ENDEMIC PLANTS OF THE INDIAN REGION

Volume 1

M. AHMEDULLAH
&
M. P. NAYAR

BOTANICAL SURVEY OF INDIA

The book on "Endemic plants of Indian region, Vol. I by M. Ahmedullah and M. P. Nayar deals with the Endemic plants of Peninsular India.

Endemic floristic elements of a country of a geographical region throw light on the biogeography of the area, centres of speciation, areas of vicariance and adaptive evolution of the flora. Since endemic elements have restricted distribution from the conservation point of view, they are of great interest. In any biologically evolving system, where evolution sets in motion, extinction of the unfit in the process of natural selection is a biological necessity. However, the present day changes in the habitat and environment, are so unnatural, the species could not get evolutionary time span for survival or adaptive radiation.

Monitoring the population of endemic and rare species is important. There are procedures of analysing and categorising species. Extinct, Endangered, Vulnerable, Rare. These categories are discussed. Sometimes taxa formerly included in one of the above categories sustain and increase the population level due to effective conservation measures taken. Then these taxa become "Out of danger" (O).

This book is an attempt to enumerate the taxa under consideration. Floristic surveys of locating and monitoring such rare vulnerable and endangered species and multiplication of these species *in situ* and *ex situ* are important programmes of the Botanical Survey of India.

ENDEMIC PLANTS OF THE INDIAN REGION

FLORA OF INDIA
Series IV

ENDEMIC PLANTS OF THE INDIAN REGION

Vol. 1

PENINSULAR INDIA

M. AHMEDULLAH
&
M. P. NAYAR

BOTANICAL SURVEY OF INDIA

© Government of India, 1987

Price

Published by the Director, Botanical Survey of India
P-8, Brabourne Road, Calcutta-700001 and printed at
Deep Printers, 3/26, Ramesh Nagar, New Delhi-110015

CONTENTS

FOREWORD

The writing of this book stems from the authors longstanding interest in endemism, phytogeography and plant conservation. The authors have worked on the endemic plants of India and a series of papers on this subject have been published as noted in the list of references. After Chatterjee's (1940) publication of the Endemic flora of India, the studies on endemism did not receive appropriate attention. Since then, due to major taxonomic revisions and new discoveries, concepts of endemic taxa received fresh attention. It is felt timely to collate all new data on endemism and update the existing basic information.

Aiming the above, since the endemic taxa of India have restricted distribution in three major geographical regions of India, i.e. the Peninsular India, the Himalayan chain of mountains and the Andaman & Nicobar islands, the first volume of the series, is restricted to the endemic flowering plants of Peninsular India.

The Chapters 1-5 relate to the general concept of endemism, rarity and extinction-prone endemic species and the concept of evaluating extinction-prone or threatened taxa. Geographically, the endemism in the W. Ghats and the E. Ghats have been specially dealt with. For each family the general distribution pattern is discussed giving a brief analysis of the relevant genera. The families are broadly classified as per the arrangement of the families followed by Cronquist (1981). The species in each family have been arranged alphabetically : the name of the species is followed by its habit and known distribution. Attempt has been made to update the taxonomic nomenclature and distribution of the endemic plants herein. This book is basically a phytogeographical treatise with emphasis on the need for conservation. Shri M Ahmedullah, Senior Research Scholar of the Botanical Survey of India working under my guidance has done a good job in the final shaping of the book. I hope this book will give impetus to the conservation of rare and endemic taxa.

Botanical Survey of India
P-8, Brabourne Road
Calcutta-700001
May 15, 1986

M.P. NAYAR
Director

ACKNOWLEDGEMENTS

The arduous task of writing this book was made lighter to some extent by the selfless and often unsolicitated help rendered by a few persons. Thanks are due to Dr. K. Thothathri, Shri D.C.S. Raju, Dr. M. Sanjappa, Dr. Debika Mitra and Shri Aloke Bhattacharya for providing valuable information during our discussions on certain plant groups in which they have specialised knowledge. Thanks are also due to the Librarian, Miss. G. Roy, for her help and co-operation.

Dr. J.L. Ellis, Botanical Survey of India, Port Blair spared time for going through the manuscript and offering suggestions. The Publication Section has kindly consented to place at our disposal many line-drawings published in the Departmental publications and a word of thanks is due to all authors of papers. Few photographs included in this volume are from the Dy. Director, Western Circle and we are thankful to Dr. B.D. Sharma and Shri P.D. Modak. Dr. V.S. Agarwal and Shri S.C. Pal of the Publication Section helped expedite the process of publication of this volume and we must thank them for their constant supervision during the printing of this book. We also thank Dr. N.P. Balakrishnan for his help in correcting the proofs. Last but not the least, we are thankful to Shri Dulal Chandra Chakravorty and Shri Swapan Kumar Das for typing the manuscript.

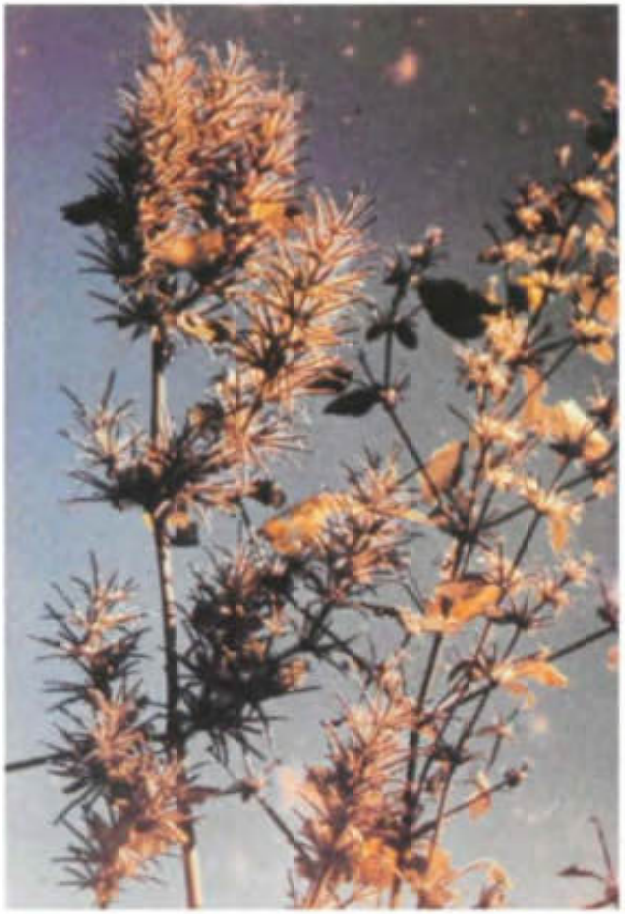
Bupleurum andhricum Nayar & Ban.

Shorea tumbuggaia Roxb.

Alysicarpus pubescens Laws. var. vasavadae (Hemadri) Sanjappa

Cycas beddomei Dyer

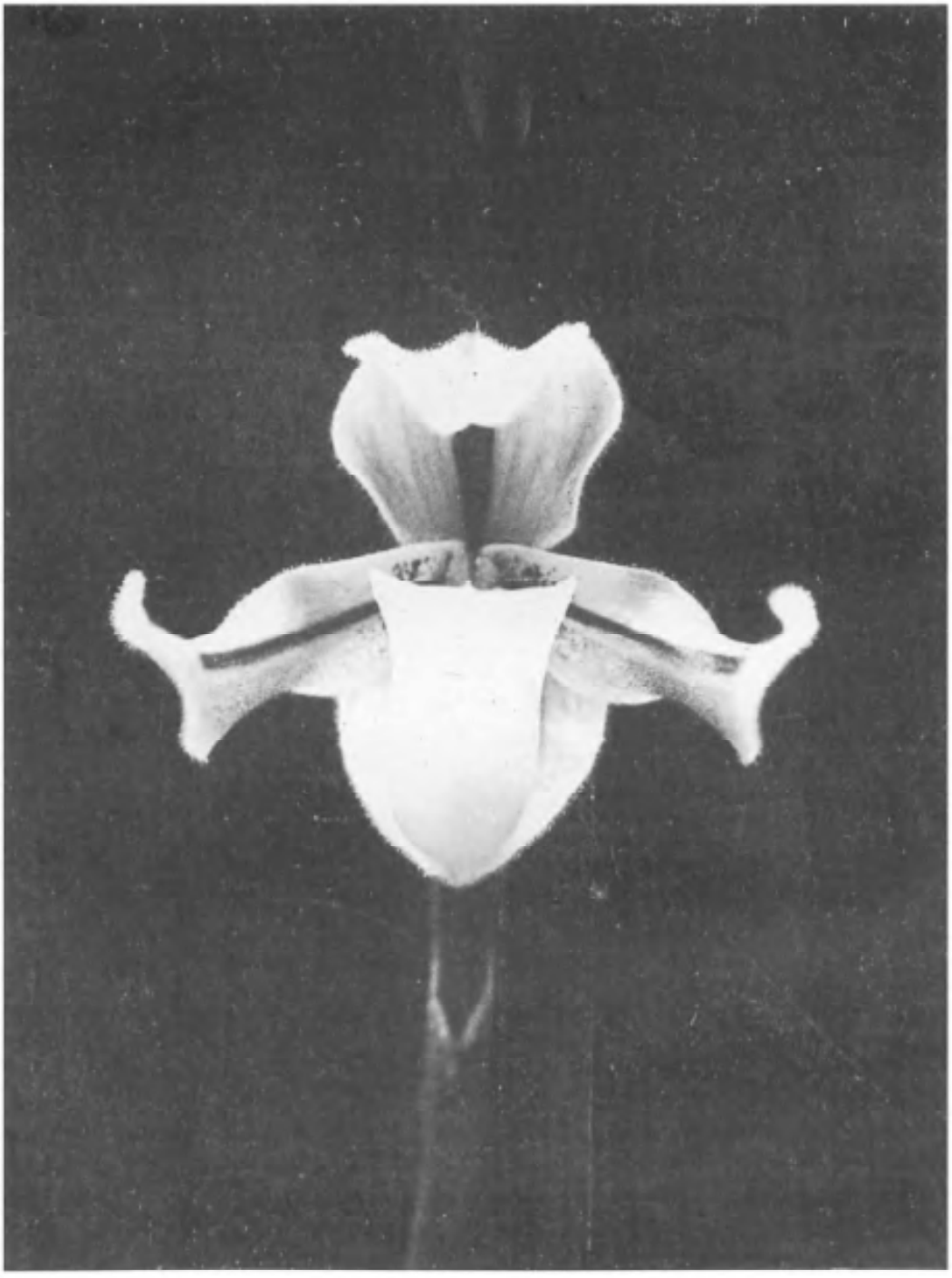
Pterocarpus santalinus Linn. f.



