats. It was described as *Elaphoglossum stigmatolepis* by Beddome (1) on his collections from Anamallays and Nilgiri mountains.

Distribution: Nilgiri and Anamallay mountains in South India. Endemic. Recent studies by Biswas and Ghosh (2) indicate it to be rare in these areas.

Habitat and Ecology: Lithophytes or epiphytes, grows in altitudes of 1000-2100 m.

Conservation Measures Taken: Its habitats in the Nilgiri hills are protected as these are included in the Nilgiri Biosphere Reserve.

Conservation Measures Proposed: Introduction trials into the botanic gardens should be made.

Biology and Potential Value: No information; of botanical interest only.

Description: Rhizome short, creeping, rigid, covered with linear-attenuate, brown scales; scale 5-9 mm long, margins entire except for a few teeth at base, apex acute. Fronds dimorphic, in two rows on dorsal side of rhizome. Phyllopodia 4-5 mm long, inconspicous, covered with scales similar to that of rhizome, deep brown. Sterile frond: stipe 3-10 cm long, brown, scaly, scales similar to that of rhizome, furrowed forming a ridge; lamina coriaceous, linear-lanceolate, 15-35 cm long, 1.5-3 cm broad, apex and base gradually narrowed, decurrent upto the base of stipe forming narrow wings, margin entire, with narrow cartilaginous border, reflexed on drying, costa below sulcate, raised above, surface with minute, brown, glandular scales, upper surface nearly glabrous. Veins once or twice forked, prominent, hydathodes wanting. Fertile frond as long as sterile frond but stipe longer; lamina 1.5-2.5 cm broad. Sori acrostichoid.

References:

1 Beddome, R. H. (1863). *The Ferns of South India*, p. 67, t. 199.

2. Biswas, A. & Ghosh, S. R. (1984). The fern family *Elaphoglossaceae* in India, Nepal, and Bhutan. *Proc. Ind. Acad. Sci.* (Pl. Sci.) 93(6) : 587.

3. Sledge, W. A. (1967). The genus *Elaphoglossum* in Indian Peninsula and Ceylon. *Bull. Brit. Mus.* (*Nat. Hist. Bot.*) 4(2) : 88.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Vulnerable, due to clearing of forests and habitat destruction.

Distribution : Endemic to South India. Described from the Nilgiri hills. Beddome (1) reported it from the Nilgiri and Puiney hills. Sledge (4), Biswas & Ghosh (2) mentioned the same locality of its occurrence. Last collection of it was made by J. Ellis in 1972(2).

Habitat and Ecology : Grows on rocks or on trees in shady, moist conditions in between 2000-2550 m altitudes. in cool shady forests.

Conservation Measures Taken : The Nilgiri hills have been recently declared as a Biosphere Reserve.

Conservation Measures Proposed : Introduction of the species into experimental gardens and ferneries and their multiplication for reintroduction into the distributional areas.

Biology and Potential Value : No information; of botanical interest only.

Description : Rhizome horizontally long creeping, rigid, densely covered with thin, ovate-lanceolate, bicolorous scales; scales brown at base and blackish above, margins entire. Fronds dimorphic, distantly placed in two rows on dorsal side of the rhizome, phyllopodia distinct, swollen, black, narrowed, 5-10 mm long, scaly. Sterile frond : stipe twisted, deep green, 8-12 cm long, scaly,; lamina narrowly elliptical, 10-15 cm long, 1.5-2 cm broad, black on drying, base narrowed and decurrent on stipe, margins entire, cartilaginous, reflexed, apex narrowed, acuminate, costa scaly beneath, upper surface with scattered scales, lower surface with minute dark, peltate scales with fimbriate margins, texture thin, transluscent; veins evident, once or twice forked, hydathodes wanting. Fertile frond : stipe longer than sterile one, lamina narrowed, 1-2 cm broad. Sori acrostichoid, spreading the whole undersurface of lamina.

References :

1. Beddome, R. H. (1863). *The Ferns of South India*, p. 67, t. 198.

2. Biswas, A. & Ghosh, S. R. (1984). The fern family *Elaphoglossaceae* in India, Nepal and Bhutan. *Proc. Ind. Acad. Sci.* (Pl. Sci.) 93(6) : 584.

