MANGROVES OF GOA

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MINISTRY OF ENVIRONMENT & FORESTS
BOTANICAL SURVEY OF INDIA

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PREFACE

Mangroves or tidal forests of Goa are mainly localised along the swampy river banks and muddy creeks of coastal area. Since these plants do not get sufficient atmospheric oxygen in muddy habitat, they develop peculiar halophytic adaptations such as pneumatophores or breathing roots, prop or stilt root system for support, viviparous germination of fruits for quick growth and development, thick-coriaceous leaves with sunken stomata and cuticularised epidermis to diminish transpiration. Such morphological, physiological and anatomical adaptations help these plants to resist against natural calamities like cyclones which bring very high tides in sea or river water causing soil erosion. Mangroves act as a wind breaker or watchman and help in soil conservation. Economically, mangroves are very useful to mankind as they provide tannin, timber, fire-wood, fodder, paper-pulp, medicines etc.

Goa is a land of scenic beauty with pleasant climate. Tourists from India and abroad visit Goa to see its huge churches, beautiful temples, famous beaches, bird and wild life sanctuaries (Chorao & Molem), Dudsagar fall etc. Mangroves of Goa are affected due to climatic factors and biotic interferences caused by local people for firewood and partly by tourists and their paraphernalia. Natural and artificial regeneration of these valuable plants by people and the Government of Goa will protect and develop this economically very important group of plants. The Ministry of Environment and Forests has already taken necessary action by way of developing mangroves in forest nurseries, in natural habitat at Chorao Island, Cumberjua Canal and Banstari areas in Goa.

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and
K. M. RAO

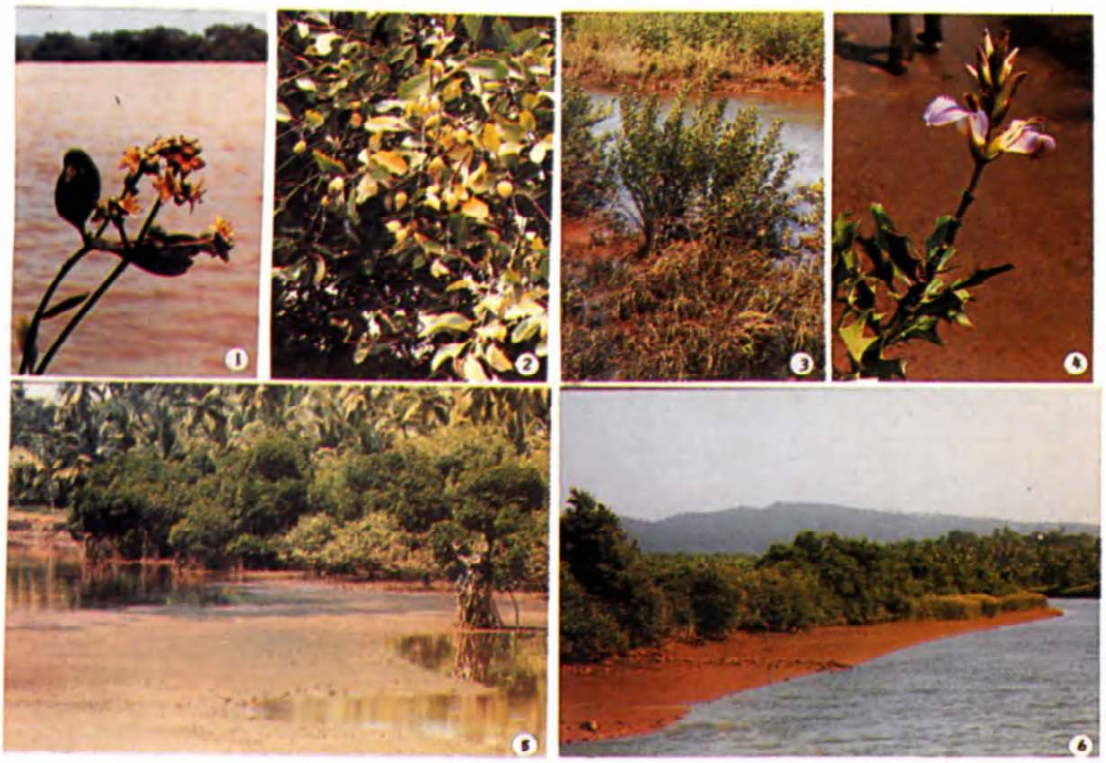


PLATE A (Figs.1-4)

Fig.1-2. : *Avicennia officinalis* L. in flowering and fruiting near Borim bridge (Ponda).

Fig. 3-4. : *Acanthus ilicifolius* L. and its flowering at Kuthali (Salcete). Fig. 5. Mangrove vegetation comprising of *Rhizophora mucronata* Lam. with prop-roots, *Avicennia marina* (Forssk.) Vierh with pneumatophores, with background *Cocos nucifera* L. near 'Durbat' (Ponda). Fig. 6. *Avicennia officinalis* L.; *Excoecaria agallocha* L.; *Sonneratia caseolaris* Engl., undergrowth of *Cyperus* sp. in foreground and *Cocos nucifera* L. in background; at Cumberjua canal linking Zuari & Mandovi river

PLATE B (Figs. 1 - 9)

Figs. 1-3 : *Bruguiera gymnorrhiza* (L.) Lam. in fruiting and flowering and with 'knee root' system at Maxem (Canacona). Figs. 4-5 : *Sonneratia caseolaris* Engl. in fruiting and flowering at Dobali, Ponda. Figs. 6-7 : *Aegiceras corniculatum* Blanco in fruiting and flowering at Chorao island, Panaji. Figs. 8-9 : *Kandelia candel* (L.) Druce in fruiting and flowering at Amona (Bicholim).

PLATE C

Rhizophora mucronata Lam. (from Tiracol river bank near Kiranpani, Pernem)

Fig. 1. : Prop-roots, hanging hypocotyls and naturally germinated seedlings in water.

Fig. 2. : Flowering twig. Fig. 3. : Fruiting branch showing viviparous germination of fruits.

Fig. 4.: Detached fruits with hypocotyls and seedlings.

PLATE D (Figs. 1 - 9).

Fig. 1. : *Rhizophora apiculata* Bl. in flowering and fruiting. Fig. 2. : *Rhizophora apiculata* Bl. associated with epiphytic fern - *Drynaria quercifolia* (L.) J. Smith at Zuari river bank, Maxem (Canacona). Figs. 3-4. : *Caesalpinea crista* L. in flowering and fruiting at Gomti river bank, Amona (Bicholim).

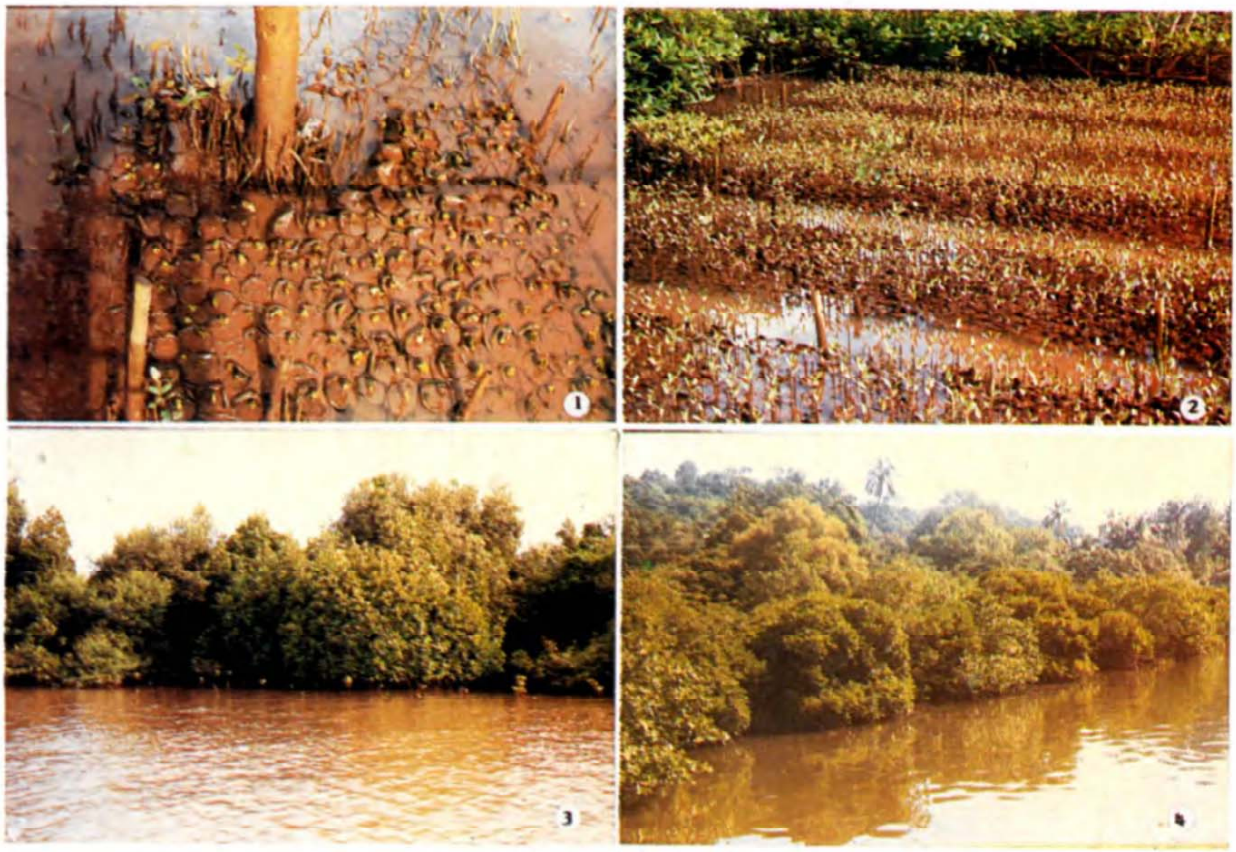


PLATE E (Figs. 1 - 4)

Figs. 1 - 2. : Artificial regeneration of *Avicennia officinalis* L. at Forest Nursery, Chorao island. Figs. 3-4. : *Avicennia officinalis* L. and *Rhizophora mucronata* Lam. with seedlings at Chorao island, Mandovi river, Panaji.

PLATE F (Figs. 1 - 5)

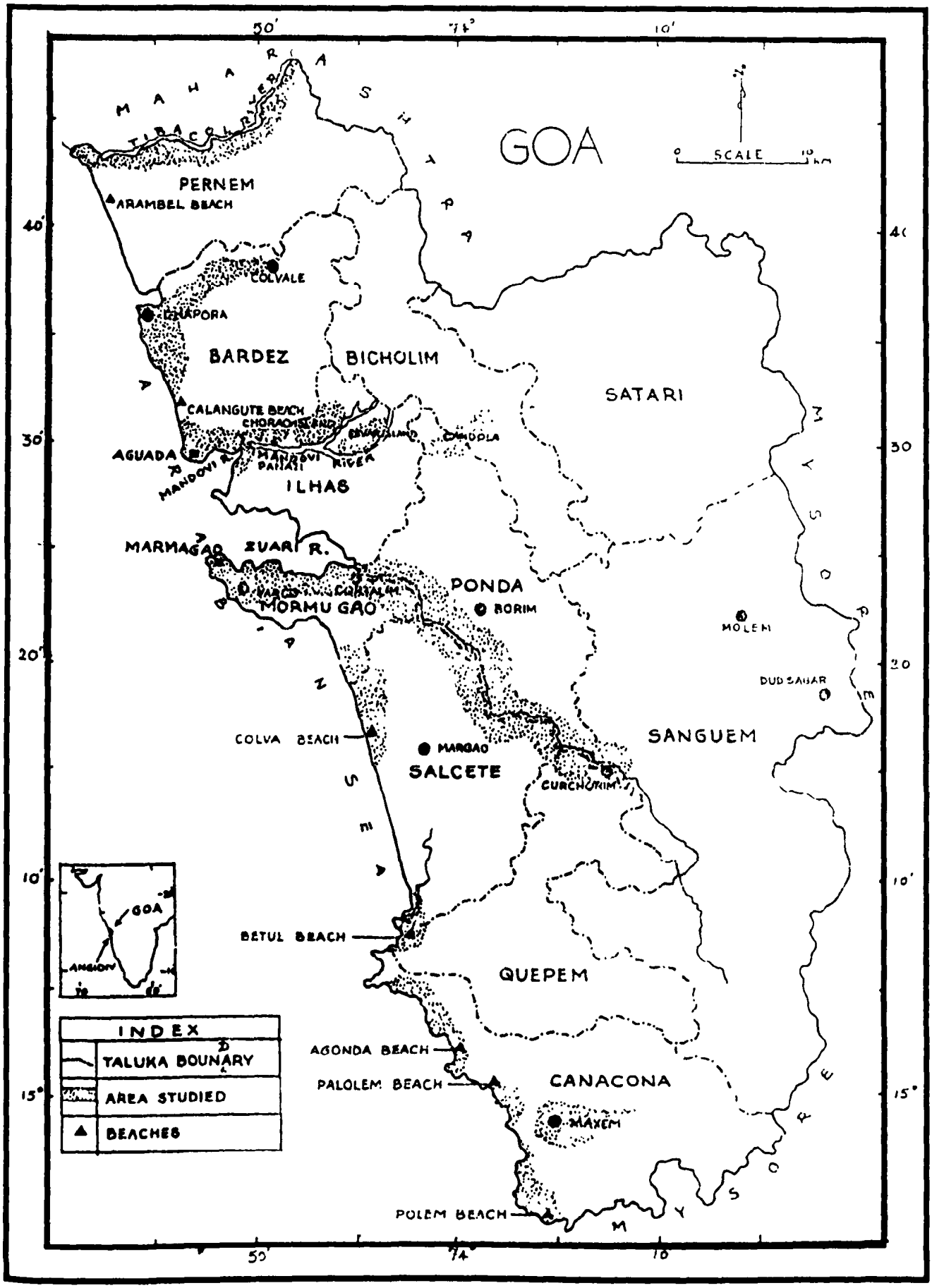
Fig. 1. : A community of a littoral fern *Acrostichum aureum* L. near Machakhajan, Curchorim (Quepem). Fig. 2. : *Rhizophora mucronata* Lam. showing its prop-roots and epiphytic fern *Drynaria quercifolia* near Zuari river (Ponda). Fig. 3-4 : *Dolichandrone spathacea* (L.f.) K Schum and a fruiting branch at Zuari river, Dobali (Ponda). Fig. 5. : A community of *Fimbristylis dichotoma* (L.) Vahl along the swampy area of Zuari river, Gazibag-Sadolsa (Canacona).

PLATE G (Figs. 1 - 6)

Fig. 1.: *Hyphaene dichotoma* (White) Furtado at Miramar beach, Panaji. Fig. 2.: A general view of Beach-Forest with *Ipomoea pes-caprae* (L.) Sweet, *Vitex trifolia* L., *Wedelia urticaefolia* DC. etc. at Colva beach (Salcete). Fig. 3.: Flowering in *Vitex trifolia* L. at Colva beach. Fig. 4.: Flowering and fruiting in *Derris trifoliata* Lour. at Calangute beach (Bardez). Fig. 5.: *Pandanus tectorius* Soland ex Parkinson with background *Thespesia populnea* (L.) Soland. ex Correa. at Arambel beach (Pernem). Fig. 6.: *Cocos nucifera* L., *Anacardium occidentale* L., *Clerodendrum inerme* (L.) Gaertn., *Lantana camera* L. var. *aculeata* (L.) Moldenke etc. at Hansa beach, Vasco (Marmugoa).

PLATE H (Figs. 1 - 4).

Flowering and/or fruiting in Fig. 1. : *Holostemma annulare* (Roxb.) Schum. at Zuari nagar island (Salcete). Fig. 2. : *Crotalaria verrucosa* L. at Sancole area, Zuari river bank (Marmugoa). Fig. 3. : *Ficus asperrima* Roxb. at Tiracol river bank near Kiranpani (Pernem). Fig. 4. : *Crotalaria pallida* Aiton at Gonsua beach (Salcete). Fig. 5. : *Canavalia virosa* at W. & A. at Dobali (Ponda). Fig. 6. : *Calophyllum inophyllum* L. at Palelum beach (Canacona). Fig.7.: *Cryptolepis buchanani* Roem. & Schult. along with *Cayratia trifoliata* (L.) Domin at Panchwadi. Zuari river bank (Ponda). Fig. 8.: *Chionanthus malabarica* (Wall. ex G. Don) Bedd. at Majorda, near Gonsua beach (Salcete). Fig. 9. : *Strychnos nux-vomica* L. at Tiracol river bank near Kiranpani (Pernem).


GOA
SCALE
MAHARASHTRA
ARABIAN SEA
PERNEM
ARAMBEL BEACH
TIRACOL R.
COLVALE
CHAPORA
BARDEZ
BICHOLIM
SATARI
CALANGUTE BEACH
CHORAO ISLAND
DIVAR ISLAND
CHANDOLA
AGUADA
MANDOVI R.
MANDOVI PANJIM RIVER
ILHAS
MARMAGAO
ZUARI R.
PONDA
BORIM
MORMUGAO
MOLEM
DUDSAGAR
SANGUEM
COLVA BEACH
MARGAO
SALCETE
CURCHOREM
BETUL BEACH
QUEPEM
AGONDA BEACH
PALOLEM BEACH
CANACONA
MAXEM
POLEM BEACH
ARABIAN SEA
GOA
ANGION
INDEX
TALUKA BOUNARY
AREA STUDIED
BEACHES

CONTENTS

I. INTRODUCTION

The term 'Mangrove' is derived from Portuguese and English words; viz. 'Mangue' and 'grove' respectively. A mangrove tree or bush is called 'Mangue' in Portuguese, whereas the community as 'mangal' The mangroves constitute a type of coastal woody vegetation encircled or spread over by tidal rivers and / or sea water in tropical and subtropical regions. There are two types of mangrove formations viz. i) Swampy or true mangroves in which plants are situated below the high tide level and submerged by sea-water twice a day, ii) Tidal or back-mangroves in which plants are submerged only during spring tide and cyclones or experimental tide where members of the family Chenopodiaceae and Aizoaceae dominated. While the former type is frequent the later type rarely occurs in Goa.

A review of literature suggests that a number of articles and books are published by many authors regarding various aspects of the mangroves in India, viz. Blatter (1905), Navalkar (1951), Mathauda (1957), Puri & Jain (1959), Waheed Khan (1959), Qureshi (1959), Shah (1962), Sidhu (1963), Rao & Sastry (1974), Blasco (1975), Blasco et al. (1975a), Yadav et al. (1979), Naskar & Guha Bakshi (1987) and Marine Algae by Srinivasan (1969), etc. Floristic wealth of Goa in general is known from a few publications of Roxburgh (1820), Grahm (1839), Dalzell and Gibson (1861), Nairne (1894), Hooker (1872-97), Dalgado (1898), Vartak (1966) and Rolla Rao (1985). They have mentioned a few mangrove species along with other wild plants.

Over and above the mangrove flora, ecology of the Goa Coast and different estuaries in Goa in particular alongwith their succession, distribution, economic potentialities or utilities were studied by Anthony et al. (1974), Gomes & Mavinkurvi (1982), Jagtap (1885a-b), Jagtap & Untawale (1980), Matondkar et al.(1980a-b). Murti & Das (1972), Oertel (1988), Parulekar et al. (1980, 1984), Untawale et al. (1976, 1980, 1982,

1988), Wagle (1982), Kothari & Rao (1990, 1991a-b, 1994, 1995), Kothari & Singh (1998), Singh & Kothari (1997, 1998, 2000). Jagtap (1985) has also reported 44 marine algal species from mangrove swamps of Goa.

From herbarium data and literature, plant collectors from Goa in general known up to 1960 are Dr. Lush ex Grahm, Dalzell, Blatter, d'Almeida, Talbot, Kanetkar, Woodrow, Cooke and Bhide whose collections are lodged in Blatter Herbarium, Bombay (BLAT) and Herbarium of Botanical Survey of India (BSI), Pune. Thereafter up to 1966, Cherian, Kanodia, Raghavan, Singh (BSI) and Vartak (Herb., Agharkar Research Institute, Pune) have also studied the mangrove flora. A status report on the "Mangroves in India" published by the Ministry of Environment & Forests, New Delhi, in 1987, is reviewed by M. R. Almeida in Journ. Bombay Nat. Hist. Soc. 85 (2) : 406 - 407. 1988 in which the information on the distribution of mangroves in Orissa, A.P., Tamil Nadu, Gujarat, Maharashtra, Goa, Karnataka and Kerala is given. However the information is far from complete.

As no comprehensive account entirely on the mangroves of Goa is available the Botanical Survey of India, Western Circle, Pune, undertook the present project in its action plan of 1989 to supplement the existing information on the mangroves of Goa. Out of 50 true mangrove species in the world recorded by UNESCO and Indian mangroves under 41 genera (Blasco, 1975), the present study deals with about 16 true mangroves and 6 obligate mangroves with their 67 associates under 73 families and 143 genera, and 180 species (including 8 cryptogamic species) (See Table III & IV).

II. MATERIALS AND METHODS

To study the mangroves in the field, plant exploration tours to Goa were undertaken in the months of August and October 1989. Plants collected were processed in customary way in the herbarium, Botanical

Survey of India (BSI), Western Circle, Pune. Leaves of succulent species of the mangroves fall off while drying. Specimens of such species were poisoned on the same day in fresh condition, before drying. Necessary ecological information regarding habit, habitat, colour of the flower, relative abundance, vernacular names etc. were given. In the herbarium, the collected specimens were studied critically and identified with the help of literature, dissecting microscope and earlier collections lodged in the Regional Herbarium, B.S.I., Pune. For the sake of convenience, the text in this book is devided into nine chapters. Besides, a number of colour photographs and line drawings are also provided.

Enumeration of plants is given under two divisions viz. (A) Phanerogams or flowering plants; (B) Cryptogams or non-flowering plants which include Thallophyta (Algae) and Pteridophyta (Ferns). Families are enumerated alphabetically. Under the families, the dichotomous key to genera and species is given based on macroscopic characters. For each species correct name with its original citation (Bennet, 1987), basionym if any and synonyms are given only for valid names accepted in 'Flora of British India' and the 'Flora of the Presidency of Bombay' Vernacular names as locally used in 'Konkani' or 'Marathi' language are given in between single inverted commas at the end of citation e.g., 'Impli' (Konk.). Short description of the plants for easy identification and ready reference is also given followed by flowering and fruiting periods. To locate the mangroves and its associates easily, locality in Goa is given taluka wise. This is followed by critical 'notes' regarding its abundance, ecological habitat, associations, distribution and important uses if any.

A few abbreviations, acronyms etc. are also used in the present work, e.g., m : metre; cm : centimetre; Fls. : Flowerings; Frts. : Fruitings; nom. cons. : nomina conservanda; Var. : Variety; Mar. : Marathi; Konk. : Konkani; BLAT : Blatter Herbarium, Bombay; BSI : Regional Herbarium of Botanical Survey of India, Pune.

III. TOPOGRAPHY AND PHYSIOGNOMY

a) Topography : Goa, Gomantak or Goapuri is situated between 14° 53' - 15° 47' N. latitude and 73°.40' - 74° 20' E. longitude covering an area of about 4000 sq. km. with 131 km long coast line which is more or less dentate with creeks, nlets, river deltas and islands. The maximum length from south to north is 105 km and breadth 60 km. The area is comprised of 11 talukas viz. (1) Pernem, (2) Bicholim, (3) Satari, (4) Bardez, (5) Tiswadi (Ilhas), (6) Salcete, (7) Marmugao, (8) Ponda, (9) Sanguem, (10) Quepem, (11) Canacona (with Angidiv) (See Map I).

b) Rivers and Islands : The main rivers that flow and bound the tract are the Mandovi (61.6 km long) and the Zuari (62. 4 km long)- which form wide 'alluvial deltas' before discharging into Agoada Bay and Marmugao Bay respectively. They are navigable through ferry system by which vehicles can be carried across throughout the year. The other small rivers are Tiracol (24 km), Chapora (29 km), Sinquerim (6 km) and Baga. There are a number of tributaries, sub-tributaries and canals of these rivers which together form a drainage system.

The river 'Mandovi' has one of the sources at Bhimgad and enters into Union Territory at Surla as it flows down, it assumes the names of villages viz. Surla, Satrem, Codal and Nancrem till it meets other tributary 'Madei' near Ustem where it changes its course in the east-west direction. The 'Madei' is met by another tributary at ' Sonarbag' called the river 'Khanepar' which enters in Goa near the famous 'Dudsagar Falls' (Sanguem taluka) and flows through the major portion of the Sanctum Sanctorum of the 'Molem Wild Life Sanctuary' The river 'Madei' has brackish water from 'Sonarbag' onwards. It bifurcates into river 'Goa' and river 'Naroa' and helps to form the islands of 'Divar' and afterwards rejoins to form the river Mandovi and also the river Naroa and Mapusa along with the Mayem channel which forms 'the islands of Chorao' The river Mandovi is connected to the river Zuari by the

Cumbarjua canal. The river 'Zuari' flows for the major portion of South Goa and forms the north Goa boundary at 'Panchwadi' 'Shiroda' 'Borim' and northern division from 'Durbat' up to the mouth of the river. The major estuarine and corresponding mangrove areas in the Goa region are shown in Table as below.

Table I: Mangrove Area of the Estuaries and Other Patches in Goa, India (Arabian Sea) (Source : Untawale, A. G., S. Wafar and T. G. Jagtap, 1986).

Estuaries/connecting canals and Patches	Estuarine Areas	Mangrove Areas	Percentage
1. Terekhol Estuary	349	30	8.6
2. Chapora Estuary	711	100	14.0
3. Mandovi Estuary	5564	700	12.6
4. Zuari Estuary	5790	900	15.5
5. Cumbarjua Canal (Connect Mandovi and Zuari Estuaries)	375	200	53.3
6. Sal / Estuary	302	30	9.9
7. Talpona Estuary	40	20	50.0
8. Galgibag Estuary	26	20	76.9
Total on Goa Territory	**13157**	**2000**	**15.2**

The riverine area in Goa is about 13000 ha. The extent of Khazan land i.e. the land inundated by back water is around 18,500 ha. Out of this, 14;500 ha are utilized for paddy cultivation and the remaining 4000 ha are fallow. Mangroves are found on these intertidal lands and the total area covered by them is c 2000 ha as informed

by the forest department.

c) Geology and Soil Geologically, Goa region can be divided into three physiographic units (I) Hills and valleys along the ghat zone with old crystalline rocks of granite - gneiss mainly of biotic type belonging to Archean age traversed by Schists and Quartzites., (ii) Narrow coast line with sandy soils and alluvium along river banks; (iii) Undulating plateau or mainland between the hills and the coast with residual laterite of the detrital type. Goa's location along the transition zone between the Deccan trap and Archean rocks is interesting. Escarpments of the Ghats in Goa mostly consist of Dharwarian Quartzites and granitegneiss which form a part of the extensive southern Archean system, presenting the rugged view of hills quite distinct from the terraced formation of Trappean hills of Maharashtra.