Haplanthodes verticillatus (Roxb.) Majumdar

Carvia callosa (Nees) Bremek.

Western Ghats stratified nature – Nasik



Paphiopedilum druryi (Bedd.) Stein
Courtesy: Udai C. Pradhan

Silent valley—Shola forests

Silent valley—Kunthipuzha river valley

1

General Characters of Endemics

The word 'endemic' is ascribed to any taxonomic unit or taxon which occurs in a restricted area, usually isolated by geographical or temporal barriers. In Greek *en* means within and *demos* means population. The word endemic requires considered application in terms of the categories defined. If it is used in a broad sense which involves definition of the occurrence of a particular species in a large continental area, the very concept of endemism loses its meaning as all plant and animal species in one sense are "endemic" to the world. Usually such widely distributed species are called cosmopolitan species or wides or panendemic species. Conventionally in botany endemic categories are defined as those that occur in a small restricted area, a phytogeographical region or mountain range or an island. The usage "a species endemic to continent of Europe, S. America or S.E. Asia" is not appropriate. However, a large category like family can be considered as endemic to continental areas like S. America, while it is meaningless to consider a specific category (species) endemic to S. America, which has an area of continental range.

1.1 The Concept of Endemism

Endemic floristic elements of a country or geographical region throw light on the biogeography of the area, centres of speciation, areas of extinction, vicariance and adaptive evolution of the flora occurring in the area. A.P. DeCandolle (1855) used the concept *Endemic area* which is defined as an area of a taxonomic unit, especially species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Usually islands, mountain ranges, geographical regions with ecological boundaries form endemic areas where conditions are favourable for the preservation of endemic taxa. According to Engler (1882) "there are two kinds of endemism—one based on the preservation of ancient forms, which may have originated in entirely different regions and the other based on the development of new, entirely autochthonous forms". The concept of endemism of a family, a genus or a species with reference to a particular region is varied.

Endemic families : It is appropriate to consider that larger the taxonomic category concerned, the wider the concept of endemism (Good, 1974). Hence for families, endemism is in the context of particular floral province

or country or region. The following families indicate their endemic nature to a particular area :

(i) **Madagascar** : Asteropeiaceae (7 spp.) ; Barbeuiaceae (1 sp.) ; Didiereaceae (11 spp.) ; Didymelaceae (2 spp.) ; Diegodendraceae (1 sp.) ; Geosiridaceae (1 sp.) ; Humbertiaceae (1 sp.) ; Sarcolaenaceae (40 spp.) ; Sphaerosepalaceae (14 spp.).

(ii) **S. Africa** : Achariaceae (3 spp.) ; Aitoniaceae (1 sp.) ; Bruniaceae (75 spp.) ; Geissolomataceae (1 sp.) ; Greyiaceae (3 spp.) ; Grubbiaceae (5 spp.) ; Heteropyxidaceae (3 spp.) ; Penaeaceae (25 spp.) ; Retziaceae (1 sp.) ; Roridulaceae (2 spp.) ; Stilbeaceae (12 spp.).

(iii) **Continent of Asia** : Bretschneideraceae (1 sp.) ; Cercidiphyllaceae (2 spp.) ; Circaeasteraceae (1 sp.) ; Davidiaceae (1 sp.) ; Dipentodontaceae (1 sp.) ; Eucommiaceae (1 sp.) ; Eupteleaceae (5 spp.) ; Helwingiaceae (4 spp.) ; Kingdoniaceae (1 sp.) ; Nandinaceae (1 sp.) ; Pentaphylacaceae (2 spp.) ; Plagiopteraceae (1 sp.) ; Podoaceae (3 spp.) ; Pteridophyllaceae (1 sp.) ; Rhoipteleaceae (1 sp.) ; Sargentodoxaceae (1 sp.) ; Sladeniaceae (1 sp.) ; Stachyuraceae (10 spp.) ; Tetracentraceae (1 sp.) ; Toricelliaceae (3 spp.) ; Trapellaceae (2 spp.) ; Trochodendraceae (1 sp.).

Endemic genera : Unlike families, endemic genera and species occur in isolated or restricted areas. The important islands and geographical regions with high degree of endemic genera are as follows :

Madagascar	—	150	endemic	genera	—	90%
S. Africa	—	500	,,	,,	—	30%
Australia	—	500	,,	,,	—	40%
Hawaii Is.	—	45	,,	,,	—	82%
Sri Lanka	—	20	,,	,,	—	29%

1.2 Endemic Categories : (Theoretical considerations)

Nature of Endemics : An endemic taxon restricted to a particular island, mountain peak or isolated peninsular region may be a remnant of a wider ancient spreading taxon, which in the course of geological and climatic changes found its refugium in isolated geographical regions. This antiquity can be judged by its phylogenetic sequence, taxonomic isolation, nature of its habitat and past fossil history, if any. The endemic taxa occurring in such isolated areas are possibly survivors of their ancient stock of relatives occurring in continental areas affected by cataclysmic geological or environmental changes. Sometimes such taxa occur in disjunct areas, the intermediate link lost by environmental or geological causes. They then form discontinuous or disjunct genera or species. Such endemics are called '*relic*' (Drude, 1890), *endemisme par conservation*

(Briquet, 1905), *conservative* (Diels, 1908), *relic* or *ancient endemism* (Herzog, 1926) and *palaeoendemics* (Chevalier and Guenot, 1925). Of all the afore-mentioned terms, the usage of the term *palaeoendemic* is generally accepted. The main characteristics of palaeoendemics are that they do not usually have close connections with other species in the area, sometimes they are taxonomically isolated, may show disjunction in their distribution or they may have possible fossil evidence provided by homologous taxa or congenera of living taxa.

New endemics develop in different ecological niches or habitats through speciation from active genetic stock. There are different modes of speciation taking place in such categories : geographic speciation, quantum speciation and sympatric speciation. These endemics are called *autochthonous endemics* by Engler (1882), *secondary endemics* by Drude (1890), *endemisme par novation* by Briquet (1905), *progressive endemics* by Diels (1908), *neoendemics* by Herzog (1926), Braun-Blanquet (1923), Chevalier & Guenot (1925). Neoendemics develop due to mutation, chromosomal rearrangements, polyploidy, adaptive radiation, vicariance in a new environment having different climatic and edaphic stresses. These neoendemics have closely related species in the same area or adjacent areas. In a few cases because of the extensive chromosomal rearrangements and aneuploidy, the hybrids of their closely related species have low fertility (Nayar, 1980).

1.2.1 Palaeoendemics

Palaeoendemics are ancient endemics, which represent remanents of older floras usually occurring in geologically old landmasses. Most of the vast majority of endemics are either palaeoendemics or their derivatives. The chief characteristics of palaeoendemics are : (i) taxonomically isolated complements having no closely related species (ii) presence of woody life forms in isolated taxa occurring in islands and mountain summits (iii) low level of polyploidy in the endemic flora (iv) major disjunction in the distribution of many of the endemic taxa and (v) possible fossil evidence (Bramwell, 1972).

Wulff (1950) mentions that due to the phenomenon of vicariance and adaptive radiation some of the endemics which for all purposes should normally be considered as palaeoendemics, appear as an evolving group of species. They are called *Active Epibiotics*. Epibiotics are apparently relict species which have undergone diversification. But according to Richardson (1978) it is better not to consider them as relict species in the sense of the palaeoendemics but as old holoendemics, which have remained unchanged until relatively recently.

1.2.2 Neoendemics

Neoendemics are newly evolved endemic taxa of relatively recent origin from an actively evolving genetic stock occurring in a particular ecotone. They have closely related taxa occurring in the same area. Neoendemics also develop through geographical speciation, quantum speciation and sympatric speciation. Polyploidy is also another hallmark of neoendemics. According to Stebbins (1938) polyploidy is stronger in herbaceous perennials. It is also noted by Tischer (1935, 1955) that the higher the latitude, greater is the frequency of polyploidy. Grant (1970) mentions that severity of climates, high latitudes or high elevations cause severe climatic stress. It is seen that disturbed habitats within a given climatic zone are among the external polyploidy promoting factors of secondary importance. Neoendemics generally have herbaceous and shrubby forms and they occur in areas where there are climatic and environmental stresses. According to Stebbins and Major (1965) in regions as the borderline between zones of adequate moisture and deficient moisture even small climatic shifts will change local conditions beyond the limits of tolerance of the resident species, so that they must either migrate or evolve new ranges of tolerance.

1.2.3 Holoendemics

According to Richardson (1978) all species start as neoendemics and end up as palaeoendemics. It is generally considered that in favourable environmental conditions, neoendemics tend to behave as holoendemics and may lead to the formation of palaeoendemics through the following steps : origin, expansion, stabilization, diversification, migration, fragmentation, contraction and later extinction. Due to selection pressures and environmental stress some relict species can become active epibiotics. These stages can occur in both ways, leading either to contraction of species with possible extinction or burst of speciation, depending on genetical, ecological and temporal factors affecting the species (Nayar, 1981). Holoendemic is the phase of endemic species between its origin, spread and eventually perhaps its loss. In this spectrum there is no time scale and according to Richardson (1978) "...taxa pass along the evolutionary pathway at different rates and a holoendemic could only be one step removed from the ancestor of the group (i.e. have few "advanced" or "derived" characters) while a contemporaneous relic would be many steps removed (with numerous such characters)".

The attributes for the main kinds of endemics are tabulated below :

Attribute	Endemic status		
	Neo—	Holo—	Palaeo—
Taxonomically isolated	—	—	+
Geographically isolated	—	+	+
Polymorphism	—	+	—
Derived characters	∓	+	—
Environment stable	±	—	.
Ploidy level high	+/—	+/—	(+)/—
Potential to expand	+	+/—	—
Age (recent —, old)+	—	+/—	(+)/

Source : Richardson (1978)

1.3 Classification of Endemics Based On Cytology

Favarger and Contrandropoulos (1961) studied endemism applying cytotaxonomic methods since cytological data can throw light on the relative age and mode of speciation of endemic taxa. The classifications of endemics are given below :

1) 'Palaeoendemics' are those endemics, which are isolated taxonomically, show no variations and occur in isolated refugia.

2) 'Schizoendemics' are endemics produced by gradual speciation having common origin, but isolated in different ecological niches. Usually schizoendemics occur in widely different ecological niches available in mountain chains, with altitudinal and latitudinal differences. They have usually identical chromosomes.

3) 'Patroendemics' are parent endemics, i.e. diploids which give rise to polyploids.

4) 'Apoendemics' are polyploids usually of hybrid origin, arising from widely distributed diploids.