3. Fee, A. L. A. (1845). *Mem. Fem. Foug.* 2 : 62, t. 24, f. 2.

4. Sledge, W. A. (1967). The genus *Elaphoglossum* in Indian Peninsula and Ceylon. *Bull. Brit. Mus.* (*Nat. Hist. Bot.*) 4(2) : 86.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Rare, due to destruction of its habitats. The species was described from Yoksum and Neebay, Sikkim on H. C. Levinge's collection. Despite several collection trips conducted by Botanical Survey of India, the species has not been collected in recent times. Mehra *et* Bir (5) collected the species from Lachen, North Sikkim and they expressed that it was quite rare. The species has also been reported from Tibet, China by R. C. Ching (2).

Habitat and Ecology : High altitude filmy fern, grows on shady moist rocks or on tree trunks, in between 2100-2550 m. alt.

Conservation Measures Taken : None.

Conservation Measures Proposed : Attempts should be made for *in situ* conservation and to grow it in Botanical Gardens and in conservatories.

Biology and Potential Value : A rare species of botanical interest.

Description : Rhizome long creeping, filiform, glabrous; stipe *ca* 2.5 cm long, not winged, upper part covered with multicellular hairs. Fronds 2.5-5 cm long, small, narrowly oblong, rachis winged, not cripsed, rachis and veins hairy and scalys scales lanceolate. Fronds pinnatifid, primary segments 1-4-lobed, ultimate lobes oblong, remotely serrate, midrib with many hairs and lanceolate scales. Sori 1-2 at the apex of segments, indusiate; indusia glabrous, 2-lipped, cleft to the base, entire or slightly toothed at apex, sporangia 2-4, receptacle included.

References ·

1. Clarke, C. B. (1880). A review of ferns of Northern India. *Trans. Linn. Soc.* ser. 2. Bot. 1 : 439, t. 49, f. 3.

2. Ching, R. C. (1959). *Fl. Reip. Pop. Sinica* 2 : 137.

3. Copeland, E. B. (1938). *Philip. J. Sci.* 67 :96.

4. Copeland E. B. (1947). *Gen. Fil.*, p. 33.

5. Mehra, P. N. & Bir, S. S. (1964). The pteridophytic flora of Darjeeling and Sikkim Himalayas. *Res. Bull. Punjab Univ* 15 :115.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Rare. The species is declining in its distribution range due to degradation and loss of forests.

Distribution : India : Eastern India ; Bhutan.

Habitat and Ecology : Prefers cool, shady moist forest floors and grows along stream sites among grasses and bushes.

Conservation Measures Taken : None.

Conservation Measures Proposed : Restriction of collection of the species and protection of some of its habitats and populations and introduction of the species into botanic garden conservatoies and ferneries should be considered.

Biology and Potential Value : It is restricted to Eastern India and Bhutan. The species is interesting in having pinnae very similar to *Adientum*, and is of phylogenetic importance.

Cultivation : Not known.

Description : *Rhizome short, creeping, clothed with reddish to dark brown scales, 4 seriate at base, uniseriate above.* Fronds tufted, stipes 6-17 cm, shining, atropurpureous to blackish ; lamina pinnate, 15-35 cm, linear ; pinnae 20-40 on each side, spreading to slightly ascending, close, subcoriaceous to coriaceous ; brownish-green when dry, subtrapezoidal to subparallelogrammoid, truncate to obtuse at apex, cuneiform, subsessile at base, pinnae 10-15 × 4-10 mm, lower margin straight to slightly convex towards apex with 1-2 very shallow incisions. Veins free, upper pinnae gradually reduced, denticuliform. Sori interrupted by incisions, continuous in smaller pinnules ; indusium brown, rigid, almost reaching the margins, not reflexed.

Reference :

1. Dixit, R. D. & Ghosh, B. (1983). The genus *Lindsaea* Dryand ex Sm. in India. *Proc. Indian Acad. Sci.* (Pl. Sci.) 92(3) : 233-268, f. 1-47.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

Status : Rare. Causes of its decline are large scale clearing of forests and consequent loss of its habitats.