There are three types of the soil in Goa - (1) 'Laterites' formed by natural metamorphosis and degeneration or underlying rocks; (2) 'Red gravelly soils' covering the undulating plateau mixed with medium black soils, adjoining river banks and (3) 'Alluvial soil' including coastal alluvium (includes sand, silt and clay) along the coastal belt and low lying situations. The different phytozonation in the coastal regions is influenced by salinity gradients and indented with seacliffs and notches (Ahmed, 1972).

(d) Climate : The climate of Goa is tropical and generally healthy with three main seasons. The monsoon or rainy season extends from the first week of June to middle of October. Winter starts from the end of November to the middle of January and the summer from February to June.

(i) Rainfall : The south-west monsoon winds bring heavy rains, rising from 90 mm to 900 mm from May to June. The average rainfall for the Goa region from June to October is 2,500 mm. In

coastal belt it ranges from 2,600 mm to 5,000 mm (Canacona taluka).

(ii) Temperature : The temperature rises slowly from March and May month is the hottest period with 35° -37° C. During monsoon, the day temperatures are lower than those during winter. The night temperatures are low in January ranging 15° - 16° C. The coastal areas are quite pleasant during hot months with sea breezes blowing throughout the day.

(iii) Humidity : Being close to the Arabian Sea, the Goa region is quite humid. The percentage humidity is varying from 70° 90° along the coast and from 80° - 95° along the Ghat zone.

(iv) Winds and weather : Very strong winds are experienced during pre and post-monsoon months, particularly near coastal regions, reaching gale force with heavy rains in association with cyclonic storms developing in the Arabian sea. Wind flow varies between 9.5 and 23 km/hour and average wind flow is 13.6 km/ hour (Untawale et al., 1988). The tidal amplitude in the estuaries of Goa is 1.90 m MSL during MHWS, 1.80 m MSL during MLWS, 1.00 m MSL during MHWN and 0.50 m MSL during MLWN (Untawale, *et al.*, 1988).

IV. VEGETATION TYPES

Mangroves of Goa are located mainly in certain estuarine areas like swampy banks of rivers Gomti (e.g. Amona), Chapora (e.g. Chapora, Colvale), Mandovi (e.g. Panaji, Chorao & Divar islands), Zuari (e.g. Agapur, Banastari, Borim, Curtorim, Maxem, Panchwadi etc.), Cumbarjua canal linking Zuari & Mandovi river, and Tiracol (e.g. Kiranpani on way to Keri beach in pernem). Usually, tidal mangroves are absent along sandy and rocky sea-coast. Occasionally, they occur in muddy creeks near sea-coast (e.g. Agonda, Betul, Palelum).

Untawale (1982) has grouped this entire saline zone of Goa under 5 saline regimes

(i) Euryhaline zone : rocky sandy (salinity 20 - 40 percent with patchy mangroves).

(ii) Polyhaline zone : sandy clay (salinity 18 - 30 percent with the major mangroves i.e. *Rhizophora mucronata*, *Sonneratia alba*, *Avicennia marina*, *Bruguiera parviflora*, *B. gymnorrhiza*, *Ceriops tagal* and *Lumnitzera racemosa*.

(iii) Mesohaline zone : Silty clay (5-18 percent with *Rhizophora apiculata*, *Avicennia officinalis*, *Kandelia candel*, *Sonneratia alba* and *Aegiceras corniculatum*).

(iv) Oligohaline zone : Silty (salinity 0.5 500 percent with *Sonneratia caseolaris*, *Acrostichum aureum*, but other mangroves are absent).

(v) Limnatic zone : mud (salinity less than 0.5 percent without any mangrove flora).

However, according to Champian and Seth (1968) followed by present authors, the mangroves of Goa can be placed under moist tropical forests, Group-4, i.e., Littoral and Swamp forests which can be broadly classified into two types as follows :

I. Littoral forests on the coast and resembling Strand vegetation (Rolla Rao & Sastry, 1974; Rolla Rao, 1985).

II. Tidal Swamp forests on estuarine mud, resembling Estuarine vegetation (Rolla Rao & Sastry, 1974; Rolla Rao 1985). This is further sub-divided into

(a) Mangrove scrub, (b) Mangrove forests.

I. Littoral forests : This type of vegetation occurs near coastal region of Goa which is rocky (e.g. Polem beach) and sandy. Vegetation studied along the sea-coasts at Agonda, Arambel (Harmal), Betul, Calangute, Cola, Gonsua, Hansa (Vasco), Miramar, Palelum and Polem, includes wild trees like *Calophyllum inophyllum*, *Hydnocarpus laurifolia*, *Hyphaene dichotoma*, *Pandanus tectorius*, *Pongamia pinnata*, *Thespesia populnea* and cultivated ones like *Anacardium occidentale*, *Casuarina equisetifolia*, *Cocos nucifera*, *Terminalia cattapa* etc.

Other associated plants collected/observed are :

Boerhavia diffusa, *B. verticillata*, *Borreria articularis*, *Celosia argentea*, *Clerodendrum inerme*, *Cynoctonum mitreola*, *Cyanotis cristata*, *Datura metal*, *Eriocaulon cinereum*, *Glinus lotoides*, *Hyptis suaveolens*, *Leucas lavandulaefolia*, *Ludwigia hyssopifolia*, *Flagellaria indica*, *Lantana camera var. aculeata*, *Phyla nodiflora*, *Rauvolfia tetraphylla*, *Scaveola taccada*, *Sesuvium portulacastrum*, *Spheranthus africanus*, *Stachytarpheta jamaicensis*, *Strichnos nux-vomica*, *Ziziphus mauritiana* etc.

Soil binding plants like *Ipomoea pes-capre*, *Launea fallax*, *Spinifex littoreus*, *Vitex negundo* etc., are found abundantly on sandy beaches.

Root system viz. pneumatophores, prop or stilt roots, knee roots etc. in the members of Avicenniaceae, Rhizophoraceae and Sonneratiaceae is covered by certain algae which have much value as fish food in the mangrove forests. Therefore, some lithophytic marine algae like *Chaetomorpha media*, *Rhodymenia palmata*, *Sargassum wightii*, *Ulva fasciata* etc. on rocky substrata were also collected and studied.

II. Tidal swamp forests : This type of vegetation with typical root

system viz. pneumatophores (*Avicennia* spp., *Sonneratia* spp.), stilt roots (*Rhizophora* spp.) and knee roots (*Bruguiera* spp.), binding mud particles, occur along the swampy river banks, edges of muddy creeks, islands like Chorao and Cumbarjua canal includes

(a) Mangrove scrub : Here the vegetation is dense with low (3 6 m high) average height, leaves thick, leathery. This type occurs in isolated small areas along the banks of Mandovi, Chapora - (Colvale area), Zuari (e.g. Vasco road and Sancole area near Margao and other salt water streams (Rangel, 1980). Floristic composition includes *Avicennia marina*, *A. officinalis*, *Excoecaria agallocha*, *Aegialitis rotundifolia* etc. Undergrowth or other associated plants found are *Acanthus ilicifolius*, *Bridelia scandens*, *Cassia tora*, *Caesalpinia crista*, *Clerodendrum inerme*, *Cyperus arenarius* etc.

(b) Mangrove forests : Here the vegetation is dense or scattered with tall or moderate sized trees (6 - 12 m high), leaves thick, leathery, fruits with vipipary, e.g. members of Rhizophoraceae. This type occurs on sheltered areas of islands, river banks of Mandovi, Zuari, Chapora, Tiracol and Cumbarjua canal. Vegetation includes *Avicennia officinalis*, *Excoecaria agallocha*, *Kandelia candel*, *Rhizophora apiculata*, *R. mucronata* and *Sonneratia caseolaris* which are common and abundant. While *Aegiceras corniculatum*, *Bruguiera cylindrica and B. gymnorrhiza* are scattered and infrequent.

Lumnitzera racemosa (Dalgado, 1898), *Heritiera littoralis* (Cooke, 1901) and *Cerbera manghas* collected by Cherian in 1965 (see Rolla Rao, 1985) could not be located.

Undergrowth or associated species collected are *Acanthus ilicifolius*, *Acanthospermum hispidium*, *Acrostichum aureum (Littoral fern)*, *Adiantum philippense*, *Aeschenomene indica*, *Aristolochia indica*, *Caesalpinia crista*, *Cayratia trifoliata*, *Clerodendrum inerme*, *C. viscosum*, *Crotalaria pallida*, *C. verrucosa*, *Cryptolepsis*

buchanani, *Cyperus malaccansis*, *Dioscorea bulbifera*, *Dolichandrone spathacea*, *Echinochloa frumentacea*, *Fimbristylis dichotoma*, *F. ovata*, *Indigofera tinctoria*, *Lygodium flexuosum*, *Mucuna prurita*, *Porteresia coarctata*, *Sesbania sesban*, *Urena lobata*, *Vigna radiata*, epiphytic ferns like *Drynaria quercifolia* and orchids like *Vanda tessellata* on RHIZOPHORA species.

V. FACTORS AFFECTING THE MANGROVE VEGETATION

International Union for Conservation of Nature and Natural Resources (IUCN) has reported 1,02,631 sq.km. area of mangrove swamps in Indo-West Pacific region in which India has 6,820 sq.km. Of this, about 1.5 m/ha of the forest is lost annually in India, 0.57 m/ha of the mangrove forest face the same problem due to demand of land and fuel (Naskar & Guha Bakshi, 1987). Mangroves of Goa are affected mainly by biotic and abiotic factors.

Biotic interference by human being has resulted deforestation of natural forest. Since Goa is on the world tourism map, people from all sides visit Goa and its beaches. So the mangroves along coastal areas have been affected by tourists and their activities. There is also illicit cutting of mangroves for fuel purpose (e.g. Gazibag Sadulsa area in Canacona taluka). This results in degeneration and depletion of many mangrove species. Grazing of leaves by cattle like buffalos also affects the growth and development of mangroves. This was observed in islands of river Chapora.

Similarly, mining of Iron ore for exports and dumping of waste by Minerals and Metals Trading Corporation is also affecting riverine system and growth of mangroves of Goa (Madan Mohan, 1991).

The mangroves along the coastal zones of Goa and the estuarine mouths are relatively poor and degraded due to anthropogenic factors. During 1993–1994, the construction of the Konkan railway bridge on

the Zuari river at Agassi-Cortalim has destroyed several hectares of mangrove habitats; prior to construction of this railway bridge several mangrove species like, *Avicennia marina*, *A.officinalis*, *Rhizophora mucronata*, *Excoecaria agallocha*, *Acanthus ilicifolius*, *Derris trifoliata* were present in these Agassi-Kortalin regions of Zuari estuary (Naskar & Mandal, 1999).

Recently Kumar (2000a) has also reported that because of biotic effects, certain mangrove species in Goa viz. *Ceriops tagal*, *Bruguiera cylindrica*, *Avicennia alba* etc. are threatened and on verge of extinction. If timely action is not taken to multiply these species, they may vanish from Goa. Therefore, there is a need to prepare a comprehensive management plan for conservation and development of mangrove ecosystem.

Similarly, due to construction of Konkan Railway bridge on the Zuari estuary at Agassi-Cortalim in 1993-94, degradation of mangroves in an area of c.4 ha was noticed by Kumar during 1992-97. However, after completion of the construction, renewal of forest crops has also been noticed in 1999 and now there is profuse growth of mangroves around the bridge (Kumar, 2000b).

Abiotically, high velocity of wind or cyclone brings high tide in sea and river water which uproots mangroves, cause erosion of coastal and agricultural land, which in turn causes enormous damage to life and property of mankind. It was observed during a recent visit to Goa that an agricultural land with rice crop was completely converted into Mangrove forest due to entry of sea-water at Agapur area in Ponda taluka.

VI. NATURAL AND ARTIFICIAL REGENERATION

Nature has created a characteristic germination type among

mangroves, i.e., 'Vivipary' where the radicles protrude while the fruit is on the tree. In other words, 'zygotes develop without any interruption through embryo and are able to produce seedlings without any resting stage' This vivipary is found in the members of Rhizophoraceae viz., *Aegiceras corniculatum* and *Avicennia species*.

In natural germination in the members of Rhizophoraceae, as soon as protruded fruits with radicle fall to the muddy soils, their hypocotyl develops roots quickly and complete plant is formed. Van Steenis (1962) studied the nature of seedling development of *Aegiceras corniculatum* and Macnae (1968) reported similar growth pattern in AVICENNIA spp. in which fallen seeds first absorb water and then split the testa enabling seedlings to come out of the pericarp.

The status of natural regeneration in mangroves along different estuaries in Goa is also studied by Kumar (2000b) and noted that *Rhizophora mucronata* and *Avicennia officinalis* were dominant and showed good natural regeneration along all the estuaries (See table II).

Though Dagar & Singh (1999) mention occurrence of *Sonneratia apetala* and *Xylocarpus granatum* from Goa, we could not collect these species from Goa. Kumar (2000b) has also mentioned the occurrence of above species in Goa as doubtful.

Artificially, a number of experiments were carried out for regeneration of mangroves away from their natural habitat (Banerjee, 1959; Basu, 1965). As the mangroves require typical environmental condition i.e., muddy habitat and tidal waves of sea water for their growth and development, they hardly survive in other habitat. Therefore, the forest department of Goa has developed nurseries of mangroves in situ i.e. in natural habitat at Chorao islands (Panaji), Cumbarjua canal (near Govandali) and Banastari area (Ponda taluka) where the seedlings kept in polythene bags in river get swampy habitat and hence develop into mature plants.

TABLE - II : COMPARATIVE STATEMENT OF NATURAL REGENERATION OF MANGROVES ALONG DIFFERENT ESTUARIES IN GOA

S.N	SPECIES	NAME OF ESTUARIES							
		TEREKHOL	CHAPORA	MANDOVI	ZUARI	CUMBARJUA CANAL	SAL	TALPONA	GALGIBAG
1	2	3	4	5	6	7	8	9	10
1	*Rhizophora mucronata*	G	P	G	G	G	G	M	G
2	*Rhizophora apiculata*			M		P			G
3	*Avicennia officinalis*	G	G	G	G	G	G	G	G
4	*Avicennia marina*	P	P	P	G	M		M	M
5	*Avicennia alba*	-		P			G		
6	*Sonneratia alba*	G	G	G	G	P	P	G	G
7	*Sonneratia caseolaris*	P	G	G	G	P	P		
8	*Bruguiera gymnorrhiza*			P	G	P	P	G	P
9	*Bruguiera cylindrica*			P	P	G			

Contd.

1	2	3	4	5	6	7	8	9	10
10	*Kandelia candelia*	P	G	G	G	P			
11	*Excoecaria agallocha*	M	G	M	M	G	M	G	G
12	*Ceriops tagal*	G	-						
13	*Aegiceras corniculatum*	P	-	P	P		M	G	
14	*Acanthus ilicifolius*	M	G	G	G	G	G	G	G
15	*Derris heterophylla*	P	G	M	G	G	G	M	M
16	*Acrostichum aureum*	G	M	G	G	M	G	M	P

Index: G = Good, M = Moderate, P = Poor natural regeneration,
Species not significant along the estuary from occurrence point if view (Source : Kumar, 2000b)

VII. UTILIZATION OF MANGROVES AND CONSERVATION

Mangroves of Goa are useful directly as well as indirectly.

i) Directly, the mangroves are economically important for mankind as they supply natural products like :

a) 'Timber' for building construction, telegraph poles, furniture, railway sleepers etc. from wood of AVICENNIA spp , BRUGUIERA spp., THESPESIA spp.etc.

b) 'Fuel and charcoal' from the wood of AVICENNIA spp., *Excoecaria agallocha*, *Kandelia candel*, *Sonneratia caseolaris* etc.

c) 'Tannin' for fish-nets and leather industries from the bark of AVICENNIA spp., BRUGUIERA spp., *Kandelia candel*, SONNERATIA spp. etc.

d) Fodder for cattle from the leaves and fruits of AVICENNIA spp. These plants save cattle from starvation in times of scarcity (Kulkarni, 1957).

e) 'Fruits and young shoots' of *Rhizophora mucronata* are cooked and eaten. Ripe fruits of *Sonneratia caseolaris* are acidic, eaten in curries while unripe fruits made into jellies. In times of scarcity, young leaves of *Acrostichum aureum* and *Lumnitzera racemosa* also are cooked and eaten.

f) 'Honey and wax' from bee hives which develop on trunks of *Aegiceras corniculatum*, *Avicennia officinalis*, EXCOECARIA sp. etc.

g) 'Paper-pulp' from AVICENNIA spp., BRUGUEIRA spp., EXCOECARIA sp., RHIZOPHORA spp.

h) 'Adhesives' from the bark of *Bruguiera gymnorrhiza*

(Mathauda, 1957).

i) 'Protein' extracted from marine algae like *Ulva fasciata*, used as a source of food.

j) Medicinal plants like *Acanthus ilicifolius* used for Asthama and rheumatism. Bark of *Brugueira gymnorrhiza* used in 'diarrhoea' while *Rhizophora mucronata* bark in 'angina' *Lumnitzera racemosa* used for herpes and itches. Roots of *Caesalpinia crista* used in treatment of 'stones'

ii) Indirectly, the mangroves play an important role in (a) Protection against wind; (b) Shelter to fishes, birds etc. and (c) Conservation of soil.

a) **Protection against wind** : Mangroves act as a wind breaker, guard or buffer to reduce the severity of the gales, cyclones (Rolla Rao, 1957). This helps to stabilize soil bunds for restoring ecological balance.

b) **Shelter to fishes, birds etc.** : Certain fishes, frogs, crabs, prawns, lobsters, reptiles (snakes etc.) get shade provided by dense foliage and shelter by profusely branched roots of mangroves. A number of birds [c 157 in Goa, Rangel,1980] also get shelter, food in the form of edible fruits, insects, fishes etc. surviving on mangrove trees. Therefore, the Government of Goa has established a Bird Sanctuary at Chorao, Panaji where mangroves are abundant.

c) **Conservation of soil** : Extensive coverage of mangroves with its network of pneumatophores; (AVICENNIA spp., SONNERATIA spp.), prop-roots (RHIZOPHORA spp., *Acanthus ilicifolius*); Knee-roots (BRUGUIERA spp.); butress roots (*Kandelia candel*) bind

soil and mud particles, promote deposition of alluvium and provide protection against soil erosion.

Conservation To protect the above valuable plant wealth and fragile ecosystem of mangroves from all biotic and abiotic factors. necessary measures for conservation are essential. For *in situ* conservation the Govt. of India has declared c 13 Biosphere Reserves, c 147 National Parks and c 633 Sanctuaries to conserve thr biodiversity of India. In Goa alone there are 4 sanctuaries viz. Bhagwan Mahavir (Molem) Wild life Sanctuary (240 sq.km) Bonda Wild life Sanctuary (8 sq.km), Dr. Salim Ali Wild life Sanctuary (Chorao Island, 2.78 sq.km) and Kotigao Wild life Sanctuary (105 sq.km) besides one National Park viz. Bhagwan Mahavir N.P. (Molem, 107 sq.km) (cf. Singh & Kothari, 1997, 2000). To conserve mangroves in particular, the Dept. of Science & Technology, constituted a panel of experts and published State of the Art Report on Mangrove Ecosystems in 1979. Later the same is revised by Ministry of Env. & Forests, New Delhi in Dec. 1987 & published 'Conservation of Mangroves' in India in June 1989 with extensive information. At present 10 Mangrove Steering Committees in different States & Union Territories are functioning. Nearly 15 Mangrove areas have been selected and a National Committee is reconstituted in Dec. 1988 with the Secretary of Min. Env. & Forests as its Chairman to advise the Govt. to take appropriate measures for conservation and management of mangroves (Banerjee et al. 1989; Kothari & Singh, 1998).

To classify and identify the mangroves of India, Botanical Survey of India has published a book also (ef. Banerjee et. al. 1989).The Min. of Env. & Forests have also initiated mapping of Mangrove Wealth of India, with the help of experts. To create mass awareness, the Goa branch of World Wide Fund for Nature (WWF) has also designed Environmental Education Centre at Chorao Bird Sanctuary to encourage nature club activities among school children & nature enthusiasts on a plot donated by the Govt. of Goa Under

social forestry programme, *c* 400,000 saplings of mangroves have also been introduced in the periphery of mangrove patch in Chorao island to enrich mangrove wealth of Goa. Similarly for regeneration and multiplication of mangroves, nurseries are also developed at Chorao island, Cumberjua canal and Banastari areas of Goa by forest dept. in 1985. The Govt. of Goa has also declared mangroves as protected species and their felling is completed banned (Report by Con. of Forests, Govt. Goa, 1989). The Govt. of India has also classified mangroves in the Coastal Regulation Zone (CRZ)-I category. According to this declaration any kind of development or conversion of mangrove swamps is not allowed. About 178 ha of mangrove area of Chodan (Chorao) in Mandovi has been declared as Salim Ali Bird Sanctuary to Protect the flora and fauna. Sundarbans in W. Bengal, Pichhavaram in Tamil Nadu, Andaman & Nicobar Islands etc. are other examples of Marine National Parks for *in situ* conservation of mangroves. Several publications of Ministry of Environment & Forests (Anonymous, 1987, 1989), Botanical Survey of India (Banerjee et al. 1989; Kothari & Singh, 1998; Singh & Kothari, 1999, 2000), Mangrove swamps of Sunderbans (Naskar & Guha Bakshi, 1987), Mangroves of Andaman & Nicobar Islands (Dagar et al. 1991), Ecology & Biodiversity of Indian Mangroves (Naskar & Mandal, 1999) etc. highlight the action taken by the Government of India and scientific works carried out on the mangroves in India.

VIII. STATISTICAL ANALYSIS ON THE MANGROVE FLORA AND CONCLUSION

Studies on the Mangrove Flora of Goa is represented in two divisions viz. Phanerogams (Flowering plants) and Cryptogams (Non-Flowering plants). Phanerogams include only Angiosperms, as no Gymnospermic plant is observed in coastal area of Goa. In Angiosperms, 66 families include 136 genera and 172 species. Among 66 angiospermic families, class Dicotyledons includes 142 species spread over 116 genera among 54 families. Class Monocotyledons

representing 12 families viz., Araceae, Arecaceae, Casuarinaceae, Commelinaceae, Cyperaceae, Dioscoreaceae, Eriocaulaceae, Flagellariaceae, Orchidaceae, Pandanaceae, Poaceae and Taccaceae, includes 30 species in 20 genera. Over and above, the study includes 7 cryptogamic families representing 8 species in 7 genera with 1 obligate, 3 mangrove associates, 4 indigenous, 4 weeds and 1 medicinal plant. (See Table III & IV).

Table IV shows statistical analysis of mangroves and their associates with important uses. It represents 66 families of angiosperms with 136 genera and 172 species. This includes 16 true mangroves, 6 obligate mangroves and 68 mangrove associates in 116 indigenous and 53 weeds or exotic plants. Based on their important uses, the statistical survey also shows 25 timber plants, 28 tannin plants, 37 fodder plants, 65 medicinal plants, 28 soil binder plants and 13 fibre yielding plants - useful in cottage industries. Most of the woody plants used as firewood, hence their statistical data is not given. Details of these uses are mentioned under 'notes' in the chapter on Enumeration of Plants.

Based on recent literature (Untawale, 1982; Naskar & Mandal, 1999), c 22 mangrove species from Goa are known. Among them c 16 species are true/major mangroves viz. *Avicennia alba*, *A. marina var. acuminata*, *A. marina var. marina*. *A. officinalis*, *Bruguiera cylindrica*, *B. gymnorrhiza*, *B. parviflora*, *Ceriops decandra*, *C. tagal*, *Kandelia candel*, *Lumnitzera racemosa*, *Rhizophora apiculata*, *R. mucronata*, *Sonneratia alba*, *S. apetala and S. caseolaris* etc. while 6 semi, obligate/minor mangroves (Tansely & Fritsch, 1905; Tomlinson, 1986) species recorded are *Acrostichum aureum* (littoral fern), *Aegialitis rotundifolia*, *Aegiceras corniculatum*, *Excoecaria agallocha*, *Heritiera littoralis* and *Xylocarpus granatum*.

There are a number of species (*c* 67) which are not strictly mangroves but are usually associated with mangroves or grow as

non-mangrove halophytes along the banks of rivers, creeks and in salt marshes some of which are as mentioned here viz. *Acanthus ilicifolius*, *Aeluropus lagopoides*, *Amoora lawii*, *Ardisia littoralis*, *Arthrocnemum indicum*, *Barringtonia acutangula*, *B. racemosa*, *Caesalpinia bonduc*, *C. crista*, *Calophyllum inophyllum*, *Cerbera manghas*, *Clerodendrum inerme*, *Cryptolepis buchnani*, *Cynometra ramiflora*, *Cyperus arenarius*, *C. compactus*, *C. malaccensis*, *C. rotundus*, *Dendrophthoe falcata*, *Derris scandens*, *D. trifoliata*, *Dolichandrone spathacea*, *Drynaria quersifolia* (epiphytic fern), *Echinochloa frumentosa*, *Fimbrisylis dichotoma*, *Flagellaria indica*, *Hibiscus tiliaceous*, *Ipomoea turbinata*, *Myriostachya wightiana*, *Pandanus tectorius*, *Phoenix humilus var. pedunculata* (Littoral palm), *Premna corymbosa*, *Porteresia coarctata*, *Salicornia brachiata Salvadora persica*, *Scaevola taccada*, *Sesuvium portulacastrum*, *Sporobolus virginicus*, *Suaeda maritima*, *Thespesia populnea*, *Viscum orientale* etc.