In favourable ecological conditions of high mountains, closely related species hybridise (Stebbins, 1954) and successfully establish themselves in isolated mountain tops.

The cytological data of endemics throws light on the relative percentages of diploids and polyploids and helps ascertain the relative age of the floras. It is generally accepted that the older the flora, higher the percentage of diploids and the younger the flora, higher the percentage of polyploids.

2

Extinction of Species and Concept of Rarity in Plants

The International Union for Conservation of Nature and Natural Resources (IUCN) played an important part in focussing World's concern in the loss or extinction of species during the last two decades. IUCN's Red Data Book (Anonymous, 1966) is a pathfinder and since then several nations published their Red Data Books (Perring & Farwell, 1977 ; Takhtajan, 1975). In a stable ecosystem all species, plants and animals form a close web and they are in a dynamic equilibrium. It is also accepted that man needs a reservoir of wild species in order to prevent genetic erosion in his cultivated crops. A species once lost cannot be recreated and this results in the loss of millions of years of evolution. About 65 million years ago dinosaurs, huge mammoth reptiles disappeared from the earth, leaving no lineal descendants. The fossil history of plants and animals tells us the story of extinction due to geologic and evolutionary changes in time and space. With the predominance of *Homo sapiens* and with the advent of industrial revolution of 20th century resulting in vast habitat disturbances concomitant with the exponential population growth, extinction of some of the vast array of plants and animals constituting our world's rich biological diversity became the order of the day. Of the estimated 10 million plant and animal species, not more than 1½ million is recorded in scientific literature. According to IUCN's Threatened Plants Committee about 10% (20,000 to 30,000) of the World's flowering plants are dangerously rare or under threat. Peter H. Raven, Director of the Missouri Botanic Garden, reports that a disappearing plant can take with it 10 to 30 dependent species, such as insects, higher animals and even other plants. Eckholm (1979) estimates that "more than half the known animal extinction of the last 2000 years—that is, since the first recorded extinction, which was the European lion around 80 A. D.- have occurred since 1900". According to the estimates of IUCN that on an average one animal species or subspecies is lost each year. Myers (1980) the author of "The Sinking Ark"—a book about the disappearance of species—cautions in an address to The World Future Society at Toronto that during the next three to five decades until human population levels out and until human appetites for raw material stabilizes, we

could say good-bye to probably one quarter, possibly one third and conceivably one half of the planetary spectrum of species. As per conservative estimates at least 10% of Indian flowering plants (ca 2000 species) remains under threat and about 25% (ca 5000 species) will become rare by the year 2000.

The process of extinction, the causes of rarity and parameters for considering a taxon rare or under threat are to be scientifically analysed and evaluated so that uniform parameters are followed by workers in the field.

2.1 Extinction Process

In any biologically evolving system, where evolution sets in motion, extinction of the unfit in the process of natural selection is a biological necessity and this is the main point underlined in Darwin's **"The Origin of Species by Means of Natural Selection"**. According to Martin (1967), extinction is not an abnormal fate in the life of a species. When all the niches in a biotic community are filled, extinction takes place as part of the evolution of new species. Hence this phenomenon of extinction is a natural process. In the evolutionary pathways in the life of organisms, there are extinctions of the unfit and survival of the fittest. However, the present day changes in the environment and habitat are so unnatural and drastic that plant species (Nayar, 1977) could not get evolutionary time span for survival or adaptive radiations.

Levins (1970) estimated that since the beginning of the Cambrian species have been getting extinct at the rate of about one per year though not uniformly. According to Hooper (1971), the factors leading to extinction can be classified under the following categories :

(1) Demographic stochasticity.

(2) Environmental stochasticity.

(3) Natural catastrophes.

(4) Genetic stochasticity.

It is formulated "...that a minimum viable population of any given habitat is the smallest isolated population having 99% chance of extant for 1000 years despite the forseeable effects of demographic environmental and genetic stochasticity and natural catastrophies" (Hooper, 1971). The reduced population of many rare plant species causes concern and their distribution is so limited that a single catastrophe

whether environmental or anthropogenic alteration of habitat would wipe out the species (Gomez-Pampo et al, 1972). Usually extinction-prone species have neither colonising abilities nor regenerative strategies like vegetative expansion and persistent seed bank. They have relatively small individual populations and are subjected to large fluctuations. Usually extinction-prone species have flowers which are produced late in their life-history, low frequency of flowering and seeds with low viability. Families and groups of plants which are specialised for their adaptations in relation to their pollen vectors, plants having low dispersal ability, fruits with low seed number, non-dormant seeds are prone to become rare in the disturbed ecosystem where specific pollen vectors for pollination of flowers and habitat necessary for the quick germination of seeds might become limiting parameters.

Extinction of species may be due to environmental factors, ecological substitutions, biological factors, pathological causes and anthropogenic interference in the form of habitat destructions, human overkill or overexploitation.

(1) **Environmental factors :** When climatic changes occur beyond the tolerance limits of a species, extinction of inflexible species is inevitable. The Nipa Palm, a tropical coastal brackish water genus having one species was present in the upper Cretaceous in tropical America where it is extinct now. The disjunctions of many world genera occurring between tropical Africa and India may be due to extinctions in intermediate areas. Post Pleistocene extinctions as a result of Pleistocene glaciations belong to this category.

(2) **Ecological substitutes :** A species or group of species is replaced from the same matrix by competitive species which have competence to survive.

(3) **Biological factors :** In the co-evolution of plants and specific pollen vectors there is close parallel evolution. Due to loss of habitat, many pollen vectors specific to plant species are getting decimated. This causes loss of chance cross-pollination leading to loss of gene flow.

(4) **Pathological causes :** Outbreak of diseases is one of the major causes of the loss of species. A recent example is the spread of Dutch Elm disease resulting in the process of wiping out of Elm trees in Europe and America. Monoculture of crops resulting in genetic uniformism, and quick mass transport are some of the causes for quick spread of plant diseases.

(5) **Habitat destruction :** When man used fire as a means of controlling nature and invented stone tools for killing animals during Early Stone Age, he started interfering with Nature's ecosystems. One of the major tenets of Ecology is "that all ecosystems tend towards stability (Goldsmith et al, 1972) and that the more diverse and complex the ecosystem, the more stable it is, i.e. the more species there are and the more they interrelate the more stable is their environment". This means a stable ecosystem has a vast array of plant and animal species, closely knit together in ever perpetuating web of life and a loss of one component of this mosaic, affects the totality of the ecosystem.

Due to man-induced-changes in the form of road building, forestry plantations, construction of large scale projects in areas of high conservation value the original habitat is fragmented into isolated patches. Each such isolated fragment behaves like an island and the theory of island biogeography (MacArthur & Wilson, 1967) holds good. Most of the Western Ghats in India and Western and Eastern Himalayas come under this category. In such a fragmented system smaller fragments will initially contain more species than they can hold at equilibrium. The rate of extinctions or loss of species is faster in such smaller group than in a bigger habitat as ecological niches available for survival will be proportionally reduced. In India, as in most countries where there is an intense population pressure, the wild life sanctuaries and parks are comparatively small and they are fragmented islands. Here the concept of Biosphere Reserves, holding together several wild life sanctuaries, if implemented, will act as a reservoir of species and the turnover due to immigration of species from small fragmented sanctuaries into a larger habitat or biosphere will be more. At equilibrium the rate of extinction and immigration in such larger biospheres is equal and hence the concept of biosphere reserve of larger areas.

2.2 Concept of rarity of species

Rarity of species requires proper scientific definition and many workers give different attributes as per their perception with reference to beauty of flowers, usefulness and availability on different qualifications. However, according to Drury (1974), "a rare species is the one that occurs in widely separated small sub-populations so that interbreeding between sub-populations is seriouly reduced or is restricted to a single population"

The biological road to rarity in plants and animals occurs in populations which are isolated in island groups or habitats where geo-

graphical or ecological barrier establishes their isolation preventing possible interbreeding. It is necessary to understand the biology of such species for finding out the causative factors which lead to reproductive failure. Biologically, in animals, a hypothetical rare species is the one which is large in size with narrow habitat tolerance, long gestation period and few litter per year. While in plant species, a hypothetical rare species is the one with narrow habitat, low climatic tolerance, specialized adaptations requiring an outside agency for flower pollination, poor dispersal strategies, few seeds per fruit and poor viability of seeds.

The anthropogenic cause of rarity of species is the large scale destruction of habitat and ecosystems for absorbing population pressure of *Homo sapiens*.

Opening out the previously inaccessible terrains of the Himalayas due to road building, threatens a large number of plants. The fate of attractive plants like Tree ferns, several species of Rhododendrons, species of Orchidaceae, Magnolias occurring in Eastern Himalayas is in a precarious state and by the turn of the century many species would be wiped out from their native habitat. Several orchids especially Red Vanda (*Renanthera imschootiana*) and Blue Vanda, (*Vanda coerulea*) and Slipper orchid (*Paphiopedilium*) may mainly survive in protected areas.

2.3 Threat value of species

Perring and Farwell (1977) have adapted a proforma by noting down rate of decline, number of extant localities, attractiveness and usefulness of plants which are exposed to unethical collection, percentage of localities in nature reserves and nonaccessibility of the terrain. Correct field observation of the populations over a period of time is required for measuring the threat value of species. According to the proforma of Perring & Farwell (1977) the following categories have been given an index number with arbitrary values and uniformly applied :

(a) The rate of decline of the species over a decade of observation :

0 : decline less than 33%

1 : decline between 33 and 66%

2 : decline over 66%

(b) The number of localities known :

0 : Over 16 localities or sites

1 : 10-15 localities or sites

2 : 6-9 localities or sites

3 : 3-5 localities or sites

4 : 1-2 localities or sites

(c) Subjective assessment of the species :

0 : not attractive

1 : moderately attractive

2 : highly attractive

(d) The Conservation Index for that species (an arbitrary figure related to the percentage of localities of that species which are in nature reserves or sanctuaries) :

0 : over 66% in nature reserves

1 : 33-36%

2 : less then 33%

3 : less than 33% and these sites are subject to exceptional threat.

(e) The remoteness of the locality :

0 : not easily reached

1 : moderately easily reached

2 : easily reached

(f) Accessibility (easy of access once the site has been located) :

0 : not easily reached

1 : moderately easily reached

2 : easily reached

(g) Species known for local uses especially in local medicines, but kept secretly and not commercially cultivated :

0 : no local or medicinal use

1 : used by few local tribes or villagers

2 : used by large number of people in the area

The category (g) is additional to Perring & Farwell's proforma as this category relates to Indian conditions. The species ranging between categories 4 to 17 comes under Threat as per the values. The maximum threat value is 17 (a+b+c+d+e+f+g).