Distribution : India : Restricted to South India and Madhya Pradesh.

Habitat and Ecology : Terrestriai, grows in moist shady situations among grasses and bushes near streams, rivers in evergeen and moist deciduous forest floors.

Conservation Measures Taken : None.

Conservation Measures Proposed :. Restriction of further collection of the plants, careful introduction of some of its plants into ferneries, green houses in botanic gardens and conservation of some of its populations in its habitats should be considered.

Biology and Potential value : The species is of academic interest since it is endemic to the Indian region.

Cultivation :. Not known.

Description : Rhizome short, creeping, 1-1.5 cm in diam., clothed with brown scales, 6-seriate at base, uniseriate above. Fronds tufted; stipes stramineous to light-brown, quadrangular above, terete at base; lamina pinnate except for one to two lower bipinnate, 15-35 × 2-2.5 cm; pinnae 10-12 × 3-7 mm, 25-30 to a side, ascending, parallelogrammoid to subtrapezoid, upper and lower margins somewhat convex, basal ones little reduced; veins immersed, free to sometimes anastomosing, upper with margins 3-4 shallow incisions. Sori interrupted by the incisions; indusium entire to crenulate, nearly to the margin.

Reference :

1. Dixit, R. D. & Ghosh B. (1983). The genus *Lindsaea* Dryand ex Sm. in India. *Proc. Indian Acad. Sci.* (Pl. Sci.) 92(3) : 233-258, f. 1-47.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

Status : Indeterminate, and probably depleted from the type locality in Sikkim due to deforestation and change of habitat.

Distribution : India; endemic to Sikkim and Darjeeling. Hooker (5) described it on the collection of Mrs. Atkinson from Hot Valley, Sikkim. Clarke (3) did not report it from N. India. Beddome (1) reported it from Goke below Darjeeling. Christensen (2) mentioned that it was endemic to Sikkim. Holttum (4) opined that it was also available in Malaya, although he mentioned that Malayan and Sikkimese plants have some differences. Mehra and Bir (7), Tagawa (8), Iwatsuki (6) could not find the species in Sikkim or Darjeeling. In the herbarium CAL, there are three old sheets of this species from Sikkim, of which the last collection was made by H. C. Levinge in 1900.

Habitat and Ecology : A terrestrial fern of high altitudes in sub-tropical and sub-temperate Himalayan forests.

Conservation Measures Taken : None.

Conservation Measures Proposed : Intensive search to relocate the species in its distribution range and if found attempts should be made to grow the plants *ex situ* for multiplication, protection and re-introduction in its distribution areas.

Biology and Potential Value : No information.

Description : Rhizome wide creeping, thick, woody, 4-5 mm in dia., covered with dark brown, shinning, linear-subulate, about 5-6 mm long scales with long acuminate apices. Fronds dimorphic. Stipe of sterile frond 20-30 cm long, stipe of fertile frond upto 50 cm long. Sterile fronds upto 50 cm long, deeply trilobed, lobes upto 5 cm wide, edges of lobes thickned, not notched, veins not visible. Fertile fronds tripartite, lobes to about 15 mm wide, lower surface completely covered with sporangia apart from thickened edges and midrib, paraphyses present.

References :

1. Beddome, R. H. (1883). *A Handbook to the Ferns of British India, Ceylon & Malay Peninsula*, p. 434, f. 263

2. Christensen, C. (1906). *Index Filicum* 20: 388.

3. Clarke, C. B. (1880). A review of the ferns of Northern India. *Trans. Linn. Soc.* ser. 2. Bot. 1.

4. Holttum, R. E. (1954). A *revised flora of Malay: Ferns* 2 : 211.

5. Hooker, W. J. (1864). *Species Filicum* 5 : 272, t. 304.

6. Iwatsuki, K. (1975). *Polypodiaceae. In :* Hara, H. (ed.). *Fl. East. Himal.*, vol. 3.

7. Mehra, P. N. & Bir, S. S. (1964). The Pteridophytic flora of Darjeeling and Sikkim Himalayas. *Res. Bull. Punj. Univ.* (N.S.), p. 15

8. Tagwa, M. (1966 & 1971). *Polypodiaceae. In :* Hara, H. (ed.). *Fl. East. Himal.*, vols. 1&2.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Vulnerable, due to deforestation for shifting cultivation and forest fires. It is seen growing in some isolated areas in Manipur, Eastern India.