TABLE-III GENERAL SURVEY OF MANGROVE FLORA OF GOA

DIVISION	CLASS	FAMILIES	GENERA	SPECIES
PHANEROGAMS (Angiosperms)	DICOTS	54	116	142
	MONOCOTS	12	20	30
CRYPTOGAMS	THALLOPHYTA (Algae)	4	4	4
	PTERIDOPHYTA (Ferns)	3	3	4
	TOTAL	**73**	**143**	**180**

TABLE IV - STATISTICAL ANALYSIS OF MANGROVES AND THEIR ASSOCIATES

Sl No.	Families	No. of Genera	No. of species	True Mangroves	Obligate Mangroves	Mangrove Associates	Indigenous plants	Weeds or Exotic Plants	Timber Plants	Tannin Plants	Fodder Plants	Medicinal Plants	Soil Binder	Fibre Yielding
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	ACANTHACEAE	2	2			1	1	1				2	1	
2	AIZOACEAE	1	1			1	1						1	
3	AMARANTHACEAE	3	3					3			1	2	2	
4	ANACARDIACEAE	1	1					1						
5	APOCYNACEAE	3	3			2	2	1				2		
6	ARACEAE	1	1				1					1		
7	ARECACEAE	2	2				1	1	1		2		2	3
8	ARISTOLOCHIACEAE	1	1			1	1					1		
9	ASCLEPIADACEAE	2	2				2				1		1	2
10	ASTERACEAE	8	8			2	4	4			1		2	
11	AVICENNIACEAE	1	1	4			4		3	4	4			
12	BARRINGTONIACEAE	2	2			2	2		1	1				
13	BIGNONIACEAE	1	1	-	-	1	1	-	1	-	1	-	-	-

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
14	BORAGINACEAE	2	2				1	1	1		1	1		
15	CAESALPINIACEAE	2	2			1	2				2	2		
16	CAMPANULACEAE	1	1					1					1	
17	CASUARINACEAE	1	1					1				1	1	
18	CLEOMACEAE	1	1					1				1		
19	CLUSIACEAE	1	1			1	1		1	1				
20	COMBRETACEAE	1	1	1			1		1	1		1		
21	COMMELINACEAE	1	1					1					1	
22	CONVOLVULACEAE	2	5			2	5				1		2	
23	CUCURBITACEAE	3	3			1	2	1				3		
24	CYPERACEAE	2	9			7	9				9		1	1
25	DIOSCOREACEAE	1	1				1					1		
26	DIPTEROCARPACEAE	1	1					1	1					
27	ERIOCAULACEAE	1	2					2						
28	EUPHORBIACEAE	3	4		1	1	4		2	2		2		
29	FABACEAE	12	20			3	13	7		1	5	6	1	
30	FLACOURTIACEAE	1	1				1		1			1		
31	[illegible]	1	1			1	1							

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
32	GOODANIACEAE	1	1			1	1	-				1	1	
33	LAMIACEAE	2	2					2			2	1	1	
34	LENTIBULARIACEAE	1	1			1	1							
35	LOGANIACEAE	2	2				2		1			1		
36	LORANTHACEAE	1	1			1	1			1		1		
37	LYTHRACEAE	3	3		1		2	1	1			1		
38	MALVACEAE	6	7			5	4	3	1	1		1	1	4
39	MELASTOMATACEAE	1	1			1	1							
40	MELIACEAE	1	1		1	1	1		1					
41	MILLINGTONIACEAE	1	1					1	1		-			
42	MIMOSACEAE	3	3			2	2	1	1	2	1	2		
43	MORACEAE	1	1			1	1		1			1		
44	MYRSINACEAE	1	1		1		1			1				
45	MYRTACEAE	1	1				1							
46	OLEACEAE	1	1			1	1		1					
47	ONAGRACEAE	1	1			1		1						
48	ORACHIDACEAE	1	1			1	1					1		
49	PANDANACEAE	1	1			1	1					1	1	

Contd

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
50	**PASSIFLORACEAE**	1	1					1			1			
51	**PEDALIACEAE**	1	1					1		1		1		
52	**PERIPLOCACEAE**	2	2			2	2					1		
53	**PIPERACEAE**	1	1					1				1		
54	**PLUMBAGINACEAE**	1	1		1		1		1	1		-		
55	**POACEAE**	7	9			4	4	5			5		5	
56	**RHAMNACEAE**	1	2			1	2			2		1		
57	**RHIZOPHORACEAE**	4	8	8			5		2	5		5	2	
58	**RUBIACEAE**	5	5			1	2	3		1		3		
59	**SCROPHULARIACEAE**	3	4			2	2	2		1		2		
60	**SOLANACEAE**	3	3				2	1				3		
61	**SONNERATIACEAE**	1	2	3			2			2		1		
62	**STERCULIACEAE**	1	1		1		1		1					
63	**TACCACEAE**	1	1				1					1		
64	**TILIACEAE**	3	4			2	2	2				2		2
65	**VERBENACEAE**	5	7			3	6	1				5	1	1
66	**VITACEAE**	2	2			1	2					1		
	TOTAL :	136	172	16	6	60	116	53	25	28	37	65	28	13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	THALLOPHYTA (*Algae*)													
1	CLADOPHORACEAE	1	1			1		1						
2	ULVACEAE	1	1					1						
	PHAEOPHYTA													
3	SARGASSACEAE	1	1			1		1				1		
	RHODOPHYTA													
4	RHODYMENIACEAE	1	1			1		1						
	PTERIDOPHYTA (*Ferns*)													
5	DRYNARIACEAE	1	1			1	1							
6	PTERIDACEAE	1	2		1	1	2							
7	SCHIZAEACEAE	1	1			1	1							
	TOTAL	7	8		1	7	4	4				1		

IX. ENUMERATION OF PLANTS

DIVISION A - PHANEROGAMS (Flowering Plants)

ACANTHACEAE

Key to genera

1a. Leaves pinnatifid, spiny on margins; flowers purple-blue — ACANTHUS.

1b. Leaves entire, margin without spines except bristle-tipped apex; flowers yellow — BARLERIA

ACANTHUS L.

Acanthus ilicifolius (L.) Sp. Pl. 639. 1753;
'*Marandi*' (Mar.); '*Moramdo*' (Konk.)

Erect, scarcely branched, cylindric shrubs. Leaves oblong or elliptic, acute at the apex. Flowers sessile, opposite, in terminal, crowded or interrupted spikes. Capsules oblong, obtuse, brown.

Fls. & Frts. April - August.

Locality : *Pernem* : Tiracol river bank. Bicholim : Ammona, Gomti river bank. Ilhas : Chorao island and Bird Sanctuary, Panaji, Mandovi river bank. Ponda : Near Borim bridge, Daboli, Panchwadi, Zuari river bank. Salcete Madgaon to Cortalim (Kuthali), Zuari river bank. Canacona : Maxem.

Notes Common along the swampy river banks, in association

with AVICENNIA spp., EXCOECARIA sp. and *Sonneratia caseolaris*. Its leaves and bark useful in nervous disorders and leaf paste in rheumatic pains. A good soil binding plant.

BARLERIA L.

Barleria prionitis L. Sp. Pl. 636. 1753.
'*Pivalikuranti*' (Mar.); '*Koramti*' (Konk.).

Erect or bushy shrubs. Leaves narrowly to broadly elliptic-lanceolate, entire, hairy beneath. Flowers yellow in axillary, spicate clusters and in terminal spikes. Capsules brown, glabrescent, beaked.

Fls. & Frts. : September - October.

Locality : *Canacona* : Maxem.

Notes : Frequent near the creeks and waste places. Leaves are chewed to relieve tooth-ache and dried bark used in cough.

AIZOACEAE

SESUVIUM L.

Sesuvium portulacastrum (L.) Linn. syst. ed. 10 : 1058, 1759.
Portulaca portulacastrum L.

Perennial fleshy herbs, rooting at nodes. Leaves linear, obovate-oblong or spathulate-oblong, glabrous. Flowers bright pink or purple, axillary, solitary. Capsules oblong, apiculate. Seeds many, glabrous, smooth.

Fls. & Frts. : October - December.

Locality : Bardez : Mapuca ferry crossing, Mandovi river.

Notes : This species was found occasionally along the muddy banks on rocky substrata near mangroves. Rao (1985) also records this plant, as rare along Panaji - sea shore on sandy and salty ground. Stem & leaves are cooked and eaten as a vegetable. The plant is also a good soil binder and cattle fodder.

AMARANTHACEAE

Key to genera

1a. Perianth parts scarious;
fruits more than 1-seeded — CELOSIA

1b. Perianth parts not scarious;
fruits usually 1 - seeded :

2a. Flowers white-woolly;
filaments united at base &
forming a hypogynous cup — AERVA

2b. Flowers not as above; filaments free — AMARANTHUS

AERVA Forssk.

Aerva lanata (L.) Juss. in Ann. Mus. Par. 2 131. 1803.
Achyranthes lanata L.

'*Tamdlo*' (Konk.).

Erect or prostrate herbs. Leaves alternate, elliptic or obovate. Flowers greenish-white, in axillary spikes. Utricles black, ovoid.

Fls. & Frts. August - October.

Locality Pernem : Keri beach. Canacona : Palelum beach.

Notes : Frequent as a weed along the sandy sea-coast. A good soil binder.

AMARANTHUS L.

Amaranthus spinosus L. Sp. Pl. 991.1753.
'*Kamte Bhaji*' (Konk.).

Erect or diffuse herbs. Leaves ovate, ovate-oblong or elliptic. Spikes pale-green. Seeds compressed, dark-brown.

Fls. & Frts. : August - November.

Locality : *Pernem* : Keri beach.

Notes : Common along the sea coast as a weed. Its roasted seeds are edible. Roots used medicinally in colic pains, eczema and gonorrhoea

CELOSIA L.

Celosia argentea L. Sp. Pl. 205. 1753. *Celosia cristata* L.
'*Kurdu*' (Konk.).

Annual, erect or branched herbs. Leaves linear or linear-lanceolate. Flowers pinkish, later glistening white in c ose cylindric, terminal spikes. Seeds spherical, compressed.

Fls. & Frts. : October - December.

Locality Ilhas Chorao island and on way to Cumbarjua canal, Mandovi river.

Notes : Frequent along the island as a weed in moist and dry localities near mangroves. Seeds used in blood and eye diseases and mouth sores. The plant is also used as a cattle feed.

ANACARDIACEAE

ANACARDIUM L.

Anacardium occidentale L. Sp. Pl. 533. 1753.

'*Kaju*' (Konk.).

Evergreen small trees. Leaves oblong or elliptic-obovate. Panicles terminal, longer than leaves. Nuts reniform, pale greenish-yellow.

Fls. & Frts. : March - May.

Locality : *Pernem* : Keri beach. Salcete : Madgaon.

Notes An introduced species from Brazil. Widely cultivated for its nuts along the coast and also found naturalized.

APOCYNACEAE

Key to genera

1a. Climbing shrubs — PARSONSIA

1b. Non-climbing shrubs or trees

2a. Leaves alternate — CERBERA

2b Leaves whorled — RAUVOLFIA

CERBERA L.

Cerbera manghas L. Sp. Pl. 208. 1753. *Cerbera odollam* Gaertn.

'*Kharo uro*' (Konk.).

Trees or shrubs. Leaves lanceolate, oblanceolate or oblong-obovate, black when dry. Flowers large, white. Fruits long, subglobose.

Fls. & Frts. : September - January.

Locality : Salcete : Gonsua-Cavollosum.

Notes : Rao (1985) has recorded this mangrove associate based on a collection by Cherian in 1965 from above mentioned locality. During recent visit to Goa, we could not trace out the plant. Bark as purgative and green fruits used as dog and fish poison; wood as a fuel.

PARSONSIA R.Br.

Parsonsia belicandra Hook. & Arn. Bot. Beech. Voy. 197. 1837. *Parsonsia spiralis* Wall. ex G. Don;

'*Nagal kuda*'

Perennial climbing shrubs. Leaves elliptic or oblong-lanceolate. Flowers greenish, in corymbose axillary cymes. Fruits coriaceous, sharply pointed.

Fls. & Frts. : April - May.

Locality : *Ponda* : Panchwadi, Zuari river.

Notes : Frequent along swampy river bank.

RAUVOLFIA L.

Rauvolfia tetraphylla L. Sp. Pl. (ed. 1) 208. 1753. *Rauvolfolia canescens* L.

Small shrubs. Leaves whorled, ovate-oblong. Flowers white, small. drupes red.

Fls. & Frts. : April - august.

Locality : *Canacona* : Agonda sea beach.

Notes : As an escape. Native of West Indies, often cultivated in gardens. Plant is toxic and cause vomiting. Bark useful in skin disease and fruit juice yields black dye.

ARACEAE

AMORPHOPHALLUS Bl.

Amorphophallus commutatus (Schott) Engler in DC. Mon. Phan. 2: 319. 1879 & Pfreich. 48: 95. 1911. *Amorphophallus sylvaticus* Dalz. & Gibs.

'*Shevla*' (Mar.).

Perennial herbs. Leaf solitary, elliptic-lanceolate. Scapes 30 - 60 cm tall. Spathe ovate, lanceolate. Spadix columnar, as long as spathe. Male flowers above, female below. Ripe berries long, deep-orange.

Fls. & Frts. : March -August.

Locality : *Ponda* : Panchwadi. Canacona : Maxem, Zuari river bank.

Notes Infrequent near swampy river banks. Its tubers cooked and eaten. Seeds cure toothache.

ARECACEAE

Key to genera

1a. Stem dichotomously branched — HYPHAENE

1b. Stem not dichotomously branched :

2a. Leaves simply pinnate; leaflets truncate, toothed at apex; inflorescence spadix — CARYOTA

2b. Leaves simply pinnate; leaflets & inflorescence not as above — COCOS

CARYOTA L.

Caryota urens L. Sp. Pl. 1189. 1753.

'*Birlomad*' (Konk.).

Trees. Trunk transversely annulated. Leaves long, in terminal crown. Flowers monoecious, in compound spadix with drooping branches.

Fls. & Frts. : Throughout the year.

Locality : *Pernem* : On way to Keri beach. Canacona : Maxem, Zuari river bank.

Notes : Frequent near sea-coast and river banks. Trees are tapped for toddy. Wood used for agricultural purposes and leaves for ropes and baskets.

Cocos L.

Cocos nucifera L. Sp. Pl. 1188. 1753.

'*Mad*' (Konk.).

Trees, 9 to 20 m, tall with straight or bent trunk. Leaves pinnate, leaflets linear-lanceolate. Drupes fibrous.

Fls. & Frts. : Throughout the year.

Locality : Throughout Goa State.

Notes : 'Cultivated' throughout Goa coastal areas. The oil from the nuts is used for burning, cooking and preparation of soaps. Fibrous pericarp yields coir used for making ropes and mats.

Hyphaene Gaertn.

Hyphaene dichotoma (White) Furtado in Gard. Bull. Singapore 25: 301. 1970. *Borassus dichotomus* White; *Hyphaene indica* Becc.

'*Sindhi*' (Mar.).

Trees, 8 - 10 m. Leaves multifid, flabellate, fan-shaped. Flowers unisexual. Fruits obovate, green with brown tinge and hairs; mesocarp spongy, fibrous.

Fls. & Frts. : September - December.

Locality : *Ilhas* : Miramar beach, Panaji.

Notes : Occasional along the west coast of India.

Young leaves used as fodder, mature ones for thatching, stem and branches as firewood.

ARISTOLOCHIACEAE

ARISTOLOCHIA L.

Aristolochia indica L. Sp. Pl. 960. 1753.

'*Sapur*' (Konk.).

Twining woody herbs. Leaves ovate-elliptic, glabrous. Flowers in axillary fascicles. Capsules 2 - 3 cm long, oblong or globose-oblong. Seeds flat and winged.

Fls. & Frts. : September - October.

Locality : *Canacona* : Maxem, Zuâri river.

Notes : Infrequent climber on mangrove spp. near swampy river banks. Roots used as tonic in fever and in leucoderma. Leaves useful in snake-bite.

ASCLEPIADACEAE

Key to genera

1a. Plants erect or sub-erect — CALOTROPIS

1b. Plants twining or trailing — HOLOSTEMMA

CALOTROPIS R. Br.

Calotropis gigantea (L.) R. Br. in Ait. Hort. Kew (ed.2), 2: 78. 1811. *Asclepias gigantea* L.

'*Dhavi Rui*' (Konk.).

Erect shrubs, latex milky. Leaves sessile or subsessile. Flowers terminal and lateral, in umbellate cymes. Seed flat.

Fls. & Frts. : Throughout the year.

Locality : *Ilhas* : Coastal area, Panaji. Canacona : Agonda Palolem beach.

Notes : Frequent near the river banks and coastal area. A good soil binder and fibre yielding plant.

HOLOSTEMMA R. Br.

Holostemma annulare (Roxb.) Schum. in Pflanzenfam. 4 (2): 250 & 247, t. 71, J - K, 1895. *Asclepias annularis* Roxb.

'*Kharabphul*' (Konk.).

Climbers, sparingly branched. Leaves fleshy. Flowers in umbellate cymes. Follicles boat-shaped. Seeds flat, glabrous.

Fls. & Frts. : August - October.

Locality : Zuari nagar island, near Madgaon.

Notes : Though Dalgado (1898) records this plant as common in Goa, it was found occasionally in an island along the Zuari river. Roots are tonic & useful in diabetes, gonorrhoea, cough etc. Leaves, flowers and fruits are edible and bark fibre used as cordage.

ASTERACEAE

Key to genera

1a. Florets all ligulate LAUNAEA

1b. Florets all tubular or at least disc florets tubular :

2a. Fruits spinous — ACANTHOSPERMUM

2b. Fruits not spinous :

3a. Florets white or creamy white :

4a. Heads compound, axillary, with two large bracts; pappus of 2 scales — CAESULIA

4b. Heads simple, not as above; pappus not of scales :

5a. Heads heterogamous; outer florets ligulate, central tubular — ECLIPTA

5b. Heads homogamous; florets all tubular — AGERATUM

3b. Florets yellow or purple :

6a. Florets yellow — WEDELIA

6b. Florets purple :

7a. Leaves white or wooly tomentose beneath. Achenes with reddish pappus — CENTRATHERUM

7b. Leaves not white or wooly tomentose beneath. Achenes without pappus — SPHAERANTHUS

ACANTHOSPERMUM Schrank

Acanthospermum hispidum DC. Prodr. 5: 522. 1836.

Herbs, dichotomously branched. Leaves obovate or spathulate. Heads pale-yellow, solitary. Achenes glabrous with hooked spines.

Fls. & Frts. : October - February.

Locality : *Canacona* : Maxem, Zuari river.

Notes : Infrequent along the swampy river banks. Rao (1985) records it as common along river beds, coastal area (Panaji), wastelands etc.

AGERATUM L.

Ageratum conyzoides L. Sp. Pl. 839. 1753.
'*Vosadi*' (Konk.).

Herbs, glandular-pubescent. Leaves broadly ovate, appressed-hairy. Heads pedunculate, white, in terminal paniculate cymes. Achenes cuneate, black,

Fls. & Frts. : Throughout the year.

Locality : *Pernem* : Keri beach. *Ponda* : Curtorim, Zuari river bank. *Quepem* : Betul beach.

Notes Frequent along sandy beaches and swampy river banks, associated with EXCOECARIA species.

CAESULIA Roxb.

Caesulia axillaris Roxb. Pl. Cor. 1: 64. t. 93. 1775.
'*Maka*' (Mar.).

Herbs, glabrous. Leaves sessile, lanceolate. Heads greyish-white or ash-coloured, axillary, solitary. Achenes blackish-brown, faintly ribbed.

Fls. & Frts. : August - May.

Locality : Zuarinagar island, Zuari river.

Notes : Frequent in moist places along the river banks.

CENTRATHERUM Cass.

Centratherum phyllolaenum (DC.) Bth. ex Cl. Comp. Ind. 4. 1876. *Decaneurum phyllolaenum* DC.

Erect herbs. Leaves broadly elliptic, whitish-tomentose beneath. Heads terminal, solitary, bright purple. Achenes glabrous, brown, 10 - ribbed.

Fls. & Frts.: September - November.

Locality : *Canacona* : Polem beach.

Notes : Though this plant is common in open areas along forest edges (Rao, 1985) it was found occasionally along sandy beach.

ECLIPTA L.

Eclipta prostrata (L.) L. Mant. 2: 286. 1771. *Verbesina prostrata* L. '*Bhangra*' (Mar.).

Diffuse herbs. Leaves stigosely hairy. Heads white, axillary, terminal. Achenes compressed, narrowly, winged.

Fls. & Frts.: August - December.

Locality : *Ponda* : Borim bridge.

Notes : Frequent near river banks in association with mangroves.

LAUNAEA Cass.

Launaea fallax (Jaub. & Spach.) Kuntze, Rev. Gen. Pl. 351. 1891. *Microrhynchus fallax* Jaub. & Spach.
'*Pathari*' (Mar.).

Perennial herbs. Leaves linear-lanceolate, pinnatifid. Heads cylindric, creamy-yellow. Achenes minute, smooth, brown, columnar.

Fls. & Frts. : Throughout the year.

Locality : *Ilhas* : Panaji sea-coast. *Canacona* : Palelum beach.

Notes : Frequent along the sea-coast. A good soil binder.

SPHAERANTHUS L.

Sphaeranthus africanus L. Sp. Pl. (ed. 2) 2: 1314. 1763.

Herbs, branches numerous. Leaves sessile finely toothed. Heads globose. Flowers purple.

Fls. & Frts. : October - December.

Locality : *Ponda* : Panchwadi, Zuari river.

Notes : Frequent along the swampy river bank. It also grows all along the coast of Bengal, Kerala and Maharashtra. Plant is used as cattle feed.

WEDELIA Jacq. nom. cons.

Wedelia urticaefolia DC. in Wt. Contrib. 18. 1834.

Erect herbs. Leaves ovate or ovate-lanceolate, hispidly hairy. Heads axillary, fascicled and in terminal racemes. Achenes obovate-triangular or cuneate, faintly ribbed.

Fls. & Frts.: September - December.

Locality : *Salcete* : Colva beach.

Notes : Rare along the sea-coast in association with *Ipomoea pes-caprae*. Rao (1985) records this plant from Nagarhaveli. Cooke (1904) has reported this plant from Konkan near Marmagao - based on Law and Dalzell's collection. The present record after 85 years from adjacent taluka in Goa is interesting.

AVICENNIACEAE

AVICENNIA L.

Key to species

1a. Leaves lanceolate; inflorescence spicate; capsules ellipsoid ..... *A. alba*

1b. Leaves obovate or elliptic; inflorescence umbellate; capsules ovoid :

2a. Trees, 10 - 30 m high; leaves obovate; capsules beaked — *A. officinalis*

2b. Shrubs or small trees, 0.5-6 m high; leaves elliptic; capsules apiculate:

3a. Leaves sessile or subsessile; accuminate at apex — *A. marina* var. *acutissima*

3b. Leaves petiolate, acute at apex — *A. marina* var. *marina*

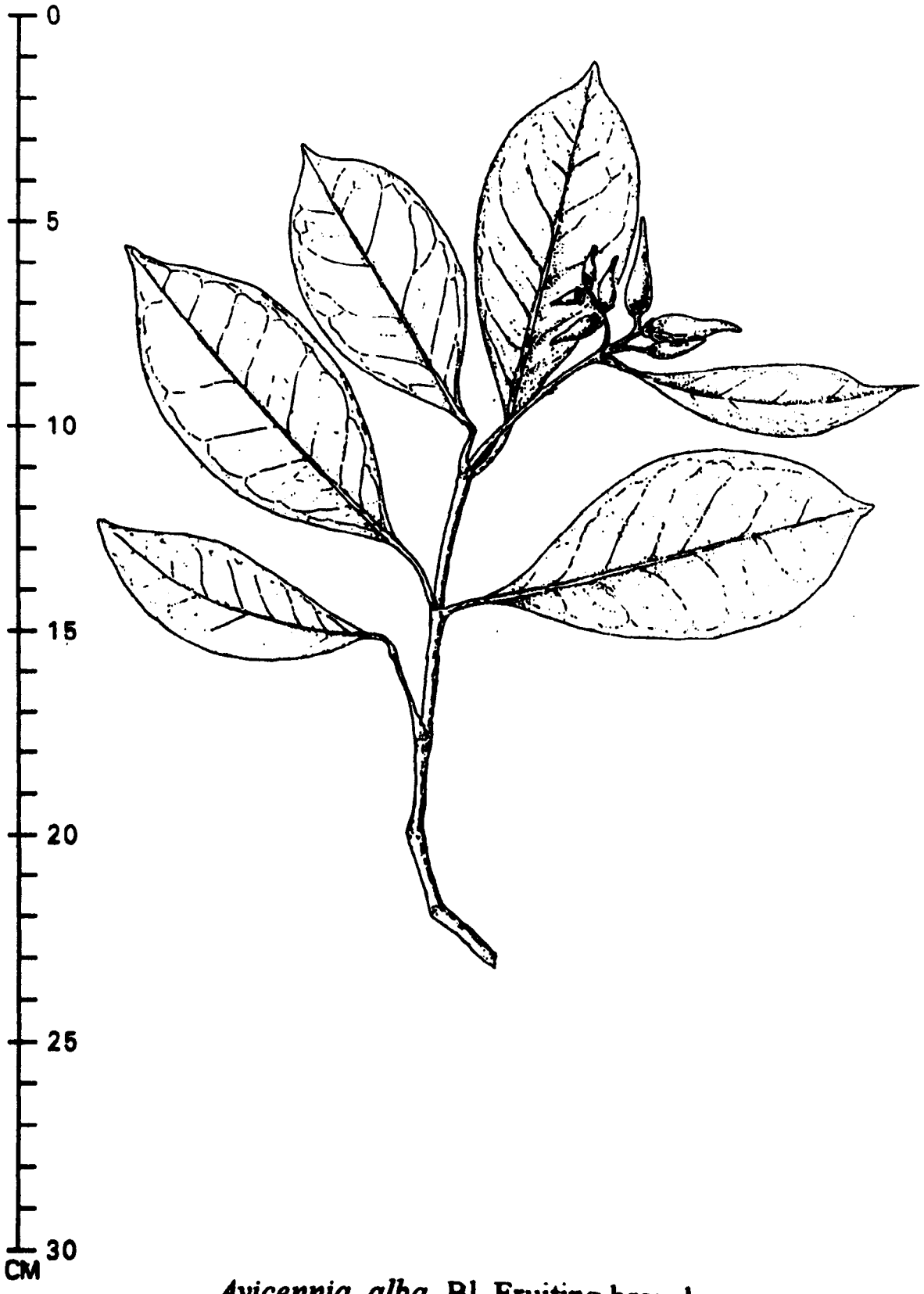
Avicennia alba Bl. Bijdr. Fl. Ned. Ind. 14: 821. 1826. *A. marina* (Forssk.) Vierh. var. *alba* (Bl) Bakh.

'Tivar'/White mangrove.

Small trees, up to 5 m high; bark brownish-black, lenticelled, stem-base without prominent buttresses; pneumatophores many, spongy; narrowly pointed, straight or hooked. Leaves 7.5 - 13 x 1.8 - 3.4 cm, lanceolate, pale green above, silvery papillose beneath, apex acute, base cuneate. Flowers yellow, small, in axillary or terminal spikes. Sepals 5, mucronate; petals 4, ovary hairy. Capsules 3 - 4 cm long, tomentose, ellipsoid accuminate and curved at apex into a short beak. Seeds often germinate, while attached to the mother tree (incipiently viviparous).

Fls. & Frts. : June - August.

Locality : Goa (Untawale et al. 1988)



Avicennia alba Bl. Fruiting branch.

Notes : The species is also overexploited for fuel wood, fodder and fish-food. Its flower are a rich source of honey and bee-wax (Banerjee et al. 1989).