2.4 Monitoring rare and threatened plants

The foremost task in the conservation process is to prepare an inventory of plants that are rare or threatened otherwise. Thus, reliable and documented information on Rare, Threatened or Endangered plants is prerequisite to actual implementation of plant conservation programmes. To determine the status of the plant the IUCN' Red Data Book categories can be employed. Mac Bryde (1979) discussed in detail the information that is required to use the Endangered species Act of 1973 (amended in 1978) which was the first federal endangered species legislation to include protection of plants, which are in danger of extinction in their natural habitats. The inventory should take into consideration scientific information like species—taxonomy, historical range, present known range, current population numbers and trends, threat to extant populations, all of which can be determined by field studies and observations. Nayar and Raju (1979) adopted a Degree Reference System for plant records and observed that grids encompassing concentration of plants can be taken as parameters for mapping endangered habitats and threatened species for conservation purposes. Davy and Jefferies (1981) underlined three basic approaches to the monitoring of rare plant populations. They are :

(i) *Demographic approaches* : based mostly on quantitative studies, accounting for number of individuals, which is relevant to problems of rarity. This approach can analyse and display the internal working of a rare plant species' population.

(ii) *Genetic approaches* : based on the surmise that many plant species exist on a mosaic of genetically differentiated populations which have evolved in response to strong local selection pressures arising from environmental heterogeneity. This approach aims at characterizing and understanding this genetic variability.

(iii) *Resource allocation approaches* : based on studies of the capture, transformation and use of resources (which could be energy or important material like water, a nutrient element or a metabolite). This gives an insight into the strategies adopted to meet environmental stringencies. Responses to scarcity of resources like nutrient or metabolite, are especially important in plants at the limit of their range and can be studied by analysis of various plant organs.

As through the ages, Man continues to be directly or indirectly the greatest threat to plant life. And hence, in any ecological evaluation of a rare plant and its population, the human impact must be considered. Most plant populations are dynamic and, provided favourable conditions exist, they thrive well unless their gene pools are at the end of their tether, as it

were. Hence, taking into account their dynamic tendencies biologists could help formulate better conservation measures or strategies.

Another aspect of cardinal importance with regard to monitoring rare plants, is the biology of the species, along with its habitat or biotic conditioning and their interrelationships. A mere attempt at nursing a rare or endangered species in botanical gardens or arboreta can have no great impact on long-range conservation programmes unless the biology of the species is thoroughly understood. Only with the full knowledge of its biology can one hope to reintroduce it in habitats or conditions which can sustain its propagation in a natural way.

2.5 Categories of species for conservation

According to the Survival Service Commission, the following categories of taxa are defined (i) Extinct, (ii) Endangered, (iii) Vulnerable, (iv) Rare (IUCN Plant Red data Book, 1978).

Endangered : "Taxa in danger of extinction and whose survival is unlikely if the casual factors continue operating". Taxa included in this list are those whose numbers have been reduced to a critical level and those whose habitats are under threat.

Vulnerable : "Taxa believed likely to move into the endangered category in the near future if the casual factors continue operating".

Rare : "Taxa with small world populations that are not at present endangered or vulnerable but are at risk"

Extinct : "Those species not found after repeated searches of known or likely areas."

2.6 The Procedure of Listing of Species

In order to evolve listing of species into different categories it is necessary to follow scientific procedures of listing, upgradation of categories, delisting of species as and when more information become available about the species. A well organised scientific community and organizational network is required for detailed evaluation.

The scientific community, the concerned national and state organisations, voluntary organisations and general interested public may interact and nominate species for different categories after field study, observations and general scientific work. The concerned apex organisations can bring out tentative lists for screening indicating whether review is required and if not indicate rejection of unfounded nominations. After getting appro-

priate replies from all relevant sources, it is necessary to prepare status reports and review informations and prepare environmental assessment. It is useful to publish the nominated species in a national register indicating scientific and common names, range of species, summary description and special regulations. After publication of these informations it is imperative to analyse information and determine whether a species can be legalistically categorised as endangered, threatened or non-threatened. Discussions in scientific forums and free exchange of views are to be ensured for getting the species nominated into the appropriate categories.

Scientific Community — National & State Organisations concerned with species. ··· States — Public & others

↓

Rejection of unfounded nomination — No-Accredited National Organization

↓

Screen & review

↓

Yes

↓

Publish Species on National Register (Indicate notice time). Prepare & review information and status reports of species

↓

Publish species National Register indicating scientific names, common names, distribution of species

↓

Request further information from scientists & public.

↓

Compile further data on the basis of additional information

↓

↓ ↓

Decide not threatened or endangered

Decide whether it is threatened or endangered

↓

List

2.7 Base information for endangered or threatened species list

As a base material, inventories may start with searches of literature and herbarium collection or from information or contributions from botanists. These informations can be further confirmed by field survey. National and state lists of inventories are to be prepared on the same basis. Local critical surveys of threatened habitat of species may also indicate the nature of threat to endemic species. Data storage of all information and updating of information is an important part of the exercise.

2.8 Strategies for conservation of rare or endangered species

In order to understand the rarity of species, it is necessary to understand the biology of the species or environmental factors affecting the species. The following guidelines prepared by Mary Sue Henifin et al. (1981) for the preparation of status reports on rare or endangered plant species can be followed with suitable modifications.

I. Species Information

(i) Classification and nomenclature
(ii) Present legal or other formal status
(iii) Description
(iv) Significance
(v) Geographical distribution
(vi) Environment and habitat
(vii) Population biology
(viii) Population ecology
(ix) Current land ownership and management responsibility
(x) Management practices and experience
(xi) Evidence of threats to survival

II. Assessment and Recommendations

(xii) General assessment of vigour, trends, and status
(xiii) Priority of listing or status change
(xiv) Recommended critical habitat
(xv) Conservation/recovery recommendations
(xvi) Interested parties

III. Information Sources

(xvii) Sources of information

(xviii) Summary of material on file

IV. Authorship

(xix) Initial authorship

(xx) Maintenance of status report

(xxi) Record of revisions

V. New Information

2.9 On the road to extinction

The population dynamics of species (Cole, 1954) is an important component in the understanding of species biology indicating the increasing or decreasing trends in their distribution. It is seen when death rate increases, a species is on the road to extinction. According to Wayne King (1984—Problems in categorizing the status of species-IUCN 16th Session—Madrid)—"If the decline has just started or is slow the species may be vulnerable. If it has been ongoing for some time, the species already may be depleted. If the decline is rapid, the species is endangered". It is necessary to investigate the life history patterns, demographic studies and genetic factors responsible for reducing genetic variation in isolated marginal population.

It is seen that the distribution of many rare species are curtailed or fragmented so much so that there is no gene exchange and they survive in few isolated pockets waiting for their turn or they are on the road to extinction. Most of the isolated rare endemic taxa follow this pattern.

The description of species is an important component for the understanding of a taxon. As Wayne King (1984) mentioned, that "if a species is not known to exist, its extinction also will be unknown". When a species is not recorded or seen during the last fifty years with repeated efforts of survey, it is presumed to be extinct. It is difficult to estimate the time of extinction. But species which are on the verge of extinction come under the following categories : population crash, fragmented population, loss of reproductive success, loss of pollinators, habitat loss, over exploitation, commercial extinction, genetic loss or variability, genetic swamping, predation and competition.

2.10 Management strategies

The main function of the management strategy is that once a species is listed as vulnerable, threatened or endangered, there should be ways to

prevent the loss of listed species. There should be organised methods to restore these species in the original habitat. Each species requires its own strategy as per its distributional range, its biology and reproductive potential.

Following strategies are needed for each category of listed species :

(i) *In situ* conservation of endangered species in their natural ecosystem, biosphere, national parks and sanctuaries. There should be designated areas (i.e.,) *Refugia* for our endangered species which should have legal status.

(ii) Preservation and cultivation of endangered species in the chain of Botanic Gardens and Arboreta.

Habitat loss : The loss of special habitats lead to eventual reduced populations, fragmentation of population and finally extinction. It is necessary to evaluate in the status reports, the present habitat available, past range and future requirements and buffer zones.

The habitat loss may be due to urbanization, forest clearance, agricultural or forest operation, nutrient enrichment, road building, mining or quarrying, water or air pollution and pressure from introduced population. Concomittant with this, there are other threats like over-utilization, commercial exploitation, even over-collection for scientific or educational purpose. It is seen populations of many commercially wild useful species decline when the reproductive potential of these species reach critical threshold limit.

In the centres of genetic diversity where there are abundant variations as seen in many river valleys, a dam constructed to impound the waters will destroy all the species diversity in the impounded area.

Introduced exotic species often become aggressive colonisers and sometimes they threaten the habitat of native species. In such cases native species are on the run for survival. Introduced tropical weeds like *Croton bonplondianum, Parthenium hysterophorus, Lantana camara, Mikania scandens* have caused loss of habitat for many tropical herbaceous flora. Fungal infections, insect pests and grazing often result in the death of vulnerable species. It is also seen hybridization with introduced species can result in the genetic swamping.

(iii) Preservation of endangered species in seed banks and through tissue culture : Artificial propagation should be started when the species is on the decline and the natural population is fragmented. There should be free exchange of germplasm material in order to avoid the risk of catastrophic loss of genetic material at one centre resulting in the total extinction of the species.

3

Endemism in Peninsular India at Generic Level

Endemic floristic elements of a country or geographical region throw light on the biogeography of the area, centres of speciation, areas of extinction, vicariance and adaptive evolution of the flora occurring in the area. The Peninsular India, bordered in the north by the Bundelkhand and Rajmahal hills has a characteristic true Indian flora which is reflected in its components. It is the palaeotropic flora derived from the original Gondwanaland. Nayar (1977) estimated about 2100 endemic flowering plants in Peninsular India which represent about 32% of its flora. In Peninsular India there are no endemic families and phylogenetically primitive families like Magnoliaceae, Schisandraceae, Annonaceae, Ranunculaceae etc., are poorly represented in this landmass of ancient origin which represents the Indian plate of the Gondwanaland. In this chapter it is proposed to analyse the endemic taxa of Peninsular India at the generic level in relation to its speciation and evaluate the causes of its present distribution, contraction and possible extinction.

There are about 58 endemic genera in Peninsular India of which 47 are monotypic. The families with the largest representatives of endemic genera are Gramineae (13 genera) and Acanthaceae (9 genera). Of the endemic genera, the genus *Nilgirianthus* has the largest number of species (20 spp.). The tree species are mainly represented in the genera *Poeciloneuron, Blepharistemma, Pseudoglochidion, Meteoromyrtus, Otonephelium* and *Erinocarpus*. Taxonomically interesting genera are seen in *Frerea, Haplothismia* and *Hubbardia*.