Distribution : Endemic to a single locality in Manipur, Eastern India. It is described by Dr. E. Rosenstock on A. Meebold's collection no. 7058 from Phalang, Nagarbazar, Manipur. During Botanical exploration tours in 1984 and 1985 in Manipur conducted by Botanical Survey of India, the species has been rediscovered and collected from Moreh in Technopol District after long time gap. In between this period the species has not been collected either from Manipur or from any other part of Eastern India.

Habitat and Ecology : Epiphytic. Grows in semishade conditions amongst rock boulders near streams and rivers in between 1000-1500 m altitude.

Conservation Measures Taken : None.

Conservation Measures Proposed : Technopol district of Manipur is to be declared reserve forest area and shifting cultivation should be totally stopped.

Biology and Potential Value : No information; of botanical and distributional interest.

Description : Rhizome creeping, roots densely covered with yellowish-brown tomentose hairs; scales of rhizome lanceolate-subulate, ferruginous, margins of scales lacerate or ciliato-dentate, about 4-5 mm long, 1 mm broad at base. Fronds dimorphic; sterile or nest fronds sessile, adpressed to rhizome, not or slightly lobed, margins entire or slightly repand, base subcordate, lamina ovate or cordate, 5-11 cm in dia., pale brown to scarious. Fertile or foliage frond stipitate, stipe 20-32 cm long, lamina decurrent upto the base of stipes leaving a wing on the stipe. Lamina 60-80 cm long, elongate-ovate, deeply pinnatifid almost to the rachis leaving a narrow wing, lobes oblique, 18-20 cm long, 4.5-5 cm wide, apex long acuminate, sinus broad, texture subcoriaceous, glabrous, margins cartilaginous; main vein oblique, 9-10 mm apart, parallel, cross veins distinct, enclosing smaller areoles with few free veins. Sori round, irregularly placed at the junction of veins.

References :

1. Christensen, C. (1913-16). *Index Filicum*, suppl. 2 : 13.

2. Rosenstock, E. (1913). Filices novae in India orientalia cl. A. Meeboldio collectae. *Fedd. Repert.* 12 : 248.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Rare, due to clearing of forests for shifting cultivation and forest fires. First described by Beddome (1), (2) based on Dr. Watt's collection (no. 4797) from Koupra, Manipur. The species had also been collected from Nagaland by H. Collet in 1882.

Distribution : Endemic to Eastern India.

Habitat and Ecology : Epiphytic on trees and rhizome often suspended in air. Grows in between 1200-1600 m altitudes.

Conservation Measures Taken : None.

Conservation Measures Proposed : Attempts should be made to relocate the species in its distribution range and the species may be introduced in Botanical Gardens in Eastern India.

Biology and Potential Value : No information on potential value; a rarely collected endemic fern of botanical interest.

Caltivation : Not known.

Description : Rhizome wide creeping on trees and often suspended in air, glaucous, naked or nearly so. Stipes 7-15 cm long, hairy. Fronds soft hairy, 20-25 cm long, 5-10 cm broad, pinnatifid to 5 mm of the rachis, segments ciliated, 20-25 pairs, entire or obscurely crenate, oblong from a broad base, blunt at apex, lowest pair deflexed and slightly reduced; veins reticulate forming a single series of costal areola. Sori in a single row, nearer the midrib than the margin.

References :

1. Beddome, R. H. (1883). New Manipur Ferns collected by Dr. Watt. *Journ. Bot.*, p. 234.

2. Beddome, R. H. (1892). *A Handbook to the Ferns of British India, Ceylon and Malay Peninsula with supplement*, p. 90.

3. Ching, R. C. (1978). The Chinese fern families and genera : systematic arrangement and historical origin. *Acta Phytotax. Sinica* 16(4) : 27.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Rare, due to destruction of its habitats. Baker (1) described this species on H. J. Elwes' collection from Lachen, North Sikkim. Mehra *et* Bir (4) expressed that the plants grow near Chhangu and near Lachen, North Sikkim. The species has been re-collected from the same locality in North Sikkim (2)

Distribution : Endemic to an isolated locality near Lachen in North Sikkim, India.