Avicennia marina (Forssk.) Vierh. var. **acutissima** Stapf & Mold. ex Mold.Geog. Distrib. Avicenn. 32. 1939 & in Phytol. 1: 411. 1940 & 7: 225. 1960. *A. officinalis* var. *alba* C. B. Cl.

'Tivar' (Mar.).

Shrubs, 5 - 10 m high; stems glabrous, yellowish-white. Leaves 5.5 - 7.2 x 2.4 - 3 cm, elliptic-lanceolate, shining above, whight puberulous beneath, acuminate at apex, cuneate at base, sessile or very shortly petiolate. Flowers yellow in terminal cymes. Capsules ovoid, apiculate at apex.

Fls. & Frts. : March - July.

Locality : Goa : Borim, Zuari river.

Notes : Common along the coast and banks of the rivers

A. marina (Forssk.) Vierh. in Denksr. Akad. Wien. Math-Nat. 71: 435. 1907. var. **marina**. *Secura marina* Forssk.

'Tivar' (Mar.).

Shrubs or small trees with white or dark-brown and fissured bark. Leaves lanceolate or ovate-lanceolate. Flowers yellow to reddish yellow, in terminal heads. Capsules apiculate, whitish-tomentose.

Fls. & Frts. : February - august.

Locality : *Pernem* : On way to Keri beach, Tiracol river bank. *Ponda* : Agapur; near Borim bridge. Zauri river. *Quepem* : Betul beach. *Salcete* : On way to Cortalim from Margao, Zuari river.

Notes : Frequent along the sea-creeks and swampy river banks. It is a good soil binder and climate purifier. Wood is used for general construction work.

Avicennia officinalis L. Sp. Pl. 110. 1753.

'*Ipad*' '*Upati*' (Konk.).

Trees, with blackish-brown rough bark. Leaves elliptic-oblong or obovate-oblong. Flowers yellow in terminal heads. Capsules compressed, beaked.

Fls. & Frts. : June - August.

Locality : *Bicholim* : Khandola to Amona, Gomti river. *Ponda* : Borim, Panchwadi, Tonka, Unir. *Ilhas* : Chorao bird sanctuary and Island, Panaji, Mandovi river bank. *Marmugao* : Vasco road, Zuari river. *Salcete* : Kuthali-Thana lotli area. *Canacona* : Gazibag-Sadolsa area, Maxem.

Notes : Fairly common along the creeks and swampy river banks. Bark used as a tanning material, leaves for cattle fodder and wood as fuel.

BARRINGTONIACEAE

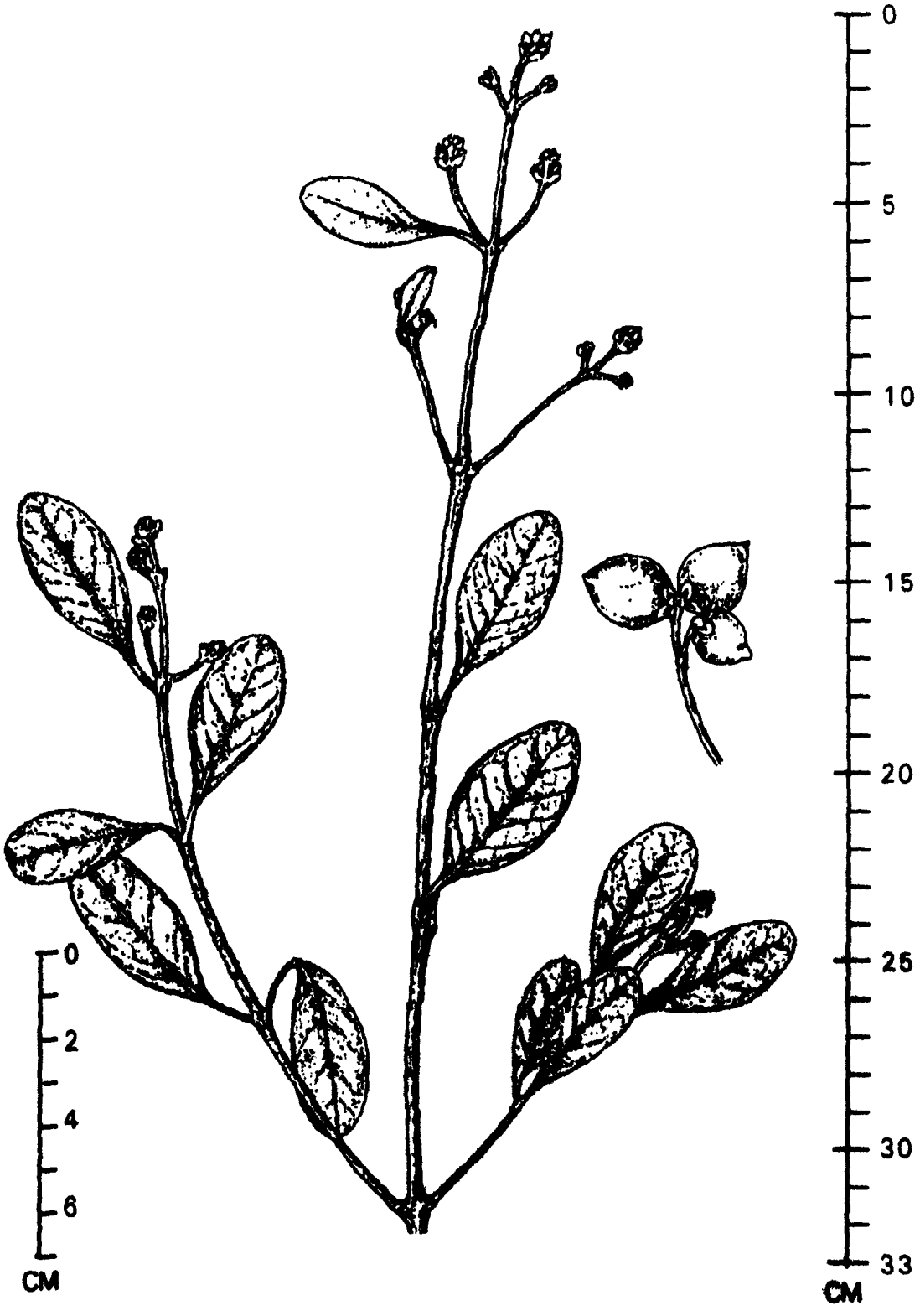
BARRINGTONIA J. R. & G. Forst. *nom. cons.*

1a. Leaves large up to 30 cms; fruits ovoid *B. racemosa*

1b. Leaves up to 15 cms; fruits quadrangular *B. acutangula*

Barringtonia acutangula (L.) Gaertn. Fruct. 2: 97, t. 101. 1791. *Eugenia acutangula* L.

'*Imgli*' (Konk.).



Avicennia officinalis L.

Trees. Leaves obovate-oblong or elliptic-cuneate. Flowers fragrant, dark scarlet. Fruits bluntly quadrangular.

Fls. & Frts. : May - October.

Locality : *Bicholin* : Sanquilim. *Bardez* : Anjuna.

Notes : This species is included based on the authority of Rao (1985) who records it as rare in swampy places along river and stream banks. The bark used as fish poison and contains tanin. Wood used for boat building, cabinet works and as a fuel.

Barringtonia racemosa (L.) Spreng. Syst. Veg. 3:127. 1826. *Eugenia racemosa* L.

'*Sadpal*' (Konk.).

Trees, bark grey. Leaves obovate-oblong or oblanceolate, base cuneate. Flowers pendulous in many flowered terminal racemes.

Fls. & Frts. : April - August.

Notes : This species is fairly common along the river banks and coastal areas in Bardez taluka (Dalgado, 1898). Seed starch edible as subsidiary food. Wood used as fuel.

BIGNONIACEAE

DOLICHANDRONE Seem

Dolichandrone spathacea (L.f.) K. Schum. Fl. Kais Wilh. Land 123. 1889; Kothari & Rao in J. Econ. Tax. Bot. 19(2): 323 - 324. 1995. *Bignonia spathacea* L. f.; *Dolchandrone rheedii* Wall. ex DC.

Trees, 9 - 18 m high. Leaves imparipinnate; leaflets 5 - 9, ovate-rhomboid, acuminate, glabrous. Flowers 1 - 8, white, fragrant in corymbose racemes. Capsules cylindric-compressed, curved at apex, speckled, smooth, up to 40 cm long. Seeds subrectangular, grey in many rows with corky wings.

Fls. & Frts. : March - October.

Locality : *Ponda* : Borim, Daboli, Sandevorum. *Quepem* Curchorim, Zuari river. Kothari 171575 (BSI)

Notes : Frequent along the swampy river bank in association with *Acanthus ilicifolius*, *Excoecaria agallocha* etc. Wood is useful for construction work, as firewood, matchsticks and toys. The species can be grown along river banks and coastal areas to check soil erosion and for its beautiful flowers (Banerjee et al. 1989).

BORAGINACEAE

Key to genera

1a. Trees — EHRETIA

1b. Erect herbs or undershrubs — HELIOTROPIUM

EHRETIA L.

Ehretia laevis Roxb. Corom. Pl. 1: 42, t. 56, 1795.
'*Kalogamdo*' (Konk.).

Trees with grey or greyish-brown bark. Leaves obovate-oblong or elliptic-oblong, glabrous. Flowers white in terminal and axillary lax cymes. Drupes black.

Fls. & Frts. : August - November.

Locality Canacona : Palolem beach.

Notes : Frequent along the sea-coast. Wood used for brush backs, splints etc. and leaves as cattle feed.

HELIOTROPIUM L.

Heliotropium indicum L. Sp. Pl. 130. 1753.
'*Ajeru*' (Konk.).

Herbs, erect, hairy. Leaves ovate, hairy. Flowers sessile, numerous in long spikes. Fruits ovoid or conical, deeply-lobed.

Fls. & Frts. : April - October.

Locality : *Ponda* : Madkai top. Zuari river bank.

Notes : Frequent as a weed near river banks. Plant is bitter, applied on ulcers, sores and wounds. Also used in skin infections and insect-bites.

CAESALPINIACEAE

Key to genera

1a. Leaves simply pinnate; stem spineless — CASSIA

1b. Leaves bipinnate; stem spiny — CAESALPINIA

CAESALPINIA L.

Caesalpinia crista L. Sp. Pl. 380. 1753. *C. nuga* (L.) Ait.
'*Vakeri*' (Konk.).

Scandent shrubs. Leaves pinnate, 4 - 20 pairs. Flowers yellow in terminal and axillary racemes. Pods ovoid-oblong, flattened. Seeds smooth, polished, lead coloured.

Fls. & Frts. : September - December.

Locality : *Pernem* : Kiranpani, Tiracol river bank. *Bicholim* Amona, Gomti river bank. *Ponda* : Daboli, Zuari river bank. *Canacona* : Maxem, Zuari river.

Notes : This climber is fairly common along the swampy river bank and closely associated with mangroves. Sometimes complete trees are covered by this vigorously growing climber (Canacona taluka). Tender leaves eaten in liver disorders; leaf paste in water as external application in inflammatory swellings.

CASSIA L.

Key to species

1a. Leaflets 3 - 5 pairs — *C. occidentalis*

1b. Leaflets 3 pairs — *C. tora*

Cassia occidentalis L. Sp. Pl. 377. 1753.

'*Ran takla*' (Mar.).

Undershrubs. Leaves long, subsessile. Flowers reddish yellow in terminal and axillary racemes. Pods compressed, linear-oblong. Seeds greenish-brown, smooth, glabrous.

Fls. & Frts. : Throughout the year.

Locality : *Bardez* : Chapora river bank. *Canacona* : Palolum beach.

Notes : Frequent along the river banks and sea-coast. Roasted seeds used as substitute to coffee, edible. It is a good green manure.

Cassia tora L. Sp. Pl. 376. 1753.

'*Tarota*' (Mar.).

Herbs, glabrous. Leaves obovate, sessile. Flowers yellow. Pods linear, beaked.

Fls. & Frts. : August - December.

Locality : *Ilhas* : Chorao bird sanctuary, Panaji, Mandovi river bank.

Notes : Frequent along coasts and river banks. The plant is a good cattle feed and green manure. Leaves and seeds used in skin diseases.

CAMPANULACEAE

SPHENOCLEA J. Gaertn. *nom. cons.*

Sphenoclea zeylanica Gaertn. Fruct. 1: 113. t. 24. f. 5. 1788.

Annual, erect herb. Leaves elliptic-lanceolate, glabrous. Flowers white in 1 - 5 cm long spikes. Capsules glabrous, globose. Seeds minute, brown, rugose.

Fls. & Frts. : August - January.

Locality : *Pernem* : Kiranpani, Tiracol river bank.

Notes : Frequent in swamps. The young tips of plant are eaten; controls weed growth in crop fields and acts as a soil binder.

CASUARINACEAE

CASUARINA L.

Casuarina equisetifolia J.R. & G. Forster, Char. Gen. 104. t. 52. 1776.

'*Pkiramgi saro*' (Konk.).

Trees, evergreen. Leaves reduced to scales, in whorls. Male spikes terminal, female fascicles globose or ovoid at ends of lateral branches. Nuts winged.

Fls. & Frts. : Throughout the year.

Locality : Along the sea coasts.

Notes : Cultivated along the sea shores and gardens. Plant is a good soil binder, increases fertility due to the presence of nitrogen fixing bacteria in its roots. Pollution resistant and climate purifier. Best firewood. Bark is useful for diarrhoea and dysentery.

CLEOMACEAE

CLEOME L.

Cleome viscosa L. Sp. Pl. 672. 1753.

'*Kanphuti*' (Konk.).

Herbs. Leaves petiolate; leaflets elliptic-oblong, sessile or subsessile. Flowers axillary, solitary in terminal, lax racemes. Capsules cylindrical, minutely beaked. Seeds numerous, dark or reddish-brown.

Fls. & Frts. : August - January.

Locality : *Quepem* : Betul beach. *Canacona* . Agonda and Palelum beach.

Notes : Frequent weed, scattered along the sandy sea-coast. Leaves externally applied to wounds. Seeds often used as condiment.

CLUSIACEAE

CALOPHYLLUM L.

Calophyllum inophyllum L. Sp. Pl. 513. 1753.

'*Undi*' (Konk.).

Trees. Leaves elliptic, rounded at the apex. Flowers white, fragrant, in lax, few-flowered racemes. Fruits globose, yellowish.

Fls. & Frts. : December - April.

Locality : *Pernem* : Kiranpani, Tiracol river bank. *Marmugao* : Hansa beach, Vasco. *Canacona* : Palelum beach.

Notes : Frequent along coastal areas, occasional near river bank. Leaves used as a fish poison, wood for furniture and bark for tanning.

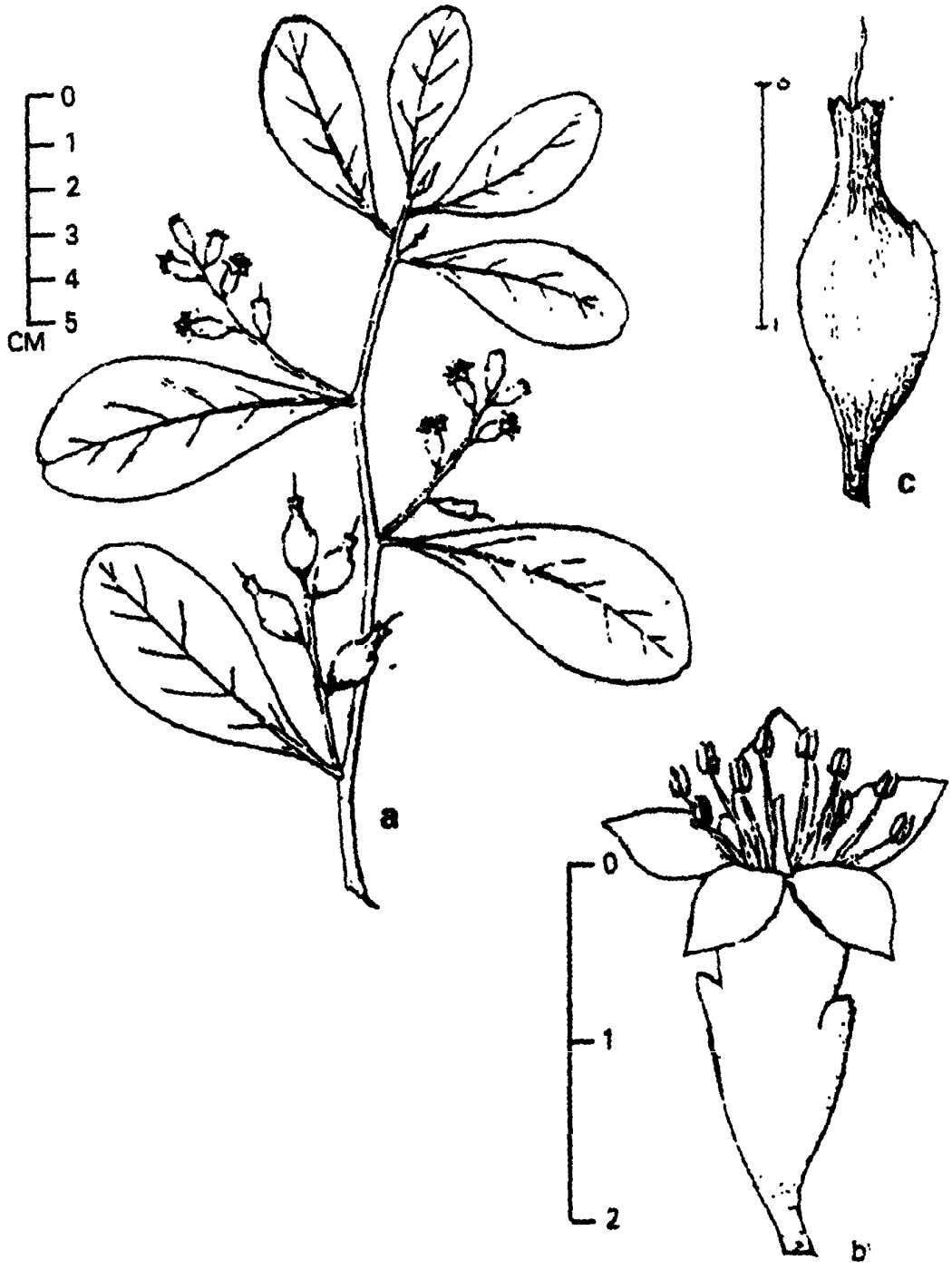
COMBRETACEAE

LUMNITZERA Willd.

Lumnitzera racemosa Willd. in Ges. Naturf. Fr. Neue. Schr. 4: 187. 1803.

'*Kharo Kamdel*' (Konk.).

Shrubs or trees. Leaves sessile, fleshy, oblanceolate or obovate.



Lumnitzera racemosa Willd.
a. Fertile branch. b. Flower & c. Fruit.

Flowers sessile in short, lax, axillary spikes. Fruits ovoid, glabrous.

Fls. & Frts. : April - October.

Notes : Rare in mangrove swamps. Recorded along the muddy banks of Siolim and Rarim rivers of Goa (Dalgado, 1898). Wood is used in ship building and general construction work and its bark for tannin (19.2%). Plant is useful medicinally for herpes & itches.

COMMELINACEAE

CYANOTIS D. Don

Cyanotis cristata (L.) D. Don Prodr. Fl. Nep. 46. 1825. *Commelina cristata* L. Sp. Pl. 42. 1753.

Herbs. Leaves ovate-oblong, elliptic-oblong or ovate-lanceolate, glabrous. Flowers violet-purple, spathes glabrous. Capsule trigonous.

Fls. & Frts. : August - November.

Locality : *Bardez* : Calangute beach. *Canacona* : Palelum beach.

Notes : Frequent along the coastal areas, with soil binding grasses, under shade of *Casuarina equisetifolia* etc.

CONVOLVULACEAE

Key to genera

1a. Fruit dehiscent ..... IPOMOEA

1b. Fruit indehiscent ..... ARGYREIA

ARGYREIA Lour.

Argyreia involucrata C. B. Cl. in Hook. f. Fl. Brit. India 4: 187. 1883.

Twiners. Leaves ovate, acute or acuminate, sparsely hairy beneath. Flowers in sub-capitate cymes. Fruits globose.

Fls. & Frts. : October - November.

Locality : *Ilhas* : Chorao island, Panaji, Mandovi river. *Marmugao* : Cortalim, Zuari river bank.

Notes : This climber is frequent along the river banks in close association with AVICENNIA and other mangrove species.

IPOMOEA L.

Key to the species

1a. Corolla tubular or salvar-shaped :

2a. Corolla white — *I. macrantha*

2b. Corolla pale-purple — *I. turbinata*

1b. Corolla campanulate or funnel-shaped :

3a. Leaves deeply 2 - lobed — *I. pes-caprae*

3b. Leaves 3 - 9 lobed — *I. mauritiana*

Ipomoea macrantha R. & S. Syst. Veg. 4: 251. 1819. *I. tuba* (Schl.) G. Don; *Convolvulus tuba* Schl.

Large twiners. Leaves cordate-ovate, acute, entire, glabrous. Flowers white, corolla tube linear. Capsules globose, obtuse. Seeds villous, margins shaggy.

Fls. & Frts. : October - November.

Locality : *Bicholim* : Amona, Gomti river. *Ponda* : Borim, Zuari river.

Notes : Occasional near river bank. Plant is a good soil binder, a good cattle feed, often cultivated for its beautiful flowers and sweet edible rhizomes.

Ipomoea mauritiana Jacq., Collect. 4: 216. 1791. *Convolvulus paniculatus* L.; *Ipomoea paniculata* (L.) R. Br.; *I. digitata* auct. Plur. non L.

'*Bhumikumvali*' (Konk.).

Herbs. Leaves palmately divided. Flowers red, many, in corymbose paniculate cymes. Capsules ovoid, surrounded by fleshy sepals.

Fls. & Frts. : August - October.

Locality : *Ponda* : Panchwadi, Zuari river bank.

Notes : Infrequent near river banks. Stems and leaves used as cattle feed.

I. pes-caprae (L.) R. Br. in Tukey, Narrat. Exped. Zaire 477. Mar. 1818. Convolvulus pes-caprae L.; Ipomoea biloba Forssk.

'*Bamgdavel*' (Konk.).

Herbs, prostrate. Leaves fleshy; lobes ovate or orbicular. Flowers

pink-purple, axillary, solitary. Capsule ovoid, glabrous, brown. Seeds hairy.

Fls. & Frts. : Throughout the year.

Locality : *Salcete* : Colva beach. *Ponda* Borim bridge, Zuari river. *Bicholim* : Amona, Gomti river bank.

Notes : Frequent on the sandy sea shores and river banks. A good sand binder. Leaves used as vegetable.

Ipomoea turbinata Lag., Gen. Sp. Pl. 10. 1816. *Ipomoea muricata* (L.) Jacq. *Convolvulus muricatus* L.
'*Barik bhomvri*' (Konk.).

Twiners, herbaceous. Leaves ovate, glabrous. Flowers in axillary cymes. Capsule ovoid, glabrous.

Fls. & Frts. : August - November.

Locality : *Ilhas* : Chorao bird sanctuary, Panaji.

Notes : Frequent as a twiner on *Sonneratia caseolaris* and other mangroves along the river banks.

CUCURBITACEAE

Key to genera

1a. Petals free or connate at base :

2a. Monoecious or dioecious;
male flowers solitary MOMORDICA

2b. Monoecious; male flowers in racemes — LUFFA

1b. Petals united, campanulate — DIPLOCYCLOS

DIPLOCYCLOS (Endl.) Von Post. & Ktze.

Diplocyclos palmatus (L.) Jeffrey in Kew Bull. 15. 352. 1962. *Bryonia palmata* L.; *Bryonopsis laciniosa* sensu Naud.

'*Kaumdali*' (Konk.).

Herbacious climbers. Leaves palmately lobed, membranous, glabrous. Flowers white. Berries spherical, smooth. Seeds white, obovate.

Fls. & Frts. : August - October.

Locality : *Salcete* : Zuarinagar island, Zuari river.

Notes : Occasionally occurs in an island of Zuari river in association with *Thespesia populnea* and ZIZIPHUS sp. The leaves are boiled and eaten in inflamations.

LUFFA Cav.

Luffa acutangula (L.) Roxb. Fl. Ind. 3: 713. 1832. *Cucumis acutangulus* L.

'*Gomsali*' (Konk.).

Climbing herbs. Leaves ovate, membranous. Flowers pale yellow. Berries linear-obovate or cylindric, fusiform. Seeds black, flat.

Fls. & Frts. : August - October.

Locality : *Salcete* : Zuarinagar island, Zuari river.

Notes : Infrequent on trees of Mangroves. Leaf juice is used in granular conjunctivitis in children.

MOMORDICA L.

Momordica dioica Roxb. ex Willd. Sp. Pl. 4: 605. 1805.
'*Phalguni*' (Konk.).

Trailing or climbing herbs. Leaves ovate, 3 - 5 lobed. Flowers bright yellow. Berries ovate or obovate, softly echinate. Seeds flat, ovate, yellow or red.

Fls. & Frts. : August - October.

Locality : *Taripent* : Zuari river.

Notes : Frequent near river banks in moist situations. Fruits eaten as vegetable. Roots astringent applied on bleeding piles.

CYPERACEAE

Key to genera

1a. Flowering glumes all distichous; hypogynous bristles absent — CYPERUS

1b. Flowering glumes spirally arranged; hypogynous bristles often present — FIMBRISTYLIS

CYPERUS

Key to species

1a. Rachilla of spikelets persistent :

2a. Spikelets digitate or clustered :

3a. Spikelets 1 - 8 flowered *C. cyperoides*

3b. Spikelets 8 - 16 flowered *C. arenarius*

2b. Spikelets distinctly spicate or racemose :

4a. Rachilla of spikelets distinctly winged *C. exaltatus*

4b. Rachilla of spikelets not or hardly winged

5a. Leaves more than 30 cm long, linear *C. nutans*

5b. Leaves not more than 16 cm long, enciform *C. malaccensis*

1b. Rachilla of spikelets not persistent i.e. disarticulating above the 2 lowest glumes *C. compactus*

Cyperus arenarius Retz. Obs. Fasc. 4: 9. 1786.

Tufted herbs. Leaves linear, coriaceous. Inflorescence a compact head. Spikelets compressed, 8-20 flowered. Nuts triquetrous, smooth, brown.

Fls. & Frts. : August - October.

Locality : *Canacona* : Agonda sea beach.

Notes : Frequent along sandy coasts and river banks. Leaves are used in making mats, baskets and for stuffing.

Cyperus compactus Retz. Obs. 5: 10. 1789. *C. dilutus* Vahl.

Rhizomatous, glabrous herbs. Leaves linear-lanceolate. Inflorescence terminal, in compound umbels. Spikelets linear-lanceolate, reddish-brown. Nuts triquetrous, blackish-brown.