Chatterjee (1940) listed 34 endemic dicotyledonous genera for Peninsular India. Of these, the genera *Adenoon, Calacanthus, Decaschistia, Diotocanthus, Goniocaulon, Meyenia, Nothopegia, Octotropis, Stenosiphonium* mentioned by Chatterjee (1940) are not endemics as they have wider distribution beyond India. The genera *Beddomea, Neopeltandra, Prosorus*, and *Solenocarpus* mentioned by Chatterjee (1940) are reduced to the genera *Aglaia, Meineckia, Margaritaria* and *Spondias* respectively in view of further taxonomic revision. Subramanyam & Nayar (1974) enumerated characteristic endemic species of W. Ghats and mentioned that W. Ghats summits are comparable to islands regarding endemic species.

A list of endemic genera along with their species complements and their distribution is given at the end of this chapter.

The endemic generic category of Peninsular India is a diverse assemblage of herbs, succulent scapigerous herbs, shrubs, undershrubs, climbers and trees. Trees are poorly represented in the endemic generic category. It is generally considered that woody "life-forms" are of relictual nature. The genus *Poeciloneuron* (Bonnetiaceae) with two species, *P. indicum* and *P. parviflorum* are big trees occurring in the rain forest of southern W. Ghats. *Blepharistemma* (Rhizophoraceae) is a genus of inland habit and is represented by *B. membranifolia*, a tree species growing in the evergreen forests of W. Ghats. Another characteristic endemic tree is *Erinocarpus nimmonii*. The genus *Pseudoglochidion* is monotypic and represented by tree species, *P. anamalayanum*. The endemic monotypic genus *Otonephilium* is represented by *O. stipulaceum*, an endemic tree occurring in the rain forests of W. Ghats from Malabar southwards. The endemic genera of shrubs and undershrubs are as follows: *Carvia*, *Nilgirianthus*, *Phlebophyllum*, *Taeniandra*, *Xenacanthus* all belonging to the family Acanthaceae, occurring in the forest floor of the rain forests of W. Ghats, and they are gregarious in growth and shade tolerant. The endemic genus *Meteoromyrtus* is monotypic and the small tree *M. wynaadensis* occurs in the Malabar region on the windward side of southern W. Ghats. *Utleria salicifolia* (Periplocaceae) is an interesting shrub growing in the crevices of rocks in Anamalai hills at altitudes ranging between 1000—1350 m. Other twining undershrubs which have restricted distribution are seen in genera *Baeolepis*, *Decalepis*, *Janakia*, *Oianthus* and *Seshagiria*. The endemic monotypic genus *Moullava* represented by *M. spicata* with gregarious scandent growth is seen in the foothills of secondary forests of W. Ghats in Maharashtra and Karnataka. The taxonomically isolated endemic genus *Haplothismia* is endemic to a small restricted area, Parambikulam hills of W. Ghats. The endemic genera in Orchidaceae is represented by *Diplocentrum* and *Protoeroceras* occurring in southern W. Ghats. The herbaceous endemic genera are mainly seen in the family Gramineae occurring in different ecological conditions.

3.1 Age and Dynamics of Endemics

It is generally accepted that the age of endemic genera can be assessed by the study of the following features: (i) dominance of woody or arborescent habit, (ii) taxonomically isolated endemic taxa, (iii) possible fossil evidences provided by homologous taxa or congenera of living taxa.

Willis's view (1922) that the area of a species is proportional to its age did not take into account the contraction of a species or loss of its

intermediate range due to palaeoclimatic changes and hence it is not accepted (van Steenis, 1969; Wolff, 1950) as a valid theory for the spread of species. Since an endemic genus occurs in a restricted area, reservoir of genepool specific to this group is limited and hence the chances of its adaptation and survival are also limited. Such endemic genera which are adaptation-oriented to a particular ecological niche like mountain top, crevice of rocks or rocky substratum of fast flowing rivers (*Willisia*, *Indotristicha*), steep surface of rocks which receive trickles of water (*Frerea*), sprays of water near water falls (*Hubbardia*) or other endemic taxa which are specific to insect pollinators may become extinct once their ecological or habitat parameters are disturbed. Such palaeoendemics are extinction-prone unless they become active epibiotics. When endemic species become "schizoendemics" due to gradual speciation or behave as "apoendemics" by ploidy, it is an expanding actively evolving population and such endemics are called "holoendemics." Hence for the conservation of species it is necessary to identify such groups of endemics which are holoendemics on the path of expansive evolution or those endemics which are extinction-prone. The rarity or extinction of an endemic species or expansive spread of an endemic species depends on the ecological genetical, and environmental parameters.

3.1.1. Predominance of arborescent/woody habit

The arborescent nature at the generic level is seen in the endemic genera *Poeciloneuron*, *Blepharistemma*, *Erinocarpus*, *Pseudoglochidion* *Otonephilium* and *Meteoromyrtus*. Some of the arborescent genera with more than two arborescent endemic species occurring in Peninsular India are given below : *Memecylon* (16 sp.) ; *Litsea* (15 sp.) ; *Symplocos* (14 sp.) ; *Syzygium* (11 sp.) ; *Actinodaphne* (9 sp.) ; *Grewia* (9 sp.) ; *Glochidion* (9 sp.) ; *Diospyros* (8 sp.) ; *Drypetes* (6 sp.) ; *Cinnamomum* (7 sp.) ; *Jambosa* (7 sp.) ; *Dalbergia* (7 sp.) ; *Hopea* (6 sp.) ; *Mallotus* (6 sp.) ; *Humboldtia* (5 sp.) ; *Holigarna* (5 sp.) ; *Euonymus* (5 sp.) ; *Terminalia* (5 sp.) ; *Garcinia* (5 sp.) ; *Cryptocarya* (5 sp.) ; *Aglaia* (5 sp.) ; *Desmos* (4 sp.) ; *Phyllanthus* (4 sp.) ; *Salacia* (2 sp.) ; *Ficus* (4 sp.) ; *Ardisia* (4 sp.); *Pittosporum* (4 sp.) ; *Orophea* (3 sp.) ; *Cynometra* (3 sp.) ; *Neolitsea* (3 sp.) ; *Strychnos* (3 sp.) ; *Dysoxylon* (3 sp.) ; *Myristica* (3 sp.) ; *Ochna* (3 sp.) ; *Canthium* (3 sp.) ; *Wendlandia* (3 sp.).

According to Meusel (1952) the woody habit in the endemic group is a relict character while Carlquist (1965) suggested that woody habit especially in islands is a derived condition resulting from insular isolation. In this regard it is interesting to observe woody nature in a few species in an otherwise predominantly herbaceous genus like *Vernonia* (*V. travancorica*, *V. anaimudica*) in the mountains of W. Ghats in Kerala. The giant Senecios and giant Cirsiums (Friis, 1975) seen in the alpine flora of E.

African mountains achieve woody habit and it is considered that E. African mountain tops behave ecologically as that of island ecosystem for endemism and speciation (Mabberley, 1974). In Peninsular India, the original palaeotropic vegetation is seen in refugiums along the folds of mountain valleys which are called the Shola forests. As species compete for sunlight by developing woody habit and achieve tree form, even genera which are primarily herbaceous become woody in a close-canopied forest where sunlight is the limiting factor. Species like *Vernonia travancorica*, *Lobelia nicotianifolia*, *Impatiens fruticosa* and *Carvia callosa* which primarily belong to genera of herbaceous habit represent the end products of close canopied ecosystem of a bygone age by developing semi-woody habit. As more and more forests get opened up this competitive ability of species for reaching the sky is getting lost in the genetic make-up. The pachycaulous habit as seen in the giant Lobelia (*Lobelia deckenii*) in Mt. Kilimanjaro in Africa and giant *Espeletia*, a compositae tree in the Andes of Columbia in S. America is not seen in the endemics of W. Ghats mountain top.

The taxonomically and phytogeographically interesting endemic tree genera occurring in Peninsular India are given below:

The genus *Poeciloneuron* comprises two species, *P. indicum* occurring in southern W. Ghats from S. Kanara southwards to Kerala and *P. pauciflorum* restricted to Travancore and Tirunelveli hills. It belongs to the family Bonnetiaceae which has its main centre of distribution in tropical S. America with six genera (*Mahurea*, *Keilmeyera*, *Bonnetia*, *Caraipa*, *Archytaea* and *Haploclathra*), while the genus *Ploiarium* with 3 species occur, in Malesia and S.E. Asia. The fibre trachieds of *Poeciloneuron* agree with most of the members of Bonnetiaceae (Seetharam & Pocock, 1978). The nature of lobulate stamens and gynaecium with two styles are unique and it is appropriate to consider *Poeciloneuron* under the family Bonnetiaceae as proposed by Hutchinson (1973). The phytogeographical distribution of the genera in S. America, southern W. Ghats in India and Malesia can be explained on the basis of Gondwanaland connections. The intermediate link in Africa was lost due to years of desiccation followed by desertification of major parts of Africa (Nayar, 1972).

Blepharistemma, an endemic genus of small trees occurring in Peninsular India from plains to mountain ranges, is an inland rhizophoraceous tree which has lost its mangrove habit as it moved to the montane region. It will be interesting to observe the speciation in *Blepharistemma membranifolia* in different ecotones from coast to the mountains with possible development of new populations in different ecological niches.

Erinocarpus, a monotypic endemic genus (*E. nimmonii*) with large yellow flowers in terminal panicles, is a conspicuous tree in W. Ghats in Maharashtra belonging to the tribe *Triumfetteae* which mainly comprises undershrubs and herbs. The nearest allied genus *Heliocarpus* occurs in central and tropical S. America.

Otonephelium is a monotypic genus of tree (*O. stipulaceum*) of restricted distribution which is the counterpart of the Indomalayan genus *Nephelium*.

Meteoromyrtus is an endemic monotypic genus of small trees represented by the species *M. wynaadensis* occurring in the windward side of the W. Ghats restricted to Malabar in Kerala and its homologous genus *Rhodomyrtus* is represented by *R. tomentosa* var. *parviflora* occurring in the hills of Nilgiris and Kodaikanal in Tamil Nadu (Schott, 1979). It is interesting to note that the above variety occurs in Sri Lanka also.