Habitat and Ecology : Grows on open hill slopes in between 2700-4200 m altitudes.

Conservation Measures Taken : None.

Conservation Measures Proposed : Protection of certain plant diversity areas in N. Sikkim and *ex situ* conservation of the species in botanic gardens should be considered.

Biology and Potential Value : No information.

Cultivation : No information.

Description : Rhizomes creeping, clothed with many light brown ovate-lanceolate scales, margins entire. Fronds tufted, stipe upto 20 cm long, glabrascent, bright cheshnut coloured, shining. Lamina bipinnatifid, elliptic-lanceolate, 30-55 cm long, narrowed from the middle to both ends; the lower pinnae gradually smaller and running down into mere auricles; pinnae alternate with aerophores at their bases, rachis pale, castaneous, lower surface hairy with white hairs; middle pinnae 4.5-6 cm long, lobed to little more than halfway to costa, lobes entire with rounded apices. Veins 3-5 pairs, simple or forked, costa bearing small glands and unicellular hairs on lower surface, grooved on upper surface with a few unicellular hairs on the ridge between the grooves, rest of the surface glabrous. Sori sumarginal, spores monolete.

References :

1. Baker, J. G. (1874). *Synopsis Filicum*, p. 497. (2nd ed.)

2. Dixit, R. D. & Ghosh, S. R. (1985). *Oreopteris elwesii* (Bak.) Holttum—A poorly known endemic fern, rediscovered. *Bull. Bot. Surv. India* 26 : 228-230.

3. Holttum, R. E. (1981). The genus *Oreopteris* (Thelypteridaceae). *Kew Bull.* 36 (2) : 223-226.

4. Mehra, P. N. & Bir, S. S. (1964). The pteridophytic flora of Darjeeling and Sikkim Himalayas. *Res. Bull. Punj. Univ.* (N.S.) 15 : 150.

The material for this sheet was supplied by S. R. Ghosh, Botanical Survey of India, Howrah.

Status : Vulnerable and is restricted to hilly terrains of South India and Sri Lanka. Beddome (1) reported it from Sispara in South India and from Sri Lanka. It is represented in MH by the recent collection made from Silent Valley. Holttum (2) reported that no specimens have been collected since 1880.

Distribution : Sispara—South India; Matale—Sri Lanka. The distribution is restricted to higher altitudes at about 1000 m in moist humus soils. It could be located only in one particular spot along the flood zone of Kuntipuzha river in Silent Valley, Kerala.

Habitat and Ecology : It is a partial shade loving plant in moist humus soils, in the higher altitudes.

Conservation Measures Taken : Its populations recently located in the Silent Valley area are safe as the whole area is now declared as a National Park.

Conservation Measures Proposed : Propagation of the species in other similar habitats in the Silent Valley area and introduction into botanic gardens and ferneries are suggested.

Biology and Potential Value : A very striking member of the genus *Pronephrium*, as it is very distinct from other species.

Cultivation : Not known.

Description : A slender shade loving plant with creeping rhizome, stipes 20-30 cm, scaly at base, glabrous above. Fronds 20-30 x 10-15 cm, deltoid or sub-deltoid, apex acuminate, more or less pinnatifid below, lowest pinnae stalked, herbaceous, pubescent. Sori spreading on maturity.

References :

1. Beddome, R. H. (1892). *A Handbook to the Ferns of British India, Ceylon, and Malay Peninsula with supplement*. New Delhi. (repr. ed. 1976).

2. Holttum, R. F. (1972). Studies on the family Thelypteridaceae IV. The genus *Pronephrium* Presl. *Blumea* 20 : 123.

The material for this sheet was supplied by N. C. Nair and P. Bhargavan, Botanical Survey of India, Coimbatore.

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