Fls. & Frts. : October.

Locality : Ponda : Panchwadi, Zuari river bank.

Notes : Infrequent along the swampy river bank. Rao (1985) records it as 'rare' along back-waters in Bicholim, Ponda and Sanguem taluka.

C. cyperoides (L.) O. Kuntze, Rev. Gen. Pl. 3 (2): 333. 1898. *Scirpus cyperoides* L.; *Mariscus sieberianus* Nees ex. Cl.

Perennial herbs. Leaves coriaceous, glabrous. Inflorescence terminal, in compound umbels. Spikelets ovate-oblong or oblong-lanceolate. Nuts brown, trigonous.

Fls. & Frts. : September - October.

Locality : Ponda : Borim, Zuari river bank.

Notes : Frequent near banks of river in moist situations.

C. exaltatus Retz. Obs. 5: 11. 1789.

'*Pen*' (Konk.).

Stout herbs. Leaves linear, glabrous, serrulate on margins. Inflorescence terminal, in compound or decompound umbel of spikes. Spikelets yellowish to golden-brown. Nuts ovate or oblong, trigonous.

Fls. & Frts. : September - December.

Locality : Marmugao : Hansa beach, Vasco.

Notes : Frequent along the sea coasts in moist situations. Rao (1985) has not recorded this species from Goa. He records it from Nagarhaveli and Daman.

Cyperus malaccensis Lam. Illust. 1: 146. 1791.
'*Loho*' (Konk.).

Perennial, herbs, rhizome creeping, clothed with dark-brown scales. Leaves few, sheaths often enclosing the stem. Umbels compound or congested. Spikelets 4 - 10, linear, 20 - 40 flowered. Nuts trigonus, dark-brown to black.

Fls. & Frts. : October - November.

Locality : Bicholim : Amona, Gomti river bank. Ilhas : Chorao bird sanctuary, Cumberjua canal, Mandovi river bank. Ponda : Borim, Khandola, Panchwadi. Quepem : Curchorim, Zuari river bank.

Notes : Frequent along muddy river banks. The stems are often used for tying, making mats, baskets and hats.

C. nutans Vahl. Enum. 2: 363. 1806.

Tufted herbs. Leaves linear, glabrous. Spikelets linear, reddish to dark-brown, in simple or compound umbels. Nuts obovoid-oblong, trigonus, brownish-black.

Fls. & Frts : August - October.

Locality : Ponda : Panchwadi, Zuari river bank.

Notes : Frequent along the swampy river banks. Rao (1985) records this species as occasional on river beds from Nagarhaveli and Daman only.

FIMBRISTYLIS Vahl.

Key to species

1a. Stigmas 2, nuts lenticular, flattened;

2a. Leaves ligulate; glumes glabrous — *F. dichotoma*

2b. Leaves eligulate; glumes ferruginous brown, puberulous in apical half — *F. sieberiana*

1b. Stigmas 3, nuts trigonals — *F. ovata*

Fimbristylis dichotoma (L.) Vahl, Enum. 2: 287. 1806. *Scirpus dichotomus* L.; *Fimbristylis diphylla* (Retz.)Vahl.

'*Puddi*' (Konk.).

Erect or spreading herbs. Leaves linear or linear-lanceolate. Spikelets greenish-yellow to yellowish-brown, in terminal compound umbels. Nuts biconvex, white.

Fls. & Frts. : August - October.

Locality : *Canacona* : Gazibag - Sadolsa area, Zuari river.

Notes : Frequent in moist places along river banks and in open grassy meadows. The local people use this Puddi plant for drying fishes.

F. ovata (Burm.f) Kern in Blumea 15: 126. 1967. *Carex ovata*

Burm. f.; *F. monostachya* (L.) Hassk.

Perennial, tufted herbs. Leaves glabrous, linear. Spikelets terminal, yellow, ovate. Nuts yellow, tubercled.

Fls. & Frts. : August - October.

Locality : *Bardez* : Island between Siolim and Chapora river. *Ilhas* Chorao bird sanctuary, Panaji, Mandovi river bank.

Notes : Infrequent along the muddy river banks.

Fimbristylis sieberiana Kunth, Enum. 2: 237. 1837. *F. ferruginea* Vahl. var. *sieberiana* Boeck.

Perennial herbs in the woody rhizomes. Leaves flat, linear. spikelets ovate-oblong to lanceolate, in terminal umbels. Nuts globose or obovate-oblong, yellowish-brown.

Fls. & Frts. : August - October.

Locality : *Bardez* : Porvarim, creek on way to Calangute.

Notes : Infrequent in muddy creeks near sea-coast. Rao (1985) records this plant as occasional on moist rocky places in Bicholim and Marmugao taluka. A soil binding plant.

DIOSCOREACEAE

DIOSCOREA L.

Dioscorea bulbifera L. Sp. Pl. 1033. 1753. *Dioscorea sativa* Thunb. '*Karamdo*' (Konk.).

Climbing herbs. Leaves ovate, membranous. Flowers greenish-white, in axillary spikes. Capsules oblong. Seeds ovoid, winged towards base.

Fls. & Frts. : August - October.

Locality : *Ponda* : Borim, Zuari river.

Notes : Frequent on BRIDELIA sp., near river beds. Tubers edible after cooking. Dried rhizomes antiseptic and used for cleaning wounds.

DIPTEROCARPACEAE

VATERIA L.

Vateria indica L. Sp. Pl. 515. 1753.

'*Dhupa*' (Mar.):

Trees, bark whitish. Leaves elliptic-oblong, cordate or rounded at base. Flowers in large terminal panicles. Capsules oblong, 3 - valved; valves 1 - seeded.

Fls. & Frts. : April - September.

Locality : *Salcete* : On way from Margao-quepem. Zuari river bank.

Notes : Occasional along the river bank. Planted as an avenue tree in Southern India. Yields a good timber for plywood, ammunition boxes, building works etc. Plant resin as dhoop, burnt for incense and in varnish.

ERIOCAULACEAE

ERIOCAULON L.

Key to species

1a. Heads globose — *E. vanheurchkii*

1b. Heads sub-globose or hemispheric *E. cuspidatum*

Eriocaulon cuspidatum Dalz. in Kew Journ. Bot. 3: 281. 1851.

Herbs. Leaves erect, linear-oblong, rounded and cuspidate at the apex. Peduncles few or many. Heads sub-globose, white-puberulous. Seeds oblong, smooth.

Fls. & Frts. : August - October.

Locality : *Marmugao* : Hansa beach, Vasco.

Notes : Infrequent in moist situations near sea-coast.

E. vanheurchkii Muell.-Arg. in Heurck. Obs. Bot. 2 : 98. 1870.

Herbs. Leaves lanceolate or oblanceolate. Floral bracts short, closely imbricate, peduncle thickened below head. Heads white; sepals 2, boat-shaped; petals linear with basal hairs.

Fls. & Frts. : August - October.

Locality : Marmugao : Hansa beach, Vasco.

Notes : Infrequent along the sea-coast in association with AMMANIA and ROTALA species.

EUPHORBIACEAE

Key to genera

1a. Cells of ovary 2 - ovuled EXCOECARIA

1b. Cells of ovary 2 - ovuled :

2a. Corolla present — BRIDELIA

2b. Corolla absent — PHYLLANTHUS

BRIDELIA Willd.

Key to species

1a. Trees; flowers in clusters — *B. retusa*

1b. Shrubs; flowers in axillary or terminal spikes — *B. scandens*

Bridelia retusa (L.) Spreng. Syst. Veg. 3: 48. 1826. *Cluytia retusa* L.

'*Kamte-asah*' (Konk.).

Trees, 4 -12 m. tall. Leaves elliptic-oblong, tomentose beneath. Flowers white or pinkish in clusters. Drupes subglobose, glabrous.

Fls. & Frts. : August - October.

Locality : *Marmugao* : Cortalim, Zuari river bank.

Notes : Though Rao (1985) records this species as very common along forest fringes and roadsides in Goa, it was found infrequent near muddy river banks. Wood used for house posts, floor boards , carts etc., bark for tanning, fruits edible and leaves as fodder.

B. scandens (Roxb.) Willd. Sp. Pl. 4: 979. 1806 (p.p.). *Cluytia*

scandens Roxb.; *Bridelia stipularis* sensu Hook. f.
'*Phaterohod*' (Mar.).

Climbing shrubs. Leaves elliptic-oblong or obovate. Flowers greenish-yellow in long spikes. drupes ellipsoid-oblong.

Fls. & Frts. : August - November.

Locality : *Quepem* : Curchorim, Zuari river bank.

Notes : Frequent along the river banks in association with *Caesalpinia crista*, CLERODENDRUM spp., *Excoecaria agallocha* etc.

EXCOECARIA L.

Excoecaria agallocha L. Syst. Nat. ed. 1. 1288. 1759.
'*Uro*' (Konk.).

Large shrubs or small trees. Leaves alternate, ovate, elliptic-ovate, entire or minutely crenate. Male flowers yellowish-green; female flowers in racemes. Fruits capsule.

Fls. & Frts. : August - October.

Locality : *Pernem* : Kiranpani, Tiracol river bank. *Ilhas* : Chorao Bird Sanctuary, Panaji. Ponda : Borim, Madkai top, Panchwadi. *Canacona* : Maxem, Zuari river.

Notes : Common along the swampy river banks in association with AVICENNIA and RHIZOPHORA spp. white wood is prized for floats, toys etc. Leaf extract used in epilepsy while roots to cure hand and feet swellings. Bark contains tannin (10.3%).

PHYLLANTHUS L.

Phyllanthus reticulatus Poir. in Lam. Encycl. 5: 298. 1804. *Kirganelia reticulata* (Poir.) Baill.

'*Panpoi*' (Konk.).

Shrubs. Leaves elliptic or oblong, glabrous, sessile. Flowers greenish-yellow or white, axillary; males clustered, females solitary. Berries globose, smooth, black.

Fls. & Frts. : August - October.

Locality : *Ilhas* : Cumberjua canal, linking Mandovi and Zuari river.

Notes : Frequent along the banks in moist situations. Leaf juice is used in bleeding gums; powdered leaf in sores and burns and roots in cough and asthama.

FABACEAE

Key to genera

1a. Plants erect, sub-erect or prostrate but not climbing or twining :

2a. Trees :

3a. Pods 1 - 4 seeded — PONGAMIA

3b. Pods many seeded — SESBANIA

2b. Shrubs, undershrubs or herbs :

4a. Flowers creamy-yellow, pure yellow or spotted purple :

5a. Pods turgid — CROTALARIA

5b. Pods not turgid :

6a. Leaflet pairs 2 — GEISSASPIS

6b. Leaflets more than 2 pairs :

7a. Joints of pods folded inside the calyx — SMITHIA

7b. Joints of pods not as above; pod exserted — AESCHYNOMENE

4b. Flowers red, reddish-purple, bluish-purple or blue :

8a. Inflorescence mostly axillary; flowers red; pods torulose,cylindric — INDIGOFERA

8b. Inflorescence mostly leaf-opposed, axillary or extra- axillary; flowers blue or bluish-purple; pods flat — TEPHROSIA

1b. Plants climbing or twining :

9a. Flowers creamy-yellow, yellow or tinged red — VIGNA

9b. Flowers rosy, purple, bluish-purple or blue :

10a. Pods turgid — CANAVALIA

10b. Pods not turgid :

11a. Flowers bluish-purple; Pods cylindric, with stinging hairs — MUCUNA

11b. Flowers rosy; pods suborbicular, glabrous — DERRIS

AESCHYNOMENE L.

Aeschynomene indica L. Sp. Pl. 713. 1753.

'*Nalabi*'(Konk.).

Erect or suberect herbs. Leaves linear to linear-oblong, obtuse or subacute. Flowers pale to creamy-yellow, few in axillary lax racemes. Pods 6 - 10 jointed straight or falcate.

Fls. & Frts. : August - October.

Locality : *Ilhas* Chorao-bird sanctuary; Panaji. *Ponda* : Dobali, Zuari river bank.

Notes : Frequent in moist places near river bank. Inferior type of pith items are prepared for stuffing, etc.

CANAVALIA DC. nom. cons.

Canavalia virosa W. & A. Prodr. 253. 1834. *Canavalia*

ensiformis (L.) DC. var. Virosa (W & A) Baker.

Twining herbs. Leaflets ovate or nearly orbicular, appressed-pubescent. Flowers few in terminal and axillary racemes. Pods linear-oblong, flat.

Fls. & Frts. : August - October.

Locality : Bicholim : Amona, Gomti river bank. *Ponda* Daboli, Zuari river.

Notes : Frequent along the swampy river bank associated with mangroves. A forage plant.

CROTALARIA L.

Key to species

1a. Leaves 3 - 7 foliate :

2a. Pods not inflated — *C. pallida*

2b. Pods much inflated, hooked at apex — *C. quinquefolia*

1b. Leaves simple :

3a. Corolla bluish-purple — *C. verrucosa*

3b. Corolla bright-yellow — *C. juncea*

Crotalaria juncea L. Sp. Pl. 714. 1753.

'*Dhakti ghagri*' (Konk.).

Undershrubs, erect, silky-pubescent. Leaves linear-lanceolate or elliptic-lanceolate, subsessile. Flowers bright-yellow, in terminal and lateral, erect, lax racemes. Pods obovate-oblong.

Fls. & Frts. : October - January.

Locality : *Quepem* : Betul beach.

Notes : Often found as an escape near river bank and creeks. Usually cultivated on large scale for green manuring, cordage fibre, for making canvas, bags, nets etc. Linen stock as cattle feed.

Crotalaria pallida Ait., Hort. Kew. 3: 20. 1789. *C. murronata* Desv.; *C. striata* DC.

Erect shrubs, stem striate. Leaves membranous; leaflets elliptic, obtuse or acute. Flowers numerous, erect in terminal and lateral elongate racemes. Pods oblong, cylindric, glabrous. Seeds dark-brown.

Fls. & Frts. : August - October.

Locality : *Bicholim* : Amona, Gomti river bank. *Ponda* : Borim, Zuari river bank. *Salcete* : Gonsua beach.

Notes : Frequent along the swampy river bank and sea-coast. the plant is good as green manure.

C. quinquefolia L. Sp. Pl. 716. 1753.

Shrubs. Leaves 5 - foliate, glabrous or sparsely pubescent. Leaflets narrow-linear, glabrous above, pale beneath. Flowers 10 - 20, in terminal racemes. Pods oblong, glabrous.

Fls. & Frts. : August - October.

Locality : *Salcete* : Gonsua beach.

Notes : Infrequent in the area.

Crotalaria verrucosa L. Sp. Pl. 715. 1753.

'*Ghagari*' (Mar.).

Erect herbs. Leaves ovate-rhomboid pubescent beneath. Flowers bluish-purple in terminal and axillary racemes. Pods oblong-cylindric.

Fls. & Frts. : August - October.

Locality : Marmugao : Sancole-Vasco Road. Ponda : Borim, Panchwadi.

Notes : Frequent near river banks and creeks.

DERRIS Lour. nom. cons.

Derris trifoliata Lour. Fl. Cochinch. 2: 433. 1790. *D. uliginosa Benth.*

'*Firtan*' (Konk.).

Large climbing shrubs. Leaves glabrous. Leaflets 3 - 7 usually 5, ovate or ovate-oblong. Flowers rose coloured, in axillary racemes. Pods flat, oblong-suborbicular, yellow when ripe, 1-seeded.

Fls. & Frts. : April - August.

Locality : *Bardez* : Parvarum, on way to Calangute sea-coast. Marmugao : Sancole-Vasco Road, Zuari river bank. Ponda : Borim.

Notes : Frequent along the muddy creeks, in close association with mangroves. Bark used as fish poison; externally applied in rheumatic pains; leaves as fodder.

GEISSASPIS Wt. & Arn.

Geissaspis cristata Wt. & Arn. Prodr. 218. 1834.

'*Barki*' (Mar.).

Diffuse and slender herbs. Leaves abruptly pinnate; leaflets, obovate, glabrous, sessile. Flowers yellow with purple streaks, in axillary and terminal racemes. Pods moniliform.

Fls. & Frts. : August -October.

Locality : Ponda : Panchwadi.

Notes : Infrequent in moist situations.

INDIGOFERA L.

Key to species

1a. Leaflets 5 - 13 :	
2a. Pods linear	*I. tinctoria*
2b. Pods tetragonous	*I. astragalina*
1b. Leaflets 13 - 21	*I. cassioides*

Indigofera astragalina DC. Prodr. 2: 228. 1825. *I. hirsuta* Baker.

Undershrubs, densely pubescent. Leaflets opposite, elliptic-oblong, or ovate-oblong. Flowers rosy-purple in axillary and terminal compact racemes. Pods deflexed.

Fls. & Frts. : August - October.

Locality : *Canacona* : Polem beach.

Notes : Frequent along the coastal areas, in association with *Ipomoea pes-caprae*, *Lantana camera* var. *aculeata* etc.

Indigofera cassioides Rottl. ex. DC. Prodr. 2: 225. 1825. *I. pulchella* Roxb.

'*Chimnati*' (Konk.).

Erect, hairy shrubs. Leaflets elliptic-oblong. Flowers rosy-purple in dense, axillary racemes. Pods cylindric, glabrous.

Fls. & Frts. : August - October.

Locality : *Marmugao* : Sancole - Vasco.

Notes : Infrequent near moist situations. The flowers are eaten. Leaves and roots used in stomach swellings.

I. tinctoria L. Sp. Pl. 751. 1753.

'*Nili*' (Konk.).

Erect shrubs. Leaves alternate. Leaflets oblong to obovate, hairy beneath. Flowers red in axillary spicate racemes. Pods linear, brown.

Fls. & Frts. : August - October.

Locality : *Canacona* : Maxem. *Salcete* : Kuthali area, Zuari river bank.

Notes : As an escape. A good green manure, plant once cultivated for indigo dye. Now growing as a weed near banks of creeks. Leaf juice is used in hydrophobia.

MUCUNA Adans.

Mucuna prurita Hook. Bot. Misc. 2: 348. 1830 - 31. *M. pruriens* Baker.

'*Kavancha*' (Mar.).

Hairy twiner. Leaves 3 - foliate, petiolate; leaflets silky-hairy, ovate-triangular or ovate-lanceolate. Flowers in 6 - 25 cm long racemes. Pods 4 - 6 seeded, brown.

Fls. & Frts. : August - October.

Locality : Salcete : Gonsua beach.

Notes : Frequent near the beach forest along hedges. Young pods and seeds are eaten as vegetable. Leaf paste in water used for healing ulcers and root extract in honey for cholera.

PONGAMIA Vent. *nom. cons.*

Pongamia pinnata (L.) Pierre. Fl. For. Cochinch. Sub. t. 385. 1899. *Cytisus pinnatus* L.

'*Karamji*' (Konk.).

Evergreen trees. Leaves alternate, imparipinnate. Leaflets coriaceous, broadly ovate or elliptic, glabrous. Flowers white with purple tinge, in axillary racemes. Pods elliptic-oblong, compressed, smooth.

Fls. & Frts. April - December.

Locality : Bicholim : Amona, Gomti river bank. Salcete : Margao.

Notes : Frequent along river banks in association with mangroves. The seed oil is used in tanning industry, soap making etc. Root paste as fish poison. Good manure for pot plants.

SESBANIA Scop.

Sesbania sesban (L.) Merrill. in Philip. J. Sci. Bot. 7: 235. 1912.

Aeschynomene sesban L.; *Sesbania aegyptiaca* (Poir.) Pers.
'*Sewari*' (Mar.).

Large shrubs or small trees. Leaflets pale-green, linear-oblong, glabrous. Flowers purple, in axillary, pendulous racemes. Pods linear-cylindric, pendulous, torulose, beaked.

Fls. & Frts. : August - October.

Locality : Ponda : Daboli, Zuari river bank.

Notes : Occasional, along the swampy river bank.

SMITHIA Ait.

Smithia conferta Sm. in Rees. Cyclop. 33 No. 2. 1819. *S. geminiflora* Roth. var. *Conferta* Baker.

Annual herbs. Leaflets subsessile. Flowers yellow in upper axils. Pods 3-6 jointed. Seeds black.

Fls. & Frts. : August - October.

Locality : *Ponda* : Panchwadi, Zuari river bank.

Notes : Frequent along with grasses near swampy river banks. Leaves are used as vegetable.

TEPHROSIA Pers.

Tephrosia purpurea (L.) Pers. Syn. Pl. 2: 329. 1807. *Cracca purpurea* L.

'*Unhali*' (Konk.).

Undershrubs. Leaves 3 - 8 cm long. Leaflets obovate to lanceolate. Flowers rosy-purple or violet in racemes. Pods flat, linear.

Fls. & Frts. : August - October.

Locality : Cumberjua canal, Mandvi river.

Notes : Frequent along open areas and river banks. The plant is used in medicine as a tonic and laxative.

VIGNA Savi

Key to species

1a. Pods glabrous	*V. trilobata*
1b. Pods hirsute :	
2a. Pods radially spreading or reflexed	*V. radiata* var. *radiata*
2b. Pods erect or suberect	*V. angularis*

Vigna angularis (Willd.) Ohwl et Ohashi in Journ. Jap. Bot. 44 (1): 29. 1969. *Dolichos angularis* Willd.; *V. radiatus* (L.) Wilczek. '*Mug*' (Konk.).

Annual, hairy herbs. Leaflets ovate to ovate-rhomboid. Flowers yellow in capitate racemes. Pods compressed, linear-oblong, hairy.

Fls. & Frts. : October - November.

Locality : *Canacona* : Maxem, Zuari river.

Notes : Infrequent, as an escape. The beans are eaten, rich in digestable proteins; twigs and plant used as cattle feed.

Vigna radiata (L.) Wilczek var. **radiata**; Verdcourt in Kew Bull. 24: 559. 1970. *Phaseolus radiatus* L.

'*Udid*' (Mar.).

Slender, trailing or twining herbs. Leaflets ovate, ovate-rhomboid. Flowers yellow in capitate racemes. Pods straight or curved, linear, cylindric.

Fls. & Frts. : August - December.

Locality : Canacona . Maxem, Zuari river bank.

Notes : Frequent along the river banks. Cultivated widely in India. The beans give dal eaten after cooking, rich in proteins; twigs used as cattle feed.

V. trilobata (L.) Verdcourt in Taxon 17: 172. 1968. *Dolichos trilobatus* L.; *Phaseolus trilobus* auct. *non* L.

'*Ran-math*' (Konk.).

Trailing or suberect herbs. Leaflets ovate to ovate-elliptic. Flowers yellow, in capitate racemes. Pods linear-cylindric, glabrous.

Fls. & Frts. : August - October.

Locality : *Pondai* : Borim bridge, Panchwadi.

Notes : Frequent in moist placed. A good soil binder and can be used for green manuring. Leaf decoction in irregular fever, green pods as cattle feed.

FLACOURTIACEAE

HYDNOCARPUS Gaertn.

Hydnocarpus laurifolia (Dennst.) Sleumer in Encl. Jahrb. 69: 33, 86. 1938. *Munnicksia laurifolia* Dennst.

'*Kavamthi*' (Konk.).

Trees, 12 - 15 m high. Leaves ovate, oblong or lanceolate, acuminate, entire or serrate. Flowers solitary or in small racemes. Fruits globose or obovoid, tomentose.

Fls. & Frts. : March - October.

Locality : *Salcete* : Gonsua beach.

Notes : A common tree inside and along the forest edges of Goa (Rao, 1985). Occasionally, it occurs near sandy beach in Goa. Seed oil of commerce, used in leprosy and other skin diseases; fruits as fish poison and wood for furniture and as fuel.

FLAGELLARIACEAE

FLAGELLARIA L.

Flagellaria indica L. Sp. Pl. 333. 1753.

'*Silon*' (Konk.).

Reed like climbers. Leaves lanceolate, base rounded, apex narrowed into spiral tendril. Flowers white in panicles. Drupes pisiform, red.

Fls. & Frts. : Not seen.

Locality : Goa (Dalgado, 1898).

Notes : Cooke (1908) based on Stocks and Delzell & Gibson's collection, reported this species as common in S. Konkan, near sea-coast among rocks. Rao (1985) included this species based on Dalgado's record.

GOODENIACEAE

SCAEVOLA L.

Scaevola taccada (Gaertn.) Roxb. Fl. Ind. 1: 527. 1824. *Lobelia taccada* Gaertn.

'*Tarkoth*' (Konk.).

Shrubs, 1 - 3 m high. Leaves alternate, obovate, obtuse, sessile. Flowers white in short, axillary, dichotomous cymes. Fruits subglobose, lobed, succulent, white with persistent calyx lobes at top.

Fls. & Frts. : June - December.

Locality : Goa (Dalgado, 1898).

Notes : Since this paper plant is common along the west coast of India, Rao (1985) included this species based on Dalgado's record. A good soil binder and medicinal.

LAMIACEAE

Key to Genera

1a. Flowers white; corolla hooded — LEUCAS

1b. Flowers blue; corolla not hooded — HYPTIS

HYPTIS Jacq.

Hyptis suaveolens (L.) Poit. in Ann. Mus. Hist. Nat. Par. 7:

472. t. 29. f. 2. 1806. *Ballota suaveolens* L.

Hairy herbs. Leaves ovate, hairy. Flowers in axillary and terminal whorls. Nutlets blackish-brown, obovoid.

Fls. & Frts. : August - October.

Locality : *Canacona* : Maxem, Zuari river bank.

Notes : Frequent along the river bank. Occasionally occurs on exposed rocky areas and in wastelands. Shoot tops are edible. A good green manure and cattle feed.

LEUCAS R. Br.

Leucas lavandulaefolia Rees, Cyclo. 20 (2) : 1819. *L. linifolia Spreng.*

'*Goma*' (Mar.).

Herbs. Leaves linear-lanceolate. Flowers white in terminal and axillary whorls towards ends of branches. Nutlets minute, brown.

Fls. & Frts : March - December.

Locality : *Ilhas* : Panaji sea-coast. Ponda : Madkai top, Zuari river. *Salcete* : Cortalim - Margoa. *Canacona* : Palelum beach.

Notes : Common weed along the sandy sea-coast. Also found occasionally near river bank. An aromatic plant used for seasoning, leaves eaten as pot herb and as cattle feed. Leaf poultice applied on wounds.

LENTIBULARIACEAE

UTRICULARIA L.

Utricularia caerulea L. Sp. Pl. 18. 1753.

Scapes erect. Leaves linear-oblong, subobtuse. Flowers bluish-purple, in lax racemes. Capsules ovoid, enclosed in enlarged sepals.

Fls. & Frts. : September - October.

Locality : Quepem : Mahakhajan, Curchorim.

Notes : An insectivorous plant found along the swampy places in association with *Acrostichum aureum*. Occasional.