3.1.2 Taxonomically isolated endemic genera

The presence of endemic elements in a flora which are taxonomically isolated from the nearest taxonomic group indicates its isolation from the main stock for a long period of time. Such taxonomically isolated endemic genera indicate the age of its origin, since intermediate groups might have become extinct due to palaeoclimatic changes. Following endemic genera in Peninsular India are of a phylogenetic and taxonomic importance : (1) The genus *Haplothismia*, a monotypic genus (*H. exannulata*) occurring in a small restricted area, Parambikulam hills in Kerala, represents the tribe *Haplothismieae* of the family Burmanniaceae, which is taxonomically isolated ; (2) The genus *Hubbardia* (Gramineae) is monotypic and is the only representative of the tribe *Hubbardeae* and the structure of the spikelet in *H. heptaneuron* is unique (Bor, 1951) ; (3) The genus *Dicoelospermum* (Cucurbitaceae) belongs to subtribe *Dicoelosperminae*. The species *Dicoelospermum ritchei*, a climbing herb, is endemic to W. India ; (4) The endemic genus *Indotristicha* (Tristichaceae) with two species is endemic to southern W. Ghats while the genus *Terniola* occurs in W. Ghats and Sri Lanka. Other taxonomically interesting endemic genera are *Helicanthes*, *Indobanalia*, *Limnopoa*, *Indopoa*, *Oianthus* and *Utleria*.

3.1.3 Possible evidence provided by fossils in relation to endemics

The Intertrappean beds in Central India is of Upper Cretaceous close to Eocene and in this strata there are fossil woods referable to some of the modern genera. It is interesting to evaluate the genera of fossils closely allied to modern genera which have large complements of endemic species in Peninsular India. So far there is no record of leaf impressions

or fossil woods representing exclusively the present endemic genera occurring in Peninsular India. Most of the palaeoendemics enumerated below are species of humid tropics and they have distributional range in W. Ghats especially in southern W. Ghats. Representative collection of fossil woods from the Deccan intertrappean beds of Cuddalore Series and Neyveli lignites indicate probable modern genera these fossil woods represent and this indicates they had a wide spread distribution during Upper Cretaceous. Due to tectonics, Deccan lava flow and progressive dessication, most of the characteristic Peninsular India flora became extinct as Indian plate moved northwards through different climatic regimes after its separation from the main Gondwanaland about 100 m Y.B.P. (Nayar, 1972). Some of the fossil genera which are referable to modern genera with number of endemic species occurring in Peninsular India are given. The fossil wood *Homalioxylon* (Bande, 1974) is represented by the modern genus *Homalium* (Flacourtiaceae) and *H. travancoricum* is endemic to southern W. Ghats. The fossil wood *Michelioxylon* (Bande, 1974) is represented by the modern genus *Michelia* (*M. nilagirica*). Endemic species *Elaeocarpus munroii* and *E. venustus* occur in W. Ghats and the fossil wood *Elaeocarpoxylon* (Prakash & Dayal, 1963) was collected from the Intertrappean beds near Nagpur. The genus *Glochidion* has 9 endemic species in Peninsular India and the fossil wood *Glochidioxplon* (Prakash, 1958 ; Lakhanpal, 1973) was collected from Madhya Pradesh.

3.2 Observations on selected endemic taxa

The studies on the following taxa in W. Ghats clearly indicate the parameters for the survival and spread of endemics. *Frerea indica* is an example of a palaeoendemic on the verge of extinction due to loss of habitat and inefficiency of the complex pollinating mechanism without parallel supply of specific pollinators. The same may be the case with the monotypic genus *Utleria* occuring in a restricted ecotone i.e. the rocky crevices of Anamalai hills (*U. salicifolia*, a shrub with attractive flowers).

The genus *Frerea* (Asclepiadaceae) is a monotypic genus and there are only 10 to 15 populations of *Frerea indica* in Junnar hill fort, Shivnar hill fort, Mahabaleswar escarpment and Purandhar hill fort near Poona, occurring on the vertical rocky faces constantly wetted with trickles of water. This is a palaeotropic endemic species with poor fruit set, but efficient seed dispersal strategy having comose seeds. The poor fruit set may be due to the complicated pollinia translator mechanism which depends on the visit of an insect pollinator which is perhaps no longer available to it. This species has a remarkable capacity to tide over the drought period by shedding its leaves and further reducing the transpiration surface by condensation of stem into thick succulent knots with silvery

grey outer surface for sunlight deflection. *Frerea indica* is capable of vegetative rooting from stem cutting. Because of silvery coated stem without leaves during drought period, these plants from a distance appear in the shape of silvery worms and it is seen that often vultures pick on these plants and in this process some of its branches get detached. Whether this results in the destruction of the plant or whether these birds act as an agency for its spread by transporting to other mountain top rocky crevices, requires further observation and study.

Contrary to *Frerea indica* and *Ulleria salicifolia*, the endemic monotypic genera *Moullava*, *Lamprachaenium*, *Nanothamnus* and *Carvia* occurring in Deccan, show successful adaptation for survival and spread. (i) *Moullava* (Caesalpiniaceae) : *M. spicata* a thorny scrambler, growing all along the foothills of W. Ghats of Maharashtra with beautiful dark orange flowers in spicate racemes has successfully adapted itself to the environment with attractive flowers for insect pollinators resulting in good fruit set. The woody scrambling habit with sharp thorns gives protection and probably helps in survival. (ii) *Lamprachaenium* (Compositae) : *L. microcephalum*, a branching annual herb with silvery undersurface of leaves is spreading at altitudes ranging from 1000 to 1500 m in the W. Ghats of Maharashtra. This palaeoendemic is becoming a holoendemic in open hill slopes. (iii) *Nanothamnus* (Compositae) : *N. sericeus* is a prostrate pubescent herb common in northern Deccan is spreading fast and reported up to Nilgiri and Palni hills (Rao, 1978). (iv) *Carvia* (Acanthaceae) : *Carvia callosa*, successfully adapted to the monsoon climatic conditions of W. Ghats, is an important gregarious understorey element in W. Ghats of Maharashtra. This species has good seed-set due to successful flower-insect adaptation and interactions of flower by way of provision of honey, balsamic exudates from the bracts and warmth inside the corolla tube. It is interesting to note that some of the *Carvia* populations achieve tree habit reaching to a height of 7-8 m.

The phenomenon of palaeoendemic species becoming epibiotic through vicarious speciation in different ecological niches is seen in the endemic grass genera *Manisuris* and *Glyphochloa*. The latter is a recent segregate of the former (Clayton, 1981). Jain (1970) mentioned that all the taxa of *Manisuris* (most of which are now under *Glyphochloa*) found in India are endemic and the genus *Manisuris* might have originated in Peninsular India. Of all the endemics of these two genera, two species *Glyphochloa forficulata* and *Manisuris clarkei* extend upto central India and the other endemic species are restricted to different climatic and altitudinal zones of W. Ghats and plains of S. India. Species restricted to small pockets in southern Deccan comprising Coorg and Mysore are the tufted grasses *Glyphochloa divergens* and *G. mysorensis*, whereas

G. santapaui and *G. ratnagirica* occur along pools in the exposed laterite hills of Ratnagiri in the windward side of W. Ghats. While *Glyphochloa talbotii* and *G. goaensis* have restricted distribution and they are endemic to Goa. *Manisuris myuros* is a widely distributed endemic commonly seen in the plains of Tamil Nadu and Andhra Pradesh. The genera *Manisuris* and *Glyphochloa* are interesting examples of palaeoendemic epibiotics taking advantage of different ecological niches for speciation. Stebbins & Major (1965) mentioned that ". in the regions on the borderline between zones of adequate moisture and of deficient moisture even small climatic shifts and species migrations will bring together related species which previously were isolated from each other and so will promote hybridization between differently adapted types. In this way climatic and edaphic diversity occurring in ecotones or border regions between different biotic provinces are factors which most actively promote the evolution and differentiation of species of higher plants". The endemic species of *Glyphochloa* (*G. ratnagirica* and *G. santapaui*) occurring in the windw ard side of W. Ghats on exposed laterite soils are vicariads and different from the species (*G. goaensis*) occurring in Goa and those species(*G. divergens*) occurring in the sheltered hills of Coorg and the species *Manisuris myuros* commonly seen in the plains of Andhra Pradesh and Tamil Nadu.

Another example of extinction-prone endemic monotypic genus in Peninsular India is *Hubbardia* (Gramineae) occurring in the steep rocks of Gersoppa falls in Karnataka constantly getting sprays of water from water falls and hill cascades. The leaves of the species *Hubbardia heptaneuron* are filmy as commonly seen in aquatic plants like *Vallisneria spiralis*. Any change in the environment can cause extinction of this species, as it is reported only from one ecological niche i.e. Gersoppa falls of Karnataka.

3.3 Enumeration of Endemic Genera of Peninsular India

ANAPHYLLUM Schott. (Araceae)

A wightii Schott : Tall herb with creeping root stock ; from plains to 1400 m, Southern W. Ghats.

A. beddomei Engl. : Tall herb with creeping root stock ; from 1300 m to upwards, Southern W. Ghats.

ASCOPHOLIS Fisch. (Cyperaceae)

A. gamblei Fisch. : Erect herb ; Nilgiris. Hassan dist. (Ariskand).

BAEOLEPIS Decne ex Moq. (Periplocaceae)

B. nervosa (Wt. & Arn.) Decne : Climbing under-shrub ; Nilgiris.

BHIDEA Stapf. (Gramineae)

B. burosiana Bor : Annual herb ; Bombay neighbourhood.

BLEPHARISTEMMA Wt. ex DC. (Rhizophoraceae)

B. membranifolia (Miq.) Ding Hou : Tree ; Peninsular India, W. Ghats ; Coorg to Travancore

BONNOYDES Blatt. & Halb. (Scrophulariaceae)

B. limnophiloides Blatt. & Halb. : Herb ; Bombay neighbourhood.

CAMPBELLIA Wt. (Orobanchaceae)

C. cytinoides Wt. : Parasitic herb ; Southern W. Ghats, Nilgiris and Palni hills.

CARVIA BREMEK. (Acanthaceae)

C. callosa (Nees) Bremek., : Shrub ; W. Ghats in Maharashtra and N. Karnataka.

DANTHONIDIUM C.E. Hubb. (Gramineae)

D. gammiei (Bhide) C.E. Hubb. : Herb ; Maharashtra and N. Karnataka.

DECALEPIS Wt. & Arn. (Periplocaceae)

D. hamiltonii Wt. & Arn. : Climbing shrub ; Peninsular India.

DICOELOSPERMUM Clarke (Cucurbitaceae)

D. ritchei Clarke : Climbing herb ; W. Peninsular India.

DIPLOCENTRUM Lindl. (Orchidaceae)

D. congestum Wt. : Epiphytic herb ; southern W. Ghats.

D. recurvum Lindl. : Epiphytic herb ; Southern W. Ghats from Nilgiri southwards.

ERINOCARPUS Nimmo ex J. Grah. (Tiliaceae)