LOGANIACEAE

Key to genera

1a. Herbs; capsule wedge-shaped — CYNOCTONUM

1b. Trees; berry globose — STRYCHNOS

CYNOCTONUM J. F. Gmel.

Cynoctonum mitreola (L.) Britton in Mem. Torrey Bot. Club 5: 258. 1894. **Ophiorrhiza mitreola** L.

Herbs. Leaves oblong, acute to acuminate. Flowers, sessile in 2 to 3 - chotomous cymes. Capsules with 2 horn like projections at apex.

Fls. & Frts. : August - October.

Locality Salcete : Margao.

Notes Occasional, on rocky sea-shores.

STRYCHNOS L.

Strychnos nux-vomica L. Sp. Pl. 189. 1753.

'*Kajro*' (Konk.).

Trees up to 3 m high. Leaves elliptic, sub-acute, shining. Flowers many, greenish-white in terminal, paniculate cymes. Fruits orange-red when ripe.

Fls. & Frts. : March - November.

Locality Pernem : Kiranpani, Tiracol river bank. *Marmugao* : Hansa beach. Vasco.

Notes : Frequent near swampy river bank, occasionally occurs near sea-shore. This plant is also recorded as common along forest edges in Goa (Rao, 1985). Ripe seeds constitute Nuxvomica drug-toxic in large doses, low dose tonic and used in nervous disorder; wood for furniture.

LORANTHACEAE

DENDROPHTHOE Mart.

Dendrophthoe falcata (L.f.) Etting. in Denks. Akad. Wissen. Math.-Nat. Cl. 32: 52 - 53 & 58, t. 13. f. 14. 1872. *Loranthus falcatus* L.f.

'*Bemdram*' (Konk.).

Shrubs, dichotomously branched. Leaves elliptic-oblong, obovate

or ovate-lanceolate. Flowers white, pinkish or red in unilateral spikes. Berries ovoid, red.

Fls. & Frts. April - October.

Locality Canacona : Maxem.

Notes : A parasitic plant, occasionally associated with mangroves. Shoot tannin used for making soft leather. Bark is a good remedy for asthma and menstrual disorders.

LYTHRACEAE

Key to genera

1a. Herbs

2a. Flowers axillary, solitary or in terminal spikes ROTALA

2b. Flowers in axillary clusters AMMANIA

1b. Shrubs or trees LAGERSTROEMIA

AMMANIA L.

Ammania baccifera L. Sp. Pl. ed. 2. 175. 1762.
'*Dadmari*' (Konk.).

Herbs. Leaves linear-oblong or elliptic-lanceolate, sessile. Flowers red. Capsules minute, red.

Fls. & Frts. : August - November.

Locality : *Ilhas* : Miramar beach, Panaji. *Marmugao* Hansa beach, Vasco.

Notes : On moist sandy-places, frequent. Leaves used in skin troubles and entire plant as strong purgative.

LAGERSTROEMIA L.

Lagerstroemia parviflora Roxb. Pl. Cor. 1: 47. t. 66. 1795.
'*Nano*' (Konk.).

Trees, 9 - 18 m high. Leaves ovate-lanceolate or elliptic-oblong. Flowers white, fragrant. Capsules ovoid or ellipsoid, deep-brown.

Fls. & Frts. : March - December.

Locality Canacona : Palelum beach.

Notes : Occasional, near the sea-coasts. Wood used for construction work and fuel.

ROTALA L. sensu amp. Koehne

Rotala densiflora (Roth) Koenhe in Bot. Jahrb. 1: 164. 1880. *Ammania densiflora* Roth.

Herbs. Leaves oblong. Flowers red, axillary. Capsules globose, reddish or pinkish.

Fls. & Frts. : August - November.

Locality Marmugao : Hansa beach, Vasco.

Notes : Frequent in moist places, associated with AMMANIA, ERIOCAULON and LUDWIGIA species.

MALVACEAE

Key to genera

1a. Styles connate upto apex; calyx entire or 5 - toothed — THESPESIA

1b. Styles free; calyx distinctly divided.

2a. Carpels separating at maturity :

3a. Flowers in dense heads — MALACHRA

3b. Flowers axillary, solitary or in clusters

4a. Involucre bracts present — URENA

4b. Involucre bracts absent :

5a. Ovule one in each cell — SIDA

5b. Ovules two or more in each cell — ABUTILON

2b. Carpels not separating at maturity — HIBISCUS

ABUTILON Miller

Abutilon glaucum (Cav.) Sweet, Hort. Brit. 54. 1826. *Sida glaucum* Cav.

Grey tomentose undershrubs. Leaves broadly ovate or sub-orbicular. Flowers bright yellow or tinged red. Fruits orbicular, depressed at top villous.

Fls. & Frts. : August - October.

Locality : *Quapem* : Betul beach.

Notes : Frequent along the sandy sea-coast.

HIBISCUS Medic.

1a. Herbs or shrubs *H. furcatus*

1b. Trees *H. tiliaceus*

Hibiscus furcatus Roxb. ex DC. Prodr. 1: 449. 1824. *H. aculeatus* Roxb.

'*Vadloran bhendo*' (Mar.).

Undershrubs. Leaves broadly ovate or sub-orbicular, strigosely hairy. Flowers lemon-yellow with purple base within, axillary, solitary. Capsules ovoid, pointed, silky hairy.

Fls. Frts. : September - November.

Locality Ponda : Borim. *Marmugao* : Cortalim. *Salcete* on way to Margao.

Notes : Common along the Zuari river bank. Leaves are acidic, eaten as a vegetable. Stem fibre used for ropes.

H. tiliaceus L. Sp. Pl. 694. 1753.

'*Khari kapusi*, '*Belipata*' (Konk.).

Trees. Leaves roundish-ovate, acuminate, entire or crenulate. Flowers yellow, turning red, in terminal racemes. Capsules globose, 5 - valved.

Fls. & Frts. : January March.

Locality . Pernem : Tiracol river bank (Dalgado, 1898).

Notes : Frequent along the swampy river banks in association with mangroves. This species is fairly common in estuarine region of Maharashtra and Karnataka (Rao, 1985). This 'Mallow tree' is a good soil binder. Its bark fibre is very strong and used for ropes, mats etc.

MALACHRA L.

Malachra capitata (L.) L. Syst. ed. 12, 2: 458. 1767. *Sida capitata* L.

'*Vanbhendi*' (Mar.).

Herbs or undershrubs. Leaves orbicular, suborbicular or slightly ovate. Flowers yellow in terminal, capitate head. Ripe carpels white, wedge-shaped.

Fls. & Frts : September - December.

Locality : Marmugao : On way to Cortalim, Zuari river.

Notes : Frequent weed along the river banks associated with mangroves.

SIDA L.

Sida rhombifolia L. Sp. Pl. 684. 1753.

'*Tupkati*' (Konk.).

Herbs. Leaves ovate-cuneate, glabrous on upper side. Flowers yellow, axillary, solitary and clustered at ends of branches. Fruits globose.

Fls. & Frts. : October - December.

Locality Ponda : Panchwadi. *Quepem* : Curchorim.

Notes : Frequent weed along the Zuari river bank in association with mangroves.

THESPESIA Soland. ex Correa

Thespesia populnea (L.) Soland. ex Correa in Ann. Mus. Hist. Nat. Paris 9: 290. 1807. *H. populneus* L.

'*Khari kapuse*' (Konk.).

Trees, 8 - 15 m high. Leaves ovate, cordate, stellately tomentose beneath. Flowers yellow, pendulous, axillary, solitary. Capsules globose.

Fls. & Frts. : November - May.

Locality : *Pernem* : Tiracol river bank, Arambel sea-beach. *Bicholim* : Amona, Gomti river bank. *Ilhas* : Panaji. *Ponda* : Borim, Zuari river bank.

Notes : Common along the river banks and sea-coasts, naturalized. A good saline tolerant species. Wood used for timber, tannin, as a fuel and its bark fibre for cordage. Leaves, flowers & fruits are antiseptic and applied in skin diseases.

URENA L.

Urena lobata L. Sp. Pl. 692. 1753.

'*Tupkata*' (Konk.).

Herbs or undershrubs. Leaves broadly ovate or nearly orbicular,

slightly lobed. Flowers rosy, axillary, solitary. Fruits globose.

Fls. & Frts. : October - March.

Locality Ilhas : Panaji. *Ponda* : Borim, Panchwadi.

Notes : Common weed along the river banks near mangroves. Stem fibre used for ropes, cordage and cuttings for paper pulp.

MELASTOMATACEAE

MELASTOMA L.

Melastoma malabathricum L. Sp. Pl. 390. 1753.
'*Nakeri*' (Konk.).

Hairy, much branched shrubs. Leaves ovate-oblong or lanceolate-oblong, hairy. Flowers large in terminal panículate cymes.; calyx strigosely hairy. Fruits broadly ovoid, truncate.

Fls. & Frts : March - November.

Locality : *Pernem* : Kiranpani, Tiracol river bank.

Notes : Common along the river banks and streams near mangroves. Leaves, flowers and fruits are eaten. Fruit's purple dye used in preparation of ink.

MELIACEAE

Key to genera

1a. **Stems with buttresses and arial roots; leaves paripinnate; seeds without aril** XYLOCARPUS

1b. Stems without buttresses and arial roots; leaves imparipinnate; seeds with aril AMOORA

AMOORA Roxb.

Amoora lawii (Wt.) Bedd. in Fl. Sylv. t. 133. 1871. *Nimmonia lawii* Wt.

'Burumb' (Mar.)

Trees. Leaves imparipinnate; leaflets 1 - 2 pairs and an odd one, elliptic or oblong-lanceolate. Flowers white in axillary, much branched panicles. Fruits buff coloured, pyriform.

Fls. & Frts. : December - January.

Locality : Goa (Dalgado, 1898).

Notes : Along the swampy river banks in association with mangroves.

XYLOCARPUS Koen.

Xylocarpus granatum Koen. Naturf. 20: 2. 1784. *Carapa obovata* Bl.

Trees up to 20 m high; trunk base with well developed buttresses. Leaves unijugate, compound; leaflets obovate, apex rounded, base tapering. Inflorescence mixed, in axillary, irregularly branched thyrses. Flowers white with a reddish gland within; calyx 4 - lobed; petals 4, free. Fruits large, 30 - 40 cm across, glabrous in septafragal capsules, 4-valved. Seeds 10 - 15, pyramid-shaped with a corky testa.

Fls. & Frts. Throughout the year.

Locality Along East and West coast of India (Banerjee et al 1989); Goa (Untawale et al. 1988).

MILLINGTONIACEAE

MILLINGTONIA L.f.

Millingtonia hortensis L.f. Suppl. 291. 1781.
'*Akasnimb*' (Konk.).

Trees. Leaflets ovate or ovate-rhomboid. Flowers fragrant, pendent in panicles at ends of branches.

Fls. & Frts. : October - December.

Locality : *Marmugao* : Cortalim, Zuari river.

Notes : **Planted or naturalized along the river bank. Its wood is exploited for furniture and ornamental work.**

MIMOSACEAE

Key to genera

1a. **Stamens definite, 4 - 10** MIMOSA

1b. **Stamens indefinite** :

2a. **Mostly armed trees, shrubs or woody climbers** ACACIA

2b. **Unarmed trees** ALBIZIA

ACACIA Mill.

Acacia pennata (L.) Willd. Sp. Pl. 4: 1090. 1806. *Mimosa pennata* L.

'*Sambo*' (Konk.).

Scandent shrubs with numerous hooked or straight prickles. Leaves 2 - pinnate; leaflets linear-oblong. Flowers creamy-white, in panicles; heads globose. Pods flat, strap-shaped.

Fls. & Frts. : May - October.

Locality : *Sanguem* : River bank, near Taripento.

Notes : Frequent along the river bank in association with EXCOECARIA and PANDANUS species. Bark contains a strong tannin. Leaves and bark used in teeth and gum troubles.

ALBIZIA Durazz

Albizia lebbeck (L.) Benth. in Hook. Lond. Journ. Bot. 3: 87. 1844. *Mimosa lebbeck* L.

'*Siras*' (Konk.).

Trees, 8 - 20 m high. Leaves pinnate; Leaflets elliptic-oblong or ovate. Flowers white, in globose umbellate heads. Pods linear-oblong.

Fls. & Frts. : March - September.

Locality : *Canacona* : Maxem, Zuari river bank.

Notes : Occasional along the river banks and streams. Wood used for fuel and furniture; bark for tannin and leaves as a good manure and for fodder.

MIMOSA L.

Mimosa pudica L. Sp. Pl. 518. 1753.

'*Lajalu*' (Mar.).

Prostrate, hairy, armed herbs. Leaves digitate; pinnae 2 pairs; leaflets linear-oblong. Flowers bright pink, axillary and in terminal, racemose heads. Pods falcate, hispid.

Fls. & Frts. : September - January.

Locality : *Ponda* Panchwadi. *Canacona* Maxem.

Notes Common in moist areas of river banks near Mangroves. A good green manure and soil binder plant. Tender leaves used as a cattle feed; leaf paste for swellings and leaf juice appiled on hydrocele, piles, sores etc. for dressing.

MORACEAE

FICUS L.

Ficus asperrima Roxb. Fl. Ind. 3: 554. 1832.

'*kharvami*' (Konk.).

Trees, 6 - 12 m high. Leaves ovate, obovate or broadly elliptic, scabrid. Receptacles globose, hispid, solitary, axillary. Achenes obovoid-oblong, pale-brown, minutely tuberculate.

Receptacles : March - October.

Locality : *Pernem* : Tiracol river bank on way to Keri beach.

Notes Occasional along the swampy river bank. Wood used as a fuel and cheap domestic articles of daily use. Bark juice in water is given in spleen & liver enlargement (Agarwal, 1986).

MYRSINACEAE

AEGICERAS Gaertn.

Aegiceras corniculatum (L.) Blanco, Fl. Fillip. ed. 1, 79. 1837. *Rhizophora corniculata* L.; *Aegiceras majus* Gaertn.

'*Kamdlam*' (Konk.).

Evergreen trees with milky sap, 3 - 5 m. high. Leaves coriaceous, obovate-oblong, ovate, cuneate at base, obtuse at apex. Flowers white, sessile in umbellate cymes. Fruits reddish or cinnamon-brown, cylindric, curved falcately.

Fls. & Frts. : February - October.

Locality : *Bicholim* : Tirla. *Ilhas* : Chorao-Island, Panaji. *Ponda*: Near Borim, Madkai top, Zuari river. *Marmugao* : Near Sancole. *Canacona* : Gazibag-Sadulsa area on way to Maxem.

Notes : Scattered in marshy and saline areas along the river banks with *Acanthus ilicifolius* spp. and *Rhizophora mucronata*. Dalgado (1898) records it as common along the banks of Agua and Salgada. Bark is useful for tannin (7%), as fish poison and wood as fuel.

MYRTACEAE

SYZYGIUM Gaertn.

Syzygium heyneanum Wall. ex Wt. & Arn. Prodr. 1: 329. 1834. *Eugenia heyneana* Duthie.

'*Bedas*' (Mar.).

Large shrubs or small trees. Leaves opposite, oblong-lanceolate or elliptic-lanceolate. Flowers white, on leafless wood. Berries oblong or ellipsoid, pale-purple.

Fls. & Frts : March - June.

Locality : *Quepem* : River bank. *Canacona* : Ordofond.

Notes : Common on river beds.

OLEACEAE

CHIONANTHUS SW.

Chionanthus malabarica (Wall. ex G. Don) Bedd., For. Man. Bot. 154. 1872 & Fl. Sylv. t. 239. 1842. *Linociera malabarica* Wall. ex G. Don.

'*Heddi*' (Mar.).

Small trees. Leaves coriaceous, elliptic-oblong, obtuse. Flowers yellowish-white, fragrant, in axillary fascicled cymes. Drupes ellipsoid.

Fls. & Frts. : November - March.

Locality : *Salcete* : Majorda, near Gonsua beach; Zuari Island.

Notes : Occasional along the sea-coast and Island in Zuari river. Rao (1985) also records the plant as rare along streams edges in Canacona taluka.

ONAGRACEAE

LUDWIGIA L.

Ludwigia hyssopifolia (G. Don) Exell in Garcia de Orta 5: 574. t. 2. 1957. *Jussia hyssopifolia* G. Don.

Small, suffruticose, branched herbs. Leave lanceolate, cuneate, acute. Flowers 4- merous, solitary, axillary. Capsules cylindric, enlarged in the upper part.

Fls. & Frts : August - October.

Locality : *Ponda* : Near Borim bridge; Panchwadi, Zuari river bank.

Notes Frequent along the river banks.

ORCHIDACEAE

VANDA R.Br.

Vanda tessellata (Roxb.) Hook. ex G. Don in Lond. Hort. Brit. 372. 1830. *Epidendrum tessellatum* Roxb.; *Vanda roxburghii* R. Br. '*Rasana*' (Konk.).

Herbs. Leaves linear-oblong, coriaceous. Flowers 2 - 10, greenish-yellow, lip bluish, dotted with purple in racemes. Capsules oblong, sharply winged.

Fls. & Frts.: August - October.

Locality : *Ponda* : Borim, Zuari river bank.

Notes : An epiphytic orchid frequently found on RHIZOPHORA trees. Leaf paste in water reduces high fever.

PANDANACEAE

PANDANUS L.

Pandanus tectorius Soland. ex Parkinson, Journ. Voy. H.M.S.

Endeavour 46. 1773. *P. fascicularia* Lam.

'*Kegdi*' (Konk.).

Large shrubs or small trees. Leaves linear-ensiform, spiny on margins and mid-rib. Flowers dioecious; spadix of male flowers much branched, numerous in spikes; spadix of female flowers simple.

Fls. & Frts. : July - October.

Locality : *Pernem* : Arambel beach. *Salcete* Gonsua beach. *Sanguem* : River bank.

Notes : Frequent along the sandy coast and swampy river banks with mangroves. Flowers yield essential oil *keora attar* used as condiment. Leaves as fibre for thatching, green leaves useful for skin, heart and brain diseases. Blasco (1975) has also mentioned this plant along with *Clerodendrum inerme*, *Acanthus ilicifolius* etc. under back mangroves.

PASSIFLORACEAE

PASSIFLORA L.

Passiflora foetida L. Sp. Pl. 959. 1753.

'*Valighani*' (Mar.).

Tendril climbers. Leaves ovate-triangular, 3 - lobed. Flowers axillary, solitary. Berries globose, orange-red when ripe.

Frts. & Frts. : August - December.

Locality : *Ilhas* : Panaji. *Marmugao* : Hansa beach, Vasco.

Notes A native of tropical America, introduced in gardens and frequently occurs as an escape or naturalized. The plant is a good green manure.

PEDALIACEAE

SESAMUM L.

Sesamum indicum L. Sp. Pl. 634. 1753.

'*Dhavo-til*' (Konk.).

Glandular-pubescent herbs. Leaves linear-lanceolate, lobed. Flowers bright yellow. Capsules oblong or ovoid, 4 - gonous.

Fls. & Frts. : July - December.

Locality : *Ponda* : Borim. *Ilhas* : Panaji. *Marmugao* : Near Vasco. *Quepem* : Betul beach.

Notes : Usually cultivated, but found frequently as an escape along the river banks and sea shore. Seed oil edible. Leaf and root extract promote hair growth and its mucilaginous juice kills hair lice.

PERIPLOCACEAE

Key to genera

1a. Leaves with many lateral veins united to form intramarginal nerves; corolla lobes yellowish, contorted — CRYPTOLEPIS

1b. Leaves with few lateral veins not united intramarginally; corolla lobes greenish or ochre, valvate — HEMIDESMUS

CRYPTOLEPIS R.Br.

Cryptolepis buchanani Roem. & Schult. Syst. Veg. 4: 409. 1819
'*Karnata*' (Mar.).

Woody twiners with latex. Leaves elliptic-oblong. Flowers creamy-yellow in terminal and axillary cymes. Follicles narrowly deltoid-conical.

Fls. & Frts.: April - October.

Locality : *Ponda* : Banastari bridge, Panchwadi, Zuari river bank. *Canacona* : Maxem, Ordofond.

Notes : Frequent along the river bank associated with *Excoecaria agallocha*, *Derris trifoliata* etc. Plants yield fibre used for cordage and clothes by tribals.

HEMIDESMUS R. Br.

Hemidesmus indicus (L.) Schult. in Roem. & Schult. Syst. Veg 6 : 125. 1819. *Periploca indica* L.
'*Anant-vel*' (Mar.); '*Uparsal*' (Konk.).

Twining or trailing herbs. Leaves linear to linear-lanceolate or elliptic-oblong. Flowers few, in axillary fascicles. Follicles slender, striate.

Fls. & Frts. : September - May.

Locality : *Ponda* : Panchwadi. *Canacona* : Maxem, Ordofond.

Notes : Frequent along the Zuari river bank, associated with mangroves. Its aromatic roots used as tonic, in fever, skin diseases and as blood purifier.

PIPERACEAE

PEPEROMIA Ruiz. & Pav.

Peperomia pellucida (L.) H.B.K., Nov. Gen. 1 64. 1815. *Piper pellucidum* L.

Slender, subfleshy herbs, rooting at lower nodes. Leaves broadly ovate, membranous, glabrous. Flowers minute, in terminal or leaf opposed spikes. Ripe nuts minute, ovoid, black.

Fls. & Frts. : August - November.

Locality : *Marmugao* : Marmugao harbour, Hansa beach, Vasco.

Notes : Common in moist places near river bank and sea-coast. The plant is used as vegetable, crushed leaves in headache & fever and juice in abdominal pains.

PLUMBAGINACEAE

AEGIALITIS Br.

Aegialitis rotundifolia Roxb. Fl. Ind. 2: 111. 1832.

Shrubs. Leaves alternate, coriaceous, broadly ovate-elliptic or spherical, glabrous. Flowers white, in panicled racemes. Capsules linear.

Fls. & Frts. : Not seen.

Locality Mangrove scrub forests along the banks of Mandovi and Zuari river.

Notes : The plant has been included based on Rangel (1980), who records it along the banks of Mandovi and Zuari river in association with *Avicennia officinalis* and *Excoecaria agallocha*. Dalgado (1898), Cooke (1901-08) and Rao (1985) have not recorded this plant. We also could not collect the same. Its bark contains tannin and wood used for turnary purposes and making boxes, toys, etc.

POACEAE

Key to genera

1a. Spikelets 2 - flowered. Upper floret hermaphrodite or the male or barren, the latter often reduced to lemma or absent; all alike or differing in size and shape

2a. Spikelets paired with one sessile and pedicelled, each pair similar or dis-similar; glumes as long as the spikelets and enclosing florets; upper lemma usually awned — ISCHAEMUM

2b. Spikelets solitary or paired, more or less similar; the lower glume smaller or suppressed; lower lemma mostly resembling the upper lemma and usually awnless :

3a. Spikelets mostly unisexual; clums creeping — SPINIFEX

3b. Spikelets all similar shape & sex; clums erect or sub-erect — ECHINOCHLOA

1b. Spikelets 1 to many flowered. The lower floret male or barren and upper floret hermaphrodite, laterally compressed or terete; the glumes and lemma all membranous

4a. Glumes minute or suppressed; fertile lemma and palea not similar in shape and texture — PORTERESIA

4b. Glumes well developed; fertile lemma and palea not similar :

5a. Spikelets with 2 florets; the lower male or barren, the upper hermaphrodite — ISACHNE

5b. Spikelets with one fertile floret :

6a. Spikelets falling entire at maturity from the axis & awned. Spikes purple; inflorescence not panicle — PEROTIS

6b. Spikelets very rarely falling entire awnless; inflorescence a panicle — SPOROBOLUS

ECHINOCHLOA P. Beauv.

Echinochloa frumentacea Limk. Hort. Berol. 1: 204. 1827.
'*Somva*' (Konk.).

Tufted annuals, 60 - 70 cm high. Leaves linear-lanceolate. Panicles pyramidal. Spikes solitary or gemminate, straight or falcate, lax or compact. Spikelets ovoid.

Fls. & Frts. : October - January.

Locality Ponda : Borim, Tonka, Unir, Zuari river. *Quepem* Curchorim, Zuari river bank.

Notes : This species was found frequently along the swampy bank of river 'Zuari', associated with *Sonneratia caseolaris* and *Avicennia* spp. (See PLATE D, Fig. 4). It is also recorded as rare in rice fields (Rao, 1985). This 'Japanese Barnyard Millet' is a good soil binder and used as green manure crop and cooked with rice by villagers, given to birds and also employed as fodder.

ISACHNE R. Br.

Isachne globosa (Thunb.) O. Kuntze, Rev. Gen. Pl. 2: 778. 1891. *Milium globosum* Thunb. *Isachne australis* R. Br.

Slender herbs. Leaves lanceolate, ovate-lanceolate or linear, flat. Panicles ovoid or pyramidal. Spikelets globose, green or purple.

Fls. & Frts. : August - October.

Locality : *Ponda* : Agapur. *Salcete* : Margoa. *Quepem* : Curchorim.

Notes : Abundant in rice fields and marshy area in association with *Avicennia marina*. The plant is used as a good cattle feed.

ISCHAEMUM L.

Key to species

1a. Margins of the lower glume of sessile spikelet expanded below the middle — *I. indicum*

1b. Margins of the lower glume of the sessile spikelet narrowly and evenly inturned from base to apex

2a. Leaves 6 - 15 cm long; linear-lanceolate, deeply cordate or sagittate at base *I. semisagittatum*

2b. Leaves not more than 6 cm long; ovate-acute or oblong-acute, cordate or truncate but not sagittate at base *I. tumidum*

Ischaemum indicum (Houtt.) Merrill in Journ. Arn. Arbor. 10: 320. 1938. *Phleum indicum* Houtt.; *Ischaemum* auct. *non* L.

Herbs, villous at nodes. Leaves linear to linear-lanceolate, flat, hairy. Spike like racemes spreading or appressed to each other. Spikelets green, reddish or violet, ovate, obovate or oblong.

Fls. & Frts : September - November.

Locality : *Bicholim* : Near Amona, Gomti river bank. *Salcete* Margoa to Quepem.

Notes : Common in moist areas and along river banks with mangroves and used as cattle feed.

I. semisagittatum Roxb. Fl. Ind. 1: 322. 1820.

Glabrous annuals. Leaves oblong-lanceolate, broadly cordate or sagittate at base. Racemes more or less villous. Sessile spikelets awned; pedicellate ones shorter and narrower.

Fls. & Frts. : September - October.

Locality : *Salcete* : On way to Margao. *Canacona* : Polem beach.

Notes : Frequent on sandy or loamy soil along the sea-coast and river beds.

Ischaemum tumidum Stapf. ex Bor. in Kew Bull. 1951: 450. 1952.

Erect or suberect, tufted herbs. Leaves linear, rounded or shallowly cordate at base. Racemes swollen, usually in pairs. Lower glume oblong, acute, scabrous; upper glume 3 - nerved, villous.

Fls. & Frts. : September - October.

Locality : *Canacona* : Polem beach.

Notes : Infrequent along the sea-coast.

PEROTIS Ait.

Perotis indica (L.) O. Kuntze, Rev. Gen. Pl. 2: 787. 1891. *Anthoxanthum indicum* L.; *Perotis latifolia* Ait.

Slender, erect herbs. Leaves lanceolate to ovate-lanceolate, flat. Spikelets compact, violet-purple. Spikelets subterete, linear scabrous.

Fls. & Frts. : October - November.

Locality : *Pernem* : Tirakhol river bank. *Ilhas* : Panaji sea-coast. *Salcete* : Gonsua Beach.

Notes : Frequent, on sandy soil along sea coast. This is also a

good soil binder and fodder grass.

PORTERESIA Takeoka

Porteresia coarctata (Roxb.) Takeoka, Bull. Nat. Sci. Muss. Tokyo 8: 406. 1965. *Oryza coarctata* Roxb.

Erect perennials. Leaves coriaceous, linear, caudate-acuminate, spinulose, serrate. Panicles spiciform, branched with trigonous rachis. Spikelets cartaceous, imbricate; floral glume solitary, lanceolate, boat-shaped, nerved, cuspidate with white awn.

Fls. & Frts. : August - October.

Locality : *Marmugao* : Sancole area on Vasco road, Zuari river bank.

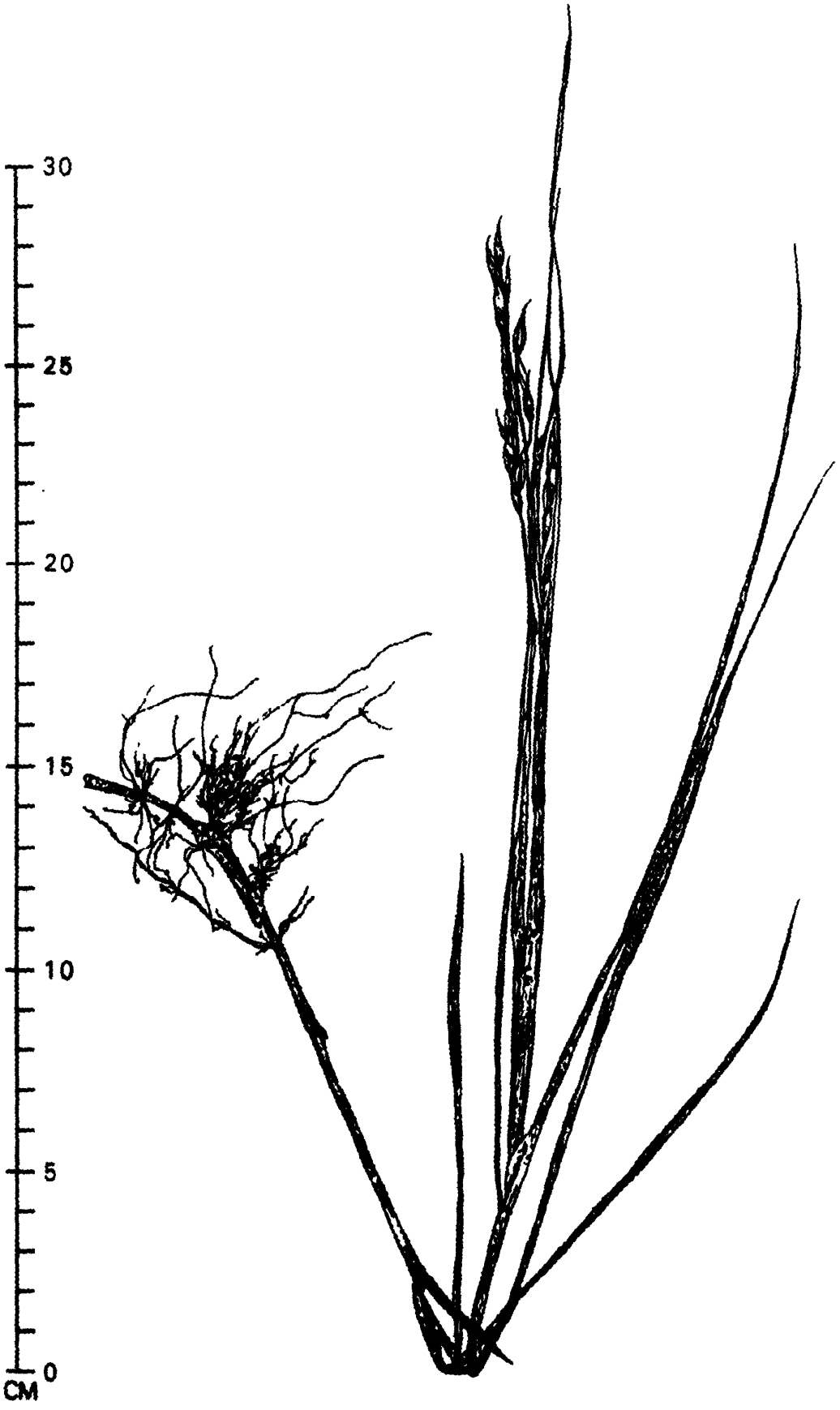
Notes : This halophytic grass is a good soil binder and occurs occasionally along the swampy river banks in association with other mangroves. R.S. Rao (1985) has not recorded this species from Goa. T.A. Rao (1971) also has not mentioned this species in his 'Maritime strand Flora of India' Naskar and Guha Bakshi (1987) records this species in tidal forests and islands of 'Sundarbans' (W. Bengal) in East coast. Hence, present collection from Goa in west coast of India is interesting.

SPINIFEX L.

Spinifex littoreus (Burm. f.) Merr. in Philip. Journ. Sci. Bot. 7: 229. 1912. *Stipa littorea* **Burm. f.**; *Spinifex squarrosus* L.

'*Saramto*' (Konk.).

Creeping, diocious shrubs. Leaves rigid, bluish-green, thickly coriaceous, spinous tipped. Inflorescence a large, terminal, stiff, globose



Porteresia coarctata **Takeoka**

bracteate head. Pistillate spikelets solitary, in dense umbels; staminate spikelets in radiating racemes.

Fls. & Frts. : November - April.

Locality : Ilhas : Panaji coastal area. *Canacona* : Agonda beach.

Notes : Common on sandy soil along the sea-coast. This soil binding grass controls soil erosion in coastal as well as in desert areas. Dried grass used as fuel.

SPOROBOLUS R. Br.

Sporobolus virginicus (L.) Kunth, Rev. Grahn. 1: 67. 1829. *Agrostis virginica* L.

Perennials, erect or basally geniculate from decumbent, woody creeping base. Leaves distichous, narrow and almost terete. Panicles subspiciform, interrupted.

Fls. & Frts. : September - October.

Locality : *Ponda* : Near Borim bridge, Zuari river.

Notes : Occasional along the river banks. Cooke (1908) has not recorded this species from Bombay Presidency. Rao (1985) records this species from Diu in association with AVICENNIA along back-waters. Hence present record of this species from Goa is interesting and an additional information. A good fodder and soil binder grass.

RHAMNACEAE

ZIZIPHUS Mill.

1a. Scrambling shrubs; leaves distichous, acute or acuminate — *Z. enoplia*

1b. Trees; leaves not distichous, rounded at both ends *Z.mauritiana*

Ziziphus mauritiana Lam. Encycl. 3: 319. 1789. *Z. jujuba* (L.) Gaertn.

'*Ber*' (Mar.); '*Bar*' (Konk.).

Trees. Leaves ovate, ovate-oblong or suborbicular. Flowers greenish-yellow or creamy-white in axillary fascicles. Drupes globose ovoid or ellipsoid, reddish-yellow.

Fls. & Frts. : September - March.

Locality : *Pernem* : Keri beach. *Canacona* : Maxem, Zuari river bank.

Notes : Frequent along the sandy sea-coast. Occasionally found near river bank. Fresh fruits are eaten. Bark used for tanning and wood for fuel, gunstock and light articles.

Z. oenoplia Mill. Gard. Dict. ed. 8, No.3. 1768.

'*Eramdi*' (Mar.).

Scandent or climbing, armed shrubs. Leaves ovate to ovate-lanceolate, rufous - silky - pubescent beneath. Flowers greenish-yellow. Fruits globose or obovoid, orange coloured.

Fls. & Frts. : August - November.

Locality : *Pernem* : Tiracol river bank. Ponda : Panchwadi, Zuari river.

Notes : Frequent along the river banks in association with *Excoecaria agallocha*, *Derris trifoliata*. Fruits are edible and used in healing of wounds.

RHIZOPHORACEAE

Key to genera

1a. Flowers axillary peduncled, 1 to many flowered; calyx 8-14 lobed; bracteoles absent; petals 2 - lobed — BRUGUIERA

1b. Flowers axillary in 2 to 3 chotomously branched cymes; calyx 4 - 6 lobed; bracteoles present; petals not lobed :

2a. Calyx 4 - lobed; petals without apical appendages — RHIZOPHORA

2b. Calyx 5 - 6 lobed; petals with apical appendages :

3a. Calyx lobes ovate; stamens 10 - 12; hypocotyle ridged, up to 25 cm long — CERIOPS

3b. Calyx lobes linear-oblong; stamens more than 12; hypocotyle smooth, up to 40 cm long — KANDELIA

BRUGUIERA Lam.

Key to species

1a. Flowers solitary, 3 - 4 cm long; mature calyx red to pinkish-red; calyx tube not reflexed — *B. gymnorrhiza*

1b. Flowers more than two, up to 1.6 cm long; mature calyx not red; calyx tube slightly or completely reflexed in fruits :

2a. Calyx tube smooth — *B. cylindrica*

2b. Calyx tube ribbed — *B. parviflora*

Bruguiera cylindrica (L.) Blume, Enum. Pl. Jav. 1: 93. 1827. *Rhizophora cylindrica* L.; *Bruguiera caryophlloides* (Burm. f.) Blume.

Large trees with smooth, greyish bark. Leaves thin elliptic, broadly lanceolate or oblanceolate, acute, base cuneate, 5.2 10.5 x 2.4 4.5 cm. Flowers 2 - 3, greenish-white, in axillary cymes; calyx tube smooth, not ribbed, lobes 8 - 10. Fruits oblong-obovoid; hypocotyl cylindric, ribbed, often curved, 2 - 14.5 cm. long.

Fls. & Frts. : August - October.

Locality : *Ilhas* Chorao Island, Mandovi river.

Notes : Rare along the swampy island near Panaji in Mandovi river. The plant is used for tannin, timber and fuel.

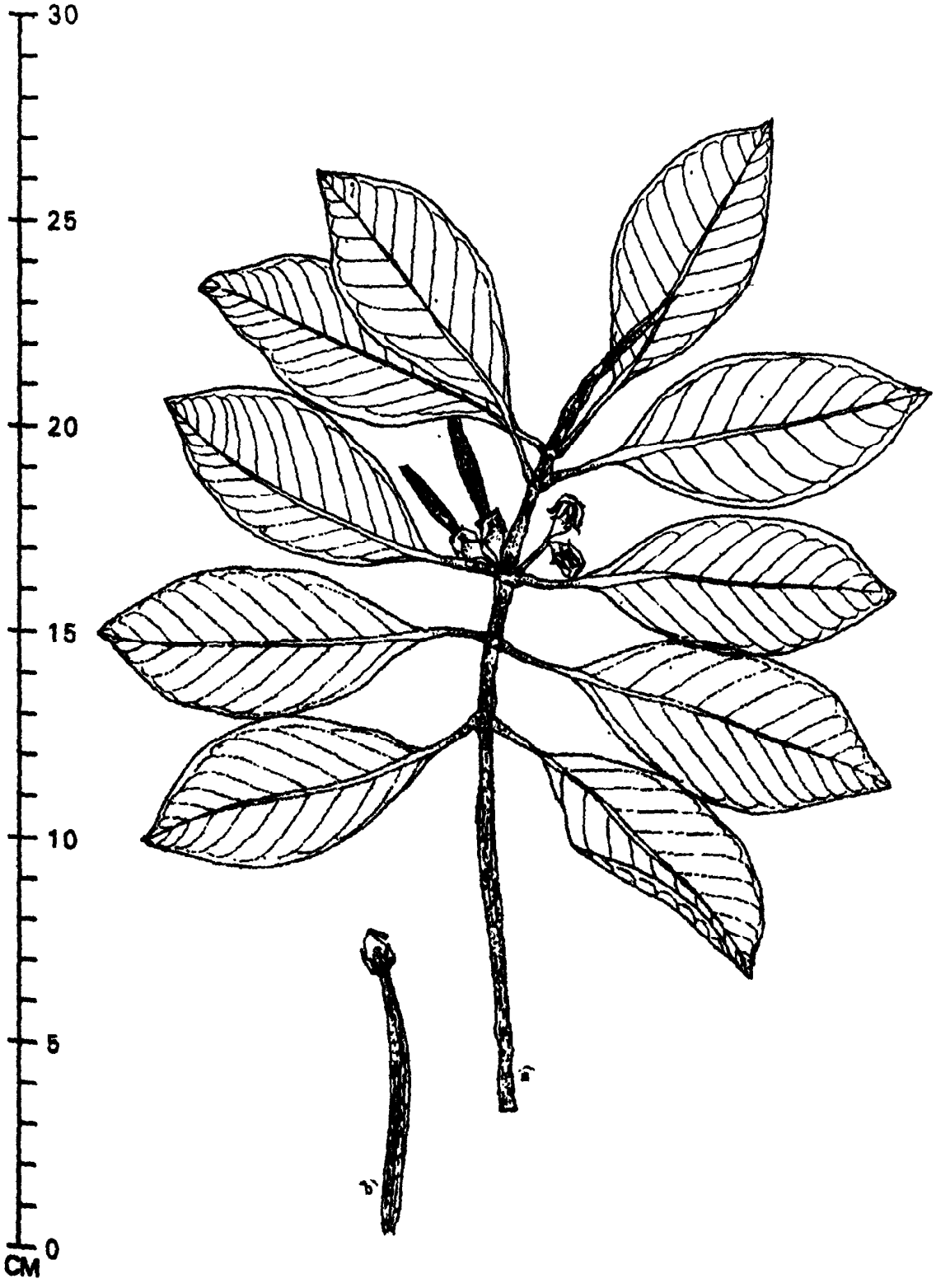
B. gymnorrhiza (L.) Lam. Ill. t. 379. 1797 & Encycl. 4: 696. 1798. *Rhizophora gymnorrhiza* L. '*Sanvar*' (Mar.); '*Impli*' (Konk.).

Evergreen large shrubs or small trees. Leaves elliptic or elliptic-oblong, glabrous. Flowers axillary, solitary; calyx lobes reddish. Fruits obconical, crowned with persistent calyx lobes; hypocotyl fusiform, smooth, not curved, up to 30 cm long.

Fls. & Frts. : August - April.

Locality : *Ilhas* : Chorao island, Mandovi river, Panaji. *Marmugao* : Sancole area on Vasco road. Ponda Near Borim bridge, Borim along Zuari river bank. *Canacona* : Maxem along Zuari river bank.

Notes : This species was found scattered and infrequent along the swampy banks of river Mandovi and Zuari, in association with RHIZOPHORA species. Rao (1985) has also recorded this plant as occasional in the shady areas, along the sea-coast and salt marshes.



Bruguiera cylindrica Bl.
a. Fruiting branch. b. A fruit with hypocotyle.

Fruits are edible and its wood used for general construction work. The plant is good as a climate purifier and soil binder. Bark yields tannin.

Bruguiera parviflora (Roxb.) Wight & Arn. ex Griff. Prodr. 311. 1834. *Rhizophora parviflora* Roxb.

Trees, up to 15 m high, with many upright branches; stem base buttressed with knee roots. Leaves simple, opposite, decussate, elliptic-oblong, apex retuse, base attenuate, exstipulate, petiolate. Inflorescence axillary, pedunculate cymes. Flowers 2-3, greenish-white; calyx tube cylindrical, up to 2 cm long in fruit, narrow, ribbed; sepals 8; petals 8, yellowish-white, bilobed, terminal part with 3 long cilia, margin sparsely hairy. Stamens 16. Carpels 3, stigma 2, bifid. Fruits berry, pendulous; hypocotyle. 7 - 12 cm long cylindrical, slightly curved in the middle.

Fls. & Frts. April - September.

Locality : Goa.

Notes : In tidal forests. Fruits are used in medicine for eye diseases and its knee-bent roots yield a perfume (Banerjee et al. 1989).

CERIOPS Arn.

Key to species

1a. Petals with terminally 3 - clavate appendages anthers shorter than filaments; hypocotyle up to 25 cm long with sharp end — *C. tagal*

1b. Petals without clavate appendages, terminally ciliated; anthers longer than filaments; hypocotyle up to 12 cm long, apex blunt — *C. decandra*

Ceriops decandra (Griff.) Ding Hou, Fl. Males. Ser. I. 5(4): 471. 1958. *Bruguiera decandra* Griff.; *C. roxburghiana* Arn.

'Yellow mangrove'

Shrubs or small trees, 2 - 5 m high; stem base pyramidal with many stilt roots. Leaves opposite decussate, exstipulate, elliptic-oblong or obovate, apex emarginate, base cuneate. Inflorescence c 1 cm long in condensed axillary cymes, Flowers 6 - 10, white, axillary. Calyx 5 - 6 merous, whitish-yellow. Petals 5 - 6, oblong, apex tipped with many ciliae. Stamens 20, free. Carpels 3, united; ovary inferior, style one, stigmas 3. Fruits capsule; hypocotyle angular, sulcate.

Fls. & Frts. : Almost throughout year.

Locality : Goa (Untawale et al. 1988)

C. tagal (Perr.) C.E. Robin. Philipp. J. Sci. Bot. 3: 306. 1908. *Rhizophora tagal* Perr.

'Yellow mangrove'

Small trees, upto 6 m high, stem base pyramidal, buttressed and with stilt roots. Leaves ovate-oblong or obovate, apex rounded or emarginate, base cuneate. Flowers white, resinous, in upper, axillary, condensed cymes; calyx 5 - lobed; petals 5 with 3 clavate appendages at the tip and uncinate hairs at base. Stamens 10, alternately long and short. Fruits conical; hypocotyle 20 - 25 cm long, reddish-brown, deeply grooved and ribbed.

Fls. & Frts. : March - August.

Locality : Goa (Untawale et al. 1988).

Notes : Decoction of stem is substitute for quinine in Africa (Cooke, 1957). Its bark is useful for tanning material and to stop haemorrhage

and as an application to malignant ulcers (Banerjee et al. 1989).

KANDELIA Wt. & Arn.

Kandelia candel (L.) Druce in Rep. Bot. Cl. Brit. Isles. 3: 420. 1914. *Rhizophora candel* L.; Kandelia rheedii .Wt. & Arn.
'*kandal*' (Mar.), '*Chipin*' (Konk.).

Large shrubs or small trees. Leaves simple, elliptic-oblong, obtuse, glabrous. Flowers 4 - 9, white in axillary cymes. Fruits cylindric or obclavate with reflexed calyx lobes.

Fls. & Frts. : June - November.

Locality : Pernem : On way to Keri beach near Kiranpani. *Bicholim* : River bank near 'Amona village'. Ilhas : Chorao Island, Mandovi river. Ponda : Borim, Candola ('Khandola') area near Banastari; Daboli, Madkai top along Zuari river bank. *Quepem* Curchorim. *Canacona* : Ordofond - Sadashivgad, 5 km., Maxem.

Notes : Common along the muddy river banks in the shade of other mangroves like *Avicennia officinalis* and RHIZOPHORA species. **Bark of this plant is rich in tannins (14%) and used for dyeing clothes (red & brown). Medicinally, with ginger & pepper, used in diabetes. Wood for fuel and charcoal. A good green manure and soil binding plant.**

RHIZOPHORA L.

Key to species

1a. **Leaves oblong-lanceolate, shortly mucronate. Flowers sessile; petals glabrous** *R. apiculata*

1b. **Leaves elliptic, long mucronate. Flowers pedicellate; petals villous on inner faces and margins** *R. mucronata*

Rhizophora apiculata Blume, Enum. Pl. Jav. 1: 91. 1827. *R. conjugata auct. non* L.

'*Vank*' (Konk.).

Large shrubs or small trees; young branches with leaf scars. Leaves elliptic-lanceolate, acute at apex, tapering at base. Flowers white, in axillary 2 flowered cymes, shorter than petioles. Fruits conical or obclavate, rugose, glabrous.

Fls. & Frts. Bicholim : Amona ferry crossing, muddy banks of river Goa ('Gomti'). Tirla. *Ilhas* Chorao island and Bird Sanctuary, Ridander area, Panaji, Mandovi river bank. *Marmagao* : Sacole area, on Vasco road. *Canacona* : Maxem, Zuari river.

Notes Frequent along the swampy areas with other mangroves and epiphytic ferns; though Rao (1985) records it rare, this plant was found frequently and abundantly especially in Maxem (Canacona). Bark is used for tanning and wood for timber and fuel. Root decoction useful for blood pressure.

R. mucronata Lam. Encycl. 6: 189. 1804.

'*Kandal, Dumbi*' (Mar.); '*Komdlam*' (Konk.).

Evergreen trees. Leaves elliptic-oblong or broadly ovate, coriaceous, glabrous, nigro-punctate beneath. Flowers creamy-white, subsessile in pedunculate cymes. Fruits ovoid-conical, crowned by persistent calyx lobes.

Fls. & Frts. : August - January.

Locality : Pernem : Kiranpani on way to Keri beach, Tiracol river bank. Bardez : *Chapora*. Ilhas : Chorao island and Sanctuary, Ridander area, Panaji, Mandovi river bank; *Ponda* : Near Borim bridge, Borim, Panchwadi, Zuari river. *Quepem* : Curchorim. *Canacona* : Maxem.

Notes : Fairly common along the swampy river banks of Goa, in association with other Mangroves. Bark is very rich in tannins and about 15% used in industries for tanning and dyeing. Its wood for construction and resin as adhesive. Fruits are sweet and eaten.

RUBIACEAE

Key to genera

1a. Erect, prostrate or climbing herbs. :

2a. Seed one in each cell — BORRERIA

2b. Seeds numerous in each cell — OLDENLANDIA

1b. Shrubs or trees

3a. One calyx lobe expanded into a white or coloured leaf — MUSSAENDA

3b. Calyx lobe neither coloured nor expanded :

4a. Fruit berries, globose, orange or purple — IXORA

4b. Fruits didymous drupes, green to yellow — CANTHIUM

BORRERIA G.F.W. Meyer nom. cons.

Borreria articularis (L.f.) F.N. Will. in Bull. Herb. Boiss. II, 5: 956.1905. *Spermacoce articularis* L.F.; S. hispida L.

'*Gedo*' (Konk.).

Procumbent or suberect herbs, hispid in younger parts. Leaves elliptic or elliptic-lanceolate, pubescent. Flowers rosy-purple or lilac, in

axillary clusters. Capsules oblong, apiculate.

Fls. & Frts. : August - October.

Locality : *Pernem* : Tiracol river bank. Bardez : Calangute beach. *Ilhas* : Panaji, coastal area.

Notes : Common along the river bank and sea-coast. Leaves as a vegetable, seeds are edible and as a substitute for coffee.

CANTHIUM Lam.

Canthium parviflorum Lam. Encycl. Meth. Bot. 1: 602. 1785. *Plectronia parviflora* Bedd.

Shrubs. Leaves ovate, obovate or suborbicular. Flowers many in pedunculate cymes or sometimes fascicled. Fruits green to yellow, oblong-ellipsoid, didymous.

Fls. & Frts. : August - October.

Locality : *Canacona* : Palelum beach.

Notes : Occasional, along the sea-coast. Fruits and leaves are edible. Bark used in dysentery and wood for turnery work.

IXORA L.

Ixora coccinea L. Sp. Pl. 110. 1753.
'*Pendgul*'(Mar.); '*Podkali*' (Konk.).

Shrubs. Leaves elliptic-oblong, sometimes obovate. Flowers red, scarlet or yellow in terminal, paniculate cymes. Berries rounded, globose,

orange or purple.

Fls. & Frts. : Salcete : Gonsua beach. Canacona Polem beach.

Notes : Frequent along the sea-coasts. Wood used for tool handles and as a fuel. Roots and leaves are useful in stomach disorders and flowers for bronchitis, eye lotion, leucorrhoea etc.

MUSSAENDA L.

Mussaenda glabrata (Hook. f.) Hutchin. ex Gamble, Fl. Pres. Madras 610. 1921. *M. frondosa* L.

'*Sarvadi*' (Konk.).

Large rambling shrubs. Leaves broadly elliptic, acuminate, glabrous above, minutely pubescent below. Flowers dark-orange or deep golden-yellow in terminal cymes. Berries subglobose or obovoid.

Fls. & Frts.: March - November.

Locality Pernem : Pernem - Bicholim. *Quepem* : Curchorim area, Zuari river bank.

Notes : This tropical plant is not mangrove but found frequently along with mangroves near river banks. Leaves and flowers are edible. Leaves as green manure and leaf paste is antiseptic and applied on ulcers.

OLDENLANDIA L.

Oldenlandia herbacea (L.) Roxb. Fl. Ind. 1: 424. 1820. *Hedyotis herbacea* L.

Erect herbs. Leaves linear or linear-lanceolate. Flowers pale - or

bright-purple, axillary. Capsules ovoid or subglobose.

Fls. & Frts. : March - November.

Locality : Pernem : Keri beach. *Ilhas* Miramar, Panaji. *Salcete* : Gonsua. *Canacona* : Maxem, Ordofond.

Notes : Frequent along the sea-coasts and river bank.

SCROPHULARIACEAE

Key to genera

1a. Corolla two-lipped — LINDERNIA

1b. Corolla not two-lipped :

2a. Shrubs or undershrubs — SCOPARIA

2b. Herbs — BACOPA

BACOPA Aubl. nom. cons.

Bacopa monnieri (L.) Pennell in Proc. Acad. Nat. Sci. Philad. 98: 94. 1946. *Lysimachia monnieri* L.; *Moniera cuneifolia* Mich. '*Brahmi*' (Konk.).

Creeping, fleshy herbs. Leaves obovate-oblong or spathulate. Flowers pale-blue or purple, axillary, solitary. Capsules ovoid, apiculate.

Fls. & Frts. : September - October.

Locality : *Ponda* : Borim bridge, Zuari river. *Quepem* : Makhajan, Curchorim.

Notes : This marshy herb is found frequently along the river banks of Goa. Rao (1985) has also recorded it in moist areas as rare. This plant is nerve tonic and good for heart, epilepsy, hysteria etc. Leaves eaten as vegetable.