E. nimmonii J. Grah. : Tree ; W. Ghats in Maharashtra and N. Karnataka.

FREREA Dalz. (Asclepiadaceae)

F. indica Dalz. : Trailing succulent herb ; W. Ghats in central Maharashtra.

GANTELBUA Bremek. (Acanthaceae)

G. urens (Heyne ex Roth) Bremek. : Herb with prostrate stem. ; Peninsular India.

GLYPHOCHLOA W.D. Clayton (Gramineae)

G. acuminata (Hack) Clayton var. **acuminata** : Herb ; W. Coast/Ghats of Peninsular India, Mysore, N. Kanara, Shimoga.

G. acuminata var. **stocksii** (Hook. f.) Clayton : Herb ; W. Coast/Ghats of Peninsular India (Mysore).

G. acuminata var. **woodrowii** (Bor) Clayton : Herb ; W. Coast of Peninsular India.

G. divergens (Hack.) Clayton var. **divergens** : Herb : W. Ghats ; Coorg-Mercara hills of Karnataka.

G. divergens var. **hirsuta** (Fischer) Clayton : Herb ; W. Ghats of Karnataka, Bababudan hills at Kalhatti.

G. forficulata (Fischer) Clayton : Herb ; Peninsular India, upto Bundelkhand hills.

G. goaensis (Rao & Hemadri) Clayton : Herb : Goa, Verna village & Porvorum.

G. mysorensis (Jain et Hemadri) Clayton : Herb ; W. Ghats of Karnataka ; south of Belgaum & N. Kanara.

G. ratnagirica (Kulk. & Hemadri) Clayton : Herb ; Northern W. Ghats, Sahyadri range, Ratnagiri dist.

G. santapaui (Jain & Desh.) Clayton : Herb ; Northern W. Ghts, Ratnagiri dist.

G. talbotii (Hook. f.) Clayton : Herb ; Goa, Marmagoa.

GRIFFITHELLA (Tul.) Warm. (Podostemaceae)

G. hookeriana (Tul.) Warm. ; Herb attached to rocks in fast flowing mountain streams ; W. Ghats.

HAPLOTHISMIA Airy Shaw (Burmanniaceae)

H. exannulata Airy Shaw : Herb ; Parambikulam hills of W. Ghats.

HELICANTHES Danser (Loranthaceae)

H. elastica (Desr.) Danser : Parasite with woody stem ; W. Peninsular India especially in W. Ghats of Maharashtra.

HUBBARDIA Bor (Gramineae)

H. **heptaneuron** Bor : Delicate herb in rocks receiving sprays of water ; Gersoppa water falls and neighbouring hill cascades in Karnataka.

HYALISMA Champ. (Triuridaceae)

H. jainthina Champ. : Saprophytic herb : Travancore and Tirunelveli hills of Southern W. Ghats.

HYDROBRYOPSIS Engl. (Podostemaceae)

H. sessilis (Willis) Engl., Herb attached to rocks of fast flowing rivers ; W. Ghats and also in mountains near Visakhapatnam in E. Ghats.

INDOBANALIA Henry & Roy (Amaranthaceae)

I. thyrsiflora (Moq.) Henry et Roy : Undershrub ; Southern W. Ghats.

INDOPOA Bor (Gramineae)

I. paupercula (Stapf.) Bor : Herb ; W. Ghats.

INDOTRISTICHA van Royen (Podostemaceae)

I. ramosissima (Wt.) van Royen : Submerged herb in fast flowing rivers; Southern W. Ghats.

I. tirunelvelica Sharma, Karthik. & Shetty : Herb in fast flowing mountain streams ; Tirunelveli hills of Southern W. Ghats

JANAKIA Joseph & Chandrasekaran (Periplocaceae)

J. arayalpathra Joseph et Chandrasekaran : Herb ; Kerala hills of Southern W. Ghats.

JERDONIA Wt. (Gesneriaceae)

J. indica Wt., ; Scapigerous herb ; Nilgiris southwards in Southern W. Ghats.

KANJARUM Ramam. (Acanthaceae)

K.palghatense Ramam. : Undershrub ; Palghat hills of Southern W. Ghats.

LAMPRACHAENIUM Benth. (Compositae)

L. microcephalum Benth. : Annual herb ; Peninsular India.

LIMNOPOA C.E. Hubb. (Gramineae)

L. meeboldii (Fisch.) C.E. Hubb. : Aquatic herb; Water tanks and pools in central Kerala.

MEIBOROMYRTUS Gamble (Myrtaceae)

M. wynaadensis (Bedd.) Gamble : Small tree ; Southern W. Ghats in Malabar.

MANISURIS L. (Gramineae)

M. clarkei (Hack) Bor. : Herb ; Peninsular India upto northern limit of Bundelkhand hills and Parasnath hills, Chotanagpur plateau.

M. myuros L. : Herb ; Plains of Andhra Pradesh and Tamil Nadu.

MOULLAVA (Rheede) Adanson (Caesalpinaceae)

M. spicata Adans. : Scandent shrub ; Peninsular India, Maharashtra and Karnataka.

NANOTHAMNUS Thoms. (Compositae)

N. sericeus Thoms. : Herb ; W. Ghats in Maharashtra, Karnataka, and Nilgiri and Palni hills.

NILGIRIANTHUS Bremek. (Acanthaceae)

N. asper (Wt.) Bremek : Shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai and Travancore hills.

N. barbatus (Nees) Bremek. : Gregarious shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai and Travancore hills.

N. beddomei Bremek. : Shrub ; Nilgiri hills, Travancore and Tirunelveli hills.

N. campanulatus (Wt.) Bremek. : Undershrub ; Coorg hills in W. Ghats.

N. ciliatus (Nees) Bremek. : Slender shrub ; W. Ghats in Karnataka to Travancore hills.

N. circarensis (Gamble) Bremek. : Shrub ; Hills of Visakhapatnam in E. Ghats.

N. decurrens (Nees) Bremek. : Herb ; W. Ghats in Karnataka, southwards to Travancore and Tirunelveli hills.

N. foliosus (Wt.) Bremek.: Gregarious shrub ; W. Ghats in Karnataka, southwards to Travancore and Tirunelveli hills.

N. heyneanus (Nees) Bremek. : Small gregarious shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai, Tirunelveli hills.

N. lupulinus (Nees) Bremek. : Shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris and Wynaad region of Kerala.

N. meeboldii (Craib.) Bremek. : Small shrub ; W. Ghats in Karnataka.

N. membranaceus (Talb.) Bremek. : Stout gregarious herb ; W. Ghats in Karnataka.

N. neilgherrensis (Bedd.) Bremek. : Large shrub ; W. Ghats in Karnataka, Nilgiris, Palni hills, Wynaad and Palghat hills in Kerala.

N. papillosus (T. And.) Bremek. : Large shrub ; Nilgiris.

N. perrottetianus (Nees) Bremek. : Large shrub ; Nilgiris, Anamalai hills and Travancore hills.

N. punctatus (Nees) Bremek ; Slender undershrub ; W. Ghats in Karnataka, Wynaad hills, Travancore and Tirunelveli hills.

N. reticulatus (Stapf) Bremek. : Small shrub; W. Ghats in Maharashtra. Mahabaleswar,

N. urceolaris (Gamble) Bremek. : Shrub ; Nilgiris, Palni hills and Travancore hills.

N. warrensis (Dalz.) Bremek. : Shrub ; W. Ghats in Maharashtra and Karnataka.

N. wightianus (Nees) Bremek. : Gregarious shrub ; Nilgiris.

NORMANBORIA Butzin (Gramineae)

N. henrardiana (Bor) Butzin ; Herb ; Tamil Nadu.

OCHREINAUCLEA Ridsd. & Bakh. f. (Rubiaceae)

O. missionis (Wall. ex G. Don). Ridsd. : A small tree ; Karnataka (N. Kanara), Kerala & Tamil Nadu.

OTANTHUS Benth. (Asclepiadaceae)

O. beddomei Hook. f. : Twining undershrubs ; Kerala, hills bordering Karnataka and Wynaad region of Kerala.

O. deccanensis Talbot. : Twining undershrub; W. Ghats in Maharashtra.

O. disciflorus Hook. f. : Twining undershrub ; Andhra Pradesh & Karnataka. N. Kanara

O. urceolatus (Dalz.) Benth. : Twining undershrub ; southern Maharashtra.

OTONEPHELIUM Radlk. (Sapindaceae)

O. stipulaceum (Bedd.) Radlk. : Tree ; Southern W. Ghats form Kerala

PARACAUTLEYA R. M. Smith (Zingiberaceae)

P. bhatti R. M. Smith : Herb ; Karnataka.

PHLEBOPHYLLUM Nees (Acanthaceae)

P. canaricum (Bedd.) Bremek. : Shrub ; W. Ghats in southern Karnataka.

P. humile (Gamble) Bremek. ; Small shrub ; W. Ghats in Anamalai and Tirunelveli hills

P. jeyporensis (Bedd.) Bremek. : Shrub ; Hills of Visakhapatnam, E. Ghats.

P. kunthianum Nees : A gregarious shrub with definite intervals of flowering every 7 to 12 years. ; Southern W. Ghats from Nilgiri southwards above 2000 m.

P. lanatum (Nees) Bremek. : Shrub ; Nilgiris.

P. lawsonii (Gamble) Bremek. : Erect shrub ; Windward side of W. Nilgiris and Wynaad and Travancore hills in Southern W. Ghats.

P. spicatum (Roth.) Bremek. : Shrub, flowering at 12 years intervals. ; Southern W. Ghats from Nilgiri southwards.

P. versicolor (Wt.) Bremek. ; Large shrub ; flowering in every 7 years ; W. Ghats above 1300 m. and northern Circar hills of E. Ghats.

PLEOCAULUS Bremek. (Acanthaceae)

P. sessilis (Nees) Bremek. : Small undershrub ; flowering annually or at short intervals throughout the year. ; W. Nilgiris. Alt. 2000-2600 m.