LINDERNIA Allioni

Key to species

1a. Flowers white — *L. parviflora*

1b. Flowers blue or violet — *L. anagallis*

Lindernia anagallis (Burm.f.) Pennell in Jour. Arn. Arb. 24: 252. 1943. *Ruellia anagallis* Burm.f.

Erect herbs. Leaves broadly elliptic to ovate-oblong, entire. Flowers blue or purplish. Capsules ovoid or ellipsoid, twice as long as the calyx.

Fls. & Frts. : September - May.

Locality : Ponda : River bank near Tonka village.

Notes : Common in moist areas along the river banks.

L. parviflora (Roxb.) Haines, Bot. Bihar & Orissa 635. 1922. *Gratiola parviflora* Benth.

Erect herbs. Leaves ovate-oblong or elliptic-lanceolate. Flowers white, axillary, solitary and in terminal racemes. Capsules obtuse or subacute at ends.

Fls. & Frts. : August - November.

Locality Ponda : Tonka, Zuari river.

Notes : Infrequent along the river bank.

SCOPARIA L.

Scoparia dulcis L. Sp. Pl. 116. 1753.

Shrubs or undershrubs. Leaves broadly elliptic-lanceolate or spathulate. Flowers white, axillary, solitary or few fascicled. Capsules subglobose, pale-brown, 5 - valved.

Fls. & Frts. : August - May.

Locality : Bicholim : Gomti river bank, near Amona village.

Notes Common as a weed in moist shady areas along the river banks near mangroves. Roots in tanning and leaf infusion used in fever, cough and bronchitis.

SOLANACEAE

Key to genera

1a. Fruiting calyx much enlarged, enveloping the berry :

2a. Corolla yellow; fruiting calyx bladdery — PHYSALIS

2b. Corolla blue or with a purple tinge; fruiting calyx 5 - angled, not bladdery — NICANDRA

1b. Fruiting calyx not enlarged — DATURA

DATURA L.

Datura metel L. Sp. Pl. 179. 1753. D. fastuosa L.

'*Dhavo dhutro*' (Konk.).

Herbs. Leaves broadly ovate-triangular, entire or shallowly lobed. Flowers white or tinged purple or wholly purple, axillary, solitary. Capsules drooping with stout tubercles.

Fls. & Frts. : September - October.

Locality : *Canacona* Palelum beach. *Quepem* Betul beach.

Notes : Frequent along the sandy sea-coasts. Green leaves used for dyeing clothes and possess property of healing wounds. Roots and seeds are also useful medicinally.

NICANDRA Adans. nom. cons.

Nicandra physaloides (L.) Gaertn. Fruct. 2: 237. t. 131. f. 2. 1791. *Atropa physaloides* L.

'*Ran-popti*' (Mar.)

Erect herbs. Leaves ovate-oblong. Flowers bluish-purple, axillary, solitary, pedicellate. Berries globose.

Fls. & Frts. August - October.

Locality : *Quepem* : Betul beach.

Notes : A native of Paru found as an escape or frequently naturalized along the sea-coast and muddy creeks. Leaf extract used to kill head-lice and seed oil in varnish.

PHYSALIS L.

Physalis minima L. Sp. Pl. 183. 1753.

'Chirputi' (Konk.)

Herbs. Leaves ovate or elliptic-oblong. Flowers yellow, axillary, solitary. Berries orange-coloured.

Fls. & Frts. : August - November.

Locality : *Ilhas* : Panjim sea shore. Ponda : Panchwadi, Zuari river bank.

Notes : Frequent along the river banks and sandy sea-shore. Fruits and leaves are edible. Fruits are tonic and purgative. Leaf juice in mustard oil used in ear-ache.

SONNERATIACEAE

SONNERATIA L.f. nom. cons.

Key to species

1a. Petals absent — *S. apetala*

1b. Petals present :

2a. Leaves mucronate with apical nobs; flowers reddish-purple with flattened calyx tube — *S. caseolaris*

2b. Leave emucronate without apical nobs; flowers white with cup-shaped calyx tube — *S. alba*

Sonneratia alba J. Sm. in Rees Cyclop. 2: 33. 1819; DC. Prodr. 3: 231. 1828.

Small trees up to 5 m high; stem much branched, pneumatophores many, corky. Leaves glabrous, 5 7.4 x 4 6 cm, elliptic, oblong or suborbicular, apex obtuse, base narrowed. Flowers white; calyx tube cup-shaped, 6-8 lobed; lobes obscure in flower, distinct in fruits; petals white, small; ovary depressed globose, style one, stigma capitate. Fruits obconical 1.3 cm in diam., with persistent calyx and pointed style.

Fls. & Frts. : April - September.

Locality : Goa (Naskar & Mandal, 1999).

Sonneratia apetala Buch.-Ham. in Symes, Embassy Ava, 3 313. 1800.

Evergreen trees up to 15 m high. Leaves oblong-lanceolate, obtuse, thick. Flowers 3 - together, large; calyx cup shaped, with short style. Capsules depressed globose.

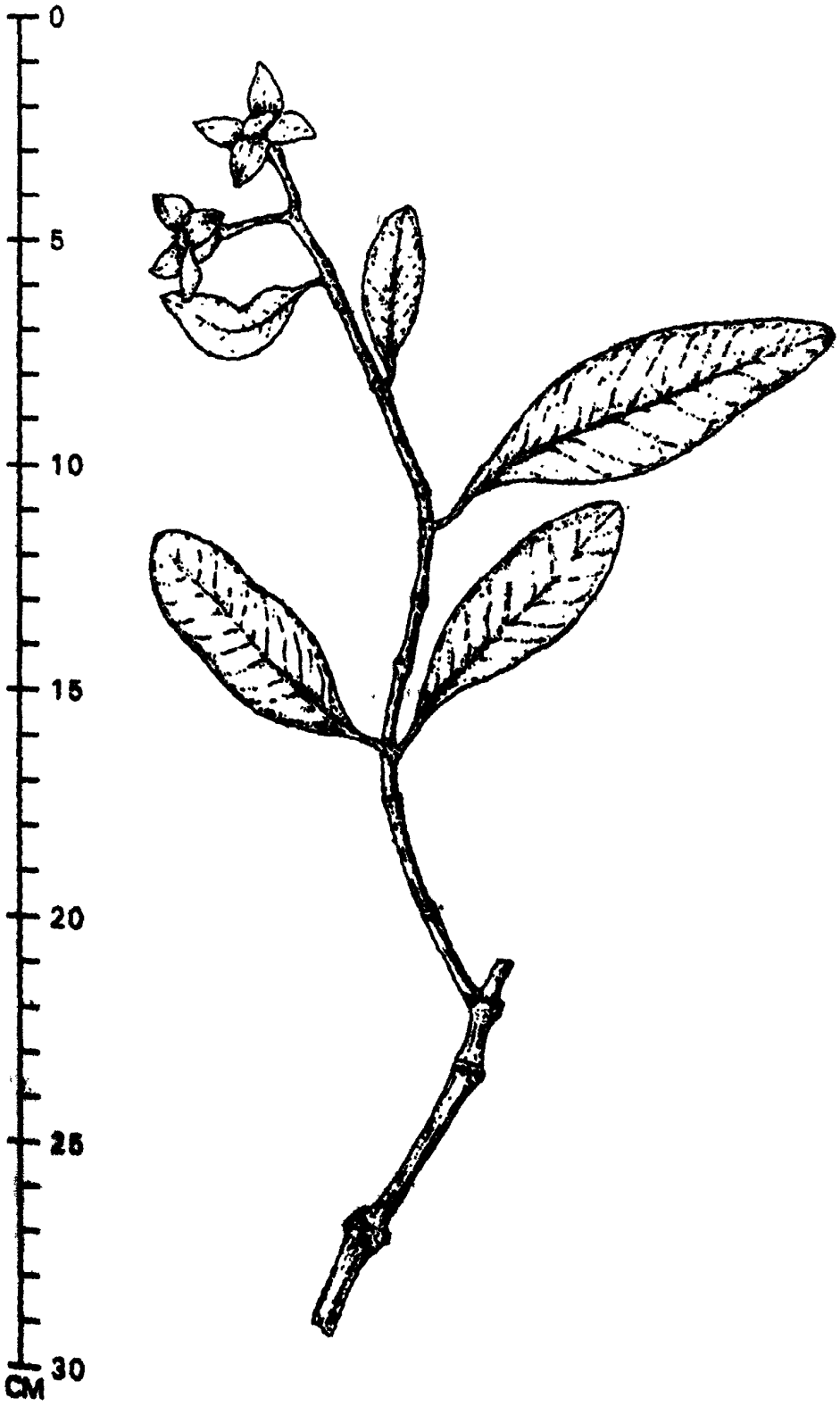
Fls. & Frts. : February.

Locality : Along the banks of river Mandovi and Zuari.

Notes : Rangel (1980) recorded this species along the swampy river banks of Goa. Rao (1985) has recorded the same not from Goa, but from Daman as rare in saline marshy areas. We also could not trace out this plant during our two visits to coastal region of Goa. Bark used in tanning and unripe fruits eaten in curries; wood for furniture, boat making and as a fuel.

S. caseolaris (L.) Engl. in Engl. & Prantl, Nachtr. 261. 1897 emend. Sm. in Rees, Cycl. 33. 1819. *Rhizophora caseolaris* L., *Sonneratia acida* L.f.

'*Ambeti*' (Konk.).



Sonneratia apetala Buch.-Ham.

Small trees, c 5 m. high. Leaves nearly sessile, obovate, obtuse. Flowers dark-rose coloured, terminal, solitary; style very long. Capsules cushion-shaped with persistent calyx-lobes.

Fls. & Frts. : March - November.

Locality : *Pernem* : Tiracol river bank on way to Keri beach. Colvate ferry crossing. *Bicholim* : River bank near Amona village. *Bardez* : River bank near Chapora. *Ilhas* : Chorao island and bird sanctuary, Mandovi river bank, Panaji. *Ponda* : Borim bridge, Panchwadi, Unir, Daboli, Zuari river bank. *Quepem* : Makhajan, Curchorim. Canacona : Maxem.

Notes : This species is fairly common along swampy river banks in coastal area, in association with *Kandelia candal*, RHIZOPHORA spp. etc. Bark used for tannin and wood for fuel. Fruits are edible. Its fermented juice used as vermifuge in blood haemorrhage.

STERCULIACEAE

HERITIERA Ait.

Heritiera littoralis Dryand in Ait. Hort. Kew ed. 1. 5 (3): 546. 1789.

'*Sundri*' (Mar.).

Moderate sized trees. Leaves elliptic-oblong, white beneath with flat scales, petiolate. Flowers pinkish in much branched clusters. Fruits oblong or broadly ovoid, woody, smooth or tubercled.

Fls. & Frts. : July - October.

Locality : Kalanadi river bank, near border of Goa & Karnataka (Cooke, 1901).

Notes : Based on Cooke, Rao (1985) mentions the possible occurrence of this species along Mandovi & Zuari river bank in Goa. Since this species is reported from Maharashtra & Karnataka and throughout the coastline of India (Rao, 1971; Naskar & Guha Bakshi, 1987), the plant has been included here also. The wood of this 'Looking glass' plant is valuable for carpentry, boat-building and for fuel.

TACCACEAE

TACCA Forst.

Tacca leontopetaloides (L.) O. Kuntze, Rev. Gen. Pl. 2: 704. 1891. *Leontice leontopetaloides* L.; *Tacca pinnatifida* J.R. & G. Forst.

Erect herbs. Leaves solitary, variously lobed, lobes deep-green, prominently veined beaneath. Flowers greenish-yellow, drooping, densely umbellate. Fruits ovoid, 6 - ribbed, yellow.

Fls. & Frts. : August - November.

Locality : *Salcete* : Gonsua beach. Canacona : Maxem, Zuari river.

Notes : Frequent along the sea-coast and river banks. Tubers are edible and good for piles, dysentery and diarrhoea.

TILIACEAE

Key to genera

1a. **Petals glandular or foveolate at base; fruits indehiscent**

2a. Fruits spiny; herbs or undershrubs — TRIUMFETTA

2b. Fruits not spiny; shrubs or trees — MICROCOS

1b. Petals not glandular or foveolate at base; fruits dehiscent — CORCHORUS

CORCHORUS L.

Key to species

1a. Capsule depressed globose, warty, without beak — *C. capsularis*

1b. Capsule longer than broad, not warty, beaked — *C. aestuans*

Corchorus aestuans L. Syst. Nat (ed. 10) 1079. 1758. *C.acutangulus auct. non* Forssk.

'*Chunch*' (Mar.)

Prostrate herbs. Leaves broadly ovate, ovate-oblong. Flowers small, yellow, solitary or fascicled, extra axillary or leaf-opposed. Capsules 3 - winged, beak trifid, each segment again 2 - fid.

Fls. & Frts. : September - November.

Locality : *Ponda* : Panchwadi, Zuari river bank. *Canacona* : Palelum beach.

Notes : Usually, occurs as a weed in cultivated fields and in waste places. Often, found frequently along the river banks and sea shore, near Mangroves. Seeds useful in Pneumonia.

Corchorus capsularis L. Sp. Pl. 529. 1753.

Erect herbs or undershrubs. Leaves ovate-lanceolate. Flowers yellow, axillary or extra-axillary, solitary or fascicled. Capsules green, black on drying.

Fls. & Frts : August - November.

Locality : *Ponda* : Borim, Panchwadi, Zuari river bank.

Notes : The plant is cultivated throughout moist, hotter parts of India for its 'jute fibre' It also occurs 'frequently' as wild, escape from cultivation along the 'Zuari river bank' near Mangroves. It is 'rare' in open areas and in wastelands (Rao, 1985).

MICROCOS L.

Microcos paniculata L. Sp. Pl. 514. 1753.

Shrubs. Leaves lanceolate or elliptic-lanceolate. Flowers yellow in long panicles. Fruits obcordate or obovate deep-purple when ripe.

Fls. & Frts. : May - November.

Locality : *Ponda* : Near Banastari bridge, Zuari river. Canacona : Maxem.

Notes : Frequent along the river bank.

TRIUMFETTA L.

Triumfetta rhomboides Jacq. Enum. Pl. Carib. 22. 1760.

Undershrubs. Leaves 3 - lobed, broadly ovate or lanceolate towards apex. Flowers bright-yellow in axillary fascicles and in terminal interrupted

racemes. Fruits ovoid, spines eciliate.

Fls. & Frts. : July - October.

Locality : *Salcete* : Gonsua beach.

Notes : Frequent along the sandy sea-coast. Bark fibre is a good substitute of 'jute' and used for making nets, ropes etc. Roots in dysentery while bark and leaves used in diarrhoea.

VERBENACEAE

Key to genera

1a. Inflorescence dense spicate, centripetal :

2a. Erect or rambling shrubs; spikes capitate, ovoid — LANTANA

2b. Herbs; spikes long, slender — STACHYTARPHETA

1b. Inflorescence cymose, centrifugal :

3a. Leaves compound, 3-5-foliolate — VITEX

3b. Leaves simple :

4a. Erect herbs or shrubs; stamens much exserted — CLERODENDRUM

4b. Scandent shrubs; stamens scarcely exserted — PREMNA

CLERODENDRUM L.

Key to species

1a. Straggling or sub-scandent shrubs; flowers in axillary cymes — *C. inerme*

1b. Erect shrubs; flowers in terminal panicles — *C. viscosum*

Clerodendrum inerme (L.) Gaertn. Fruct. 1: 271. t. 75. 1788. *Volkameria inermis* L.

'*Vanajai*' (Mar.); '*Siritmari*' (Konk.).

Shrubs. Leaves ovate-oblong, elliptic-lanceolate or obovate, coriaceous. Flowers white. Fruits deep-purple, enclosed in persistent calyx.

Fls. & Frts. : August - October.

Locality : *Bicholim* : Island in river Gomti (Goa). *Marmugao* Hansa beach, Vasco. *Ilhas* Sea shore, Panaji; Chorao island, Mandovi river. *Canacona* : Polem beach.

Notes : Common along the sea-coast, islands and river banks in association with mangroves. Leaves used as poultice to resolve buboes and also yield a brown dye for colouring fine fibres.

C. viscosum Vent. Jard. Malm. 1: 25. 1803. *C. infortunatum auct. non* L.

'*Bhandire*' (Mar.); 'kadri'(Konk.).

Herbs or shrubs. Leaves ovate, cordate. Flowers dark-pink. Fruits spherical - ovoid, purplish-black.

Fls. & Frts. *Marmugao* : Sancole area, Zuari river bank. *Salcete* : Near Zuari island. *Canacona*: Maxem.

Notes : Frequent along the river banks. A native of tropical America, naturalized in Goa. Leaves used as bitter tonic, vermifuge; leaf-oil for making soaps; leaf and roots in tumers and skin troubles and wood as a fuel.

LANTANA L.

Lantana camera L. var. **aculeata** (L.) Moldenke in Torreya 34 9. 1934. *L. aculeata L. aculeata* L.; *L. camera auct. non* L.
'*Tantani*' (Mar.).

Straggling or scandent shrubs. Leaves ovate, scabrid pubescent. Flowers bright-pink, dark-red or orange or peripheral ones bright pink, central ones yellow or orange, in terminal cymes. Pyrenes globose, dark-greenish-black.

Fls. & Frts. : September - November.

Locality : *Pernem* : Keri beach, Tiracol river bank. *Ilhas* : Panaji along the sea-coast. *Marmugao* : Hansa beach. Vasco. *Canacona* Polem beach.

Notes : Common along the sea-coast and occasionally near river banks with back water mangroves. Leaves and twigs as green manure; leaf oil is antiseptic and used in skin itches and seed oil in rheumatism. A good soil binder and hedge plant.

PREMNA L.

Premna corymbosa (Burm. f.) Rottl. & Willd. in Gasell. Nat.

Freunde Neue Schr. 4: 187. 1803. *Cornutia corymbosa* Burm. f., *Premna integrifolia* L.; *P. serratifolia* L.

'khara-narvel' (Mar.).

Sarmentose shrubs. Leaves broadly elliptic, elliptic - oblong, obovate - oblong, hairy. Flowers greenish-white in paniculate cymes. Drupes obovoid or spherical, dark-brown or black.

Fls. & Frts. : August - October.

Locality : *Ilhas* : Chorao bird sanctuary, Panaji. *Salcete* : Sancole area near Margao; Zuari island. *Canacona* Maxem.

Notes : Common along the river bank, in association with mangroves. Rao (1985) records it as occasional on rocky exposed slopes in Goa. Though Blasco (1975) does not consider this species as a mangrove, it occurs commonly in swampy habitat along with other mangroves in Goa. The root extract is used as cardiac tonic, in stomach-ache and in liver troubles.

STACHYTARPHETA Vahl nom. cons.

Stachytarpheta jamaicensis (L.) Vahl, Enum. Pl. 1: 206. 1804. ***Verbena jamaicensis*** L.; *Stachytarpheta indica auct. non*. Vahl.

Herbs, dichotomously branched. Leaves elliptic, obtuse or acute, coarsely serrate. Flowers purple-blue in slender spikes. Fruits oblong, ribbed, splitting into 2 - pyrenes.

Fls. & Frts. : August - October.

Locality : *Quepem* : Betul beach.

Notes : Occasional as a weed along the sea-coast.

VITEX L.

Key to species

1a. Leaves simple and trifoliate, mixed; leaflets sessile — *V. trifolia*

1b. Leaves 3 - 5 - foliate; leaflets petiolate — *V. negundo*

Vitex negundo L. Sp. Pl. 638. 1753.

'*Nirgudi*' (Mar.); '*Nimgud*' (Konk.).

Shrubs or small trees. Leaflets lanceolate, petioled, grey tomentose beneath. Flowers white, blue or bluish-purple in terminal panicles. Fruits dark-purple to black, globose.

Fls. & Frts. : August.

Locality : *Pernem.* : Arambel beach. *Ilhas* Panaji, sea-coast area. *Ponda* : Borim, Tonka, Zuari river bank.

Notes : Common along the sea-coast and river banks. Seeds cooked and eaten. Wood used for construction work and as fuel while plant ash in dyeing. Medicinally, leaf juice in rheumatism, hair tonic; leaf infusion in leprosy, anti-cancer; roots as tonic in dysentery and piles; flowers in watery eyes and as vermifuge.

V. trifolia L. Sp. Pl. 638. 1753.

'*Indrani*' (Mar.).

Shrubs. Leaflets obovate-oblong, sessile. Flowers light blue-purple in lax, paniculate cymes. Fruits green to black, spherical or ellipsoid.

Locality *Bardez* : On way to Calangute beach. *Ilhas* Panaji sea-coast. *Salcete* : Colva beach.

Notes : Frequent on sandy soil along the sea-coast. The wood as fuel and the plant is used medicinally.

VITACEAE (incl. LEEACEAE)

1a. Erect shrubs without tendrils; petals connate at base; ovary 2 - celled — LEEA

1b. Climbers with tendrils; petals free or connate at top; ovary 2 - celled — CAYRATIA

CAYRATIA Juss.

Cayratia trifolia (L.) Domin in Bibl. Bot. 89, 371. 1927. *Vitis trifolia* L.

'*Ambet-bel*' (Mar.); '*Sarbari bel*' (Konk.).

Tendril climbers. Leaves trifoliolate, ovate-elliptic or obovate, pubescent. Flowers greenish-white in branched cymes. Berries globose, deep-purple.

Fls. & Frts. : May - October.

Locality : *Ilhas* : Chorao island, Panaji. *Ponda* : Borim, Panchwadi, Tonka. *Canacona* : Polem beach.

Notes : Common along the swampy river banks and sandy sea-coast associated with EXCOECARIA and LANTANA species. The leaves are used as poultice in rheumatic pains and flowers with honey in vomitting.

LEEA L.

Leea indica (Burm. f.) Merrill in Phil. J. Sci. Bot. 14: 245. 1919. *Stampylea indica* Burm. f.; *Leea sambucina* Willd.

'*Rai-dinda*' (Mar.); '*Dimdo*' (Konk.).

Undershrubs. Leaflets oblong or elliptic-oblong, glabrous. Flowers white in leaf opposed cymes. Berries depressed-globose, 2 6 lobed, dark-purple to almost black.

Fls. & Frts. : February - October.

Locality Canacona : Maxem, Zuari river bank.

Notes : Frequent along the river banks. The tender shoots are used as vegetable and leaves as green manure.

DIVISION B - CRYPTOGAMS (Non-flowering plants)

THALLOPHYTA (ALGAE)

I - CHLOROPHYTA

CLADOPHORACEAE

Chaetomorpha media (Ag.) Kutz.

This green marine alga is densely tufted with brush-like branched filaments. Thallus erect, stiff and rigid below, flexuous above. Rhizoids well developed. Vegetative filaments cylindrical, barrel-shaped.

Locality Canacona : Polem beach.

Notes : Frequent on rocky substrata along the sea-coast.

ULVACEAE

Ulva fasciata Delile

A green marine alga with large fronds, attached to the subsratum by circular or oblong hold-fasts. Thallus with distinct, flat, linear-lanceolate lobes with undulate, serrate margins.

Locality Canacona : Polem beach.

Notes : Frequent on rocky substrata, submerged under water along the sea-coast. This plant is useful as a source of food, for protein extraction.

II - PHAEOPHYTA

SARGASSACEAE

Sargassum wightii Grev.

A brown alga with disc like expanded roots; stem erect with several distichous branches. Leaves narrow linear - lanceolate, vesicles elliptical, apiculate on long dilated foliaceous stalks.

Locality : *Canacona* : Polem beach.

Notes : Frequent on rocky substrata along the sea-coast. This alga is a source of commercial iodine. It is estimated that this plant also yields 29.8% alginic acid (Srinivasan, 1969).

III - RHODOPHYTA

RHODYMENIACEAE

Rhodymenia palmata Grev.

This red alga attached to the subsratum by small discs. Fronds solitary or tufted: stipe thin, short, cylindrical to flat, wedge-shaped leaf.

Locality : *Canacona* : Polem beach.

Notes : Frequent on rocky substrata along the sea-coast. In Europe this alga was once much used as human food and eaten raw along with other algae like LAMINARIA, CODIUM etc.

PTERIDOPHYTA (Ferns)

DRYNARIACEAE

DRYNARIA J. Smith

Drynaria quercifolia (L.) J. Smith in Hook. Journ. Bot. 3: 398. 1841. *Polypodium quercifolium* L.

Epiphytes with stout rhizomes densely clothed with reddish brown hairs. Fronds coriaceous, dimorphous. Sori small, many.

Frts. : October - November.

Locality : *Ponda* : Near Borim bridge. *Canacona* : Maxem, Zuari river.

Notes : Frequent. An epiphytic fern found on *Rhizochora mucronata* (Ponda taluka) and on *R. apiculata* (Canacona) along the swampy river banks.

PTERIDACEAE

Key to genera

1a. Sori occur on the venation and the parenchyma of the whole or part of the under-surface of the frond ACROSTICHUM

1b. Sori occur on the inside the recurved margins of the fronds, at the ends of veins ADIANTUM

ACROSTICHUM L.

Acrostichum aureum L. Sp. Pl. 2 1069. 1753.

'*Ankur*' (Konk.).

Terrestrial ferns. Fronds linear-oblong, cylindric, margin entire, obtuse or retuse at apex, rounded or tapering at base. Sori on partly or whole under surface (abaxial) of the fronds, reddish-brown.

Frts. : August - November.

Locality : *Bicholim* : Ammona, Gomti river bank. *Ponda* : Daboli, Panchwadi, Zuari river bank. *Quepem* : Makhajan, Curchorim, Zuari river bank.

Notes : Rao (1985) records this littoral fern as rare in back waters from Tivem in 'Satari' taluka. During recent visit, this fern found frequently in abundance along the swampy river bank of Goa, associated with mangroves. Tender leaves are cooked and eaten as a vegetable by local people in times of scarcity. Medicinally, rhizome - paste is said to be used for boils (Naskar & Mandal, 1999).

ADIANTUM L.

Adiantum phylippense L. Sp. Pl. 1094. 1753.

'*Supli*' (Konk.).

Tufted herbs with creeping rhizomes. Fronds oblong, pinnate, sori marginal.

Frts. : September - November.

Locality Ilhas : Chorao bird sanctuary, Panaji; Mandovi river bank.

Notes : This fern was found frequently near the river banks. Rao (1985) also records it as common in the rock crevices near streams.

SCHIZAEACEAE

LYGODIUM Swartz

Lygodium flexuosum (L.) Swartz, Schrad. Journ. Bot. 1800 (2) : 106. 1801. *Ophioglossum flexuosum* L.

Climbers. Fronds with pinnules pinnate or variously lobed, serrulate. Sori protruding from margins.

Frts. : September - November.

Locality : *Marmugao* : Near Cortalim, Zuari river bank.

Notes : Frequent along the river banks, moist shady areas and on hedges along rice fields.

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INDEX TO THE FAMILIES