P. sessiloides (Wt.) Bremek. : Small undershrub ; Bababudan hills of Karnataka and Nilgiris. Alt. 2000-2500 m.

P. ritchiei (Clarke) Bremek. : Shrub, flowering once in 7 years ; W. Ghats near Bombay.

POECILONEURON Bedd. (Bonnetiaceae)

P. indicum Bedd. : Large tree ; W. Ghats from S. Kanara down southwards.

P. pauciflorum Bedd. : Large tree ; Travancore and Tirunelveli hills of Southern W. Ghats.

POGONACHNE Bor (Gramineae)

P. racemosa Bor : Stilt-rooted grass ; Maharashtra near coastal area.

POLYZGUS Dalz. (Umbelliferae)

P. tuberosus Dalz. : Herb with tuberous roots ; W. Ghats in Maharashtra and Karnataka.

PROTOEROCERAS Joseph et Vajravelu (Orchidaceae)

P. holttumii Joseph et Vajravelu ; Herb : W. Ghats in Tamil Nadu.

PSEUDODICHANTHIUM Bor (Gramineae)

P. serrafalcoides (Cooke & Stapf.) Bor ; Herb ; Maharashtra.

PSEUDOGLOCHIDION Gamble (Euphorbiaceae)

P. anamalayanum Gamble : Tree ; Anamalai hills.

SANTAPAUA Balakr. & Subram. (Acanthaceae)

S. madurensis Balakr. & Subram. : Herb ; Alagar hills in Tamil Nadu

SESHAGIRIA Ansari et Hemadri (Asclepiadaceae)

S. sahyadrica Ansari et Hemadri : Climbing undershrub ; W. Ghats in Maharashtra.

SILENTVALLEYA V. J. Nair *et al* (Gramineae)

S. nairii V. J. Nair *et al* : Tufted perennial herb ; Southern W. Ghats, Palghat dist., Silent valley.

TAENIANDRA Bremek. (Acanthaceae)

T. micrantha (Wt.) Bremek. : Undershrub ; Southern W. Ghats from Nilgiris southwards.

TRILOBACHNE Schenck ex Henr. (Gramineae)

T. cookei (Stapf.) Schenck ex Henr. : Herb ; western Peninsular India.

TRIPLOPOGON Bor (Gramineae)

T. ramosissimus (Hack.) Bor. : Herb ; western Peninsular India.

UTLERIA Bedd. ex Benth. (Periplocaceae)

U. salicifolia Bedd. : Shrub ; Anamalais in Southern W. Ghats.

VANASUSHAVA Mukherjee & Constance (Umbelliferae)

V. pedata (Wight) Mukherjee & Constance : Herb ; Southern W. Ghats.

WILLISIA Warm. (Podostemaceae)

W. selaginoides (Bedd.) Warm. ex Willis. : Tufted herb attached to rocks of fast flowing mountain streams. ; Anamalai hills of Southern W. Ghats.

XENACANTHUS Bremek. (Acanthaceae)

X. heteromallus (T. And. ex Clarke) Bremek. : A large shrub reaching up to 7 m and flowering in intervals of about 12 to 14 years ; Southern W. Ghats at altitude of 1200 m and above. Nilgiris southwards.

X. pulneyensis (Clarke) Bremek. : A shrub flowering at long intervals.. Southern W. Ghats from Nilgiris southwards.

X. zenkerianus (T. And.) Bremek. : A large shrub ; flowering at long intervals ; Southern W. Ghats from Nilgiris southwards.

4

Endemic Components in the Vegetation of Eastern Ghats

The Eastern Ghats are 'Tors' of geological antiquity with isolated mountain ranges lying between Mahanadi and the Vaigai rivers. The area is spread over ca 1750 km. traversing the length of the Coromandel coast between 10-20°N latitudes with varied precipitation under monsoon conditions. Floristically the region is rich with *ca* 2000 species of flowering plants which constitute 13% of the Indian element. Little attention was paid to biogeographical studies in this area. The flora of Eastern ghats of Orissa is covered in the work of Haines (1921) while Gamble (1915-1936) complemented the floristic detail of the Eastern Ghats of Andhra Pradesh and Tamil Nadu in his *Flora of Madras Presidency*. Vegetations of isolated hill ranges like Mahendragiri, Madgol hills, Rampa agency Polavaram agency, Nallamalais, Tirupati hills, Shevaroys and Pachamalais were described by others in some detail. Fyson (1932), Kapoor (1964), Rao (1958), Sebastine (1968) Ellis (1968) have made some contributions to our knowledge of the flora and vegetation of Eastern Ghats. Legris and Viart (1959) and more recently Legris and Meher-Homji (1979-1982) have analysed the bioclimatic regions of India including Eastern Ghats.

The vegetation of Eastern Ghats ranges from moist deciduous type in the north to dry deciduous type in the south. It has an assortment of tropical, subtropical, temperate elements along with evergreen types which occur at higher elevations. Its characteristic elements are *Hardwickia binata*, *Pterocarpus santalinus*, *Santalum album*, *Shorea robusta*, *S. tumbuggaia*, *Terminalia pallida* and *Syzygium alternifolium*. On the basis of degree of dryness, the Eastern Ghats are well distinguished into two zones of natural vegetation. (i) a northern zone of moist deciduous type with *Shorea robusta* and (ii) a southern dry deciduous forest region with *Shorea tumbuggaia—Hardwickia binata* type.

4.1 The Northern Eastern Ghats

The northern part of Eastern Ghats covering Mahendragiri hills of Ganjam, Koraput range and Madgol hills of Visakhapatnam with characteristic 'Sal' forests extending up to Dudhari (1730 m) Rayagada Division are of moist deciduous type, interspersed with some patches of evergreen

forest types or sholas on the slopes. The predominance of Sal (*Shorea robusta*) in the northern section, particularly in Mahendragiri is owing to the relatively higher rainfall. The mean annual rainfall at Mahendragiri ranges from 100—150 cm and the area, particularly Gumsur of Ganjam, is subject to extremes of temperature. The Visakhapatnam hills of northern part of Eastern Ghats are relatively drier with mean annual rainfall averaging about 114.3 cm and annual temperature ranging from 25° to 37° C. Geologically the northern part of E. Ghats belong to Archaean age : Khodalites and Charnokites constitute the hill ranges.

The moist patches of northern E. Ghats harbour tall arborescent elements like *Toona ciliata* and *Xylia xylocarpa* ; the sal forests flourish between 600 to 700 m forming natural stands. The upper slopes comprise scrub jungles. The Eastern Ghats of Orissa are in fact the meeting ground of temperate elements from the north and Burmese and Chinese elements from the east. Some characteristic elements of northern E. Ghats are, *Adina cordifolia, Anogeissus latifolia, Bauhinia vahlii, Bombax ceiba, Chloroxylon swietenia, Crotalaria alata, Dalbergia latifolia, Dillenia pentagyna, Diospyros candolleana, Ficus retusa, Gmelina arborea, Lagerstroemia parviflora, Lannea coromandelica, Linociera ramiflora, Litsea laeta, Memecylon umbellatum, M. madgolense, Terminalia chebula, T. alata,* etc.

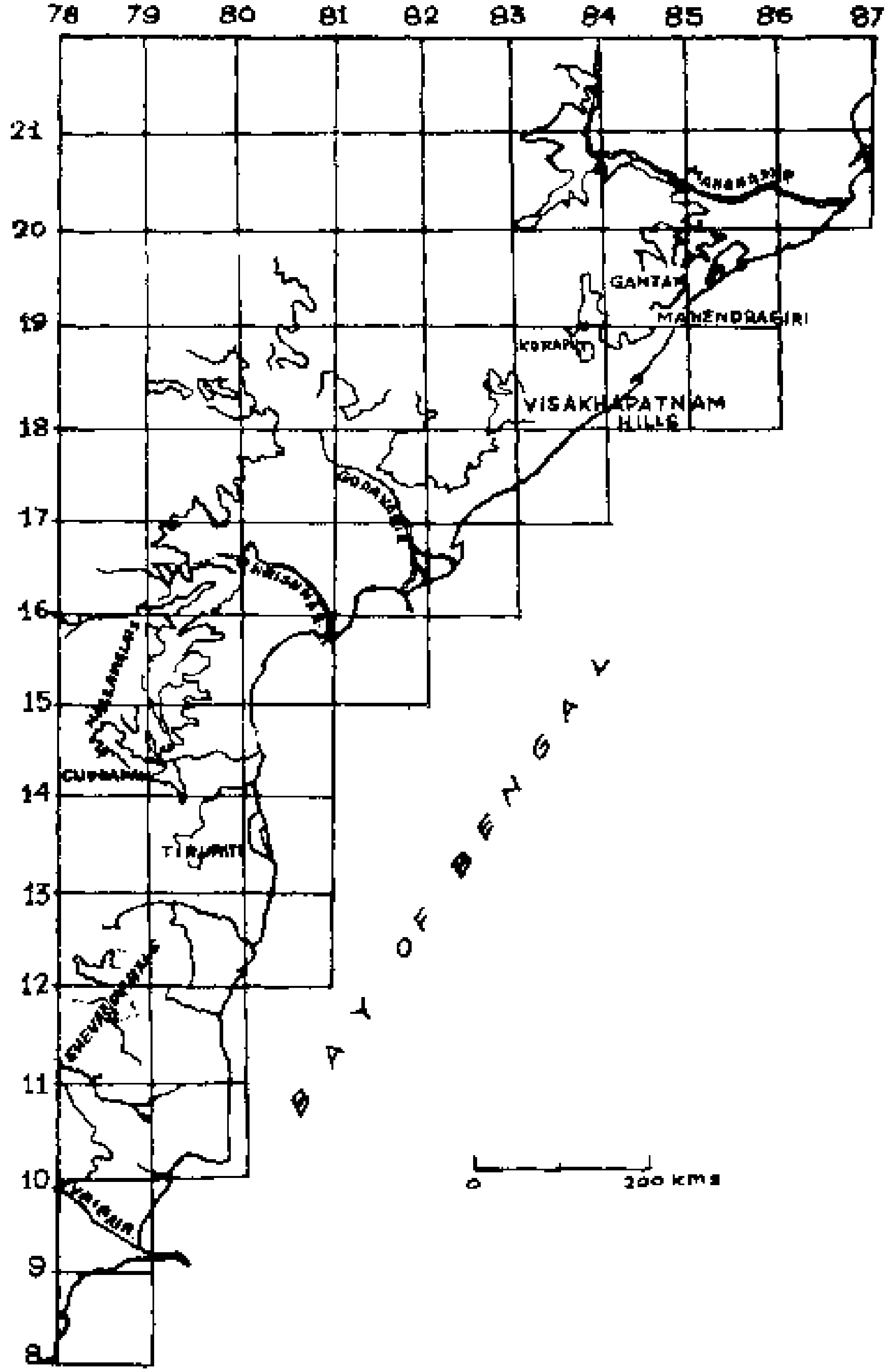
The hills of Ganjam-Koraput range have many narrow endemic species like *Acacia donaldii, Aglaia haslettiana, Aspidopteris hutchinsonii, Dimeria orissensis, Mucuna minima, Oryza jeyporensis, Themeda mooneyi, T. saxicola, Tragia gagei* and *Uvaria eucincta*. Further in the south the hills of Visakhapatnam also harbour endemic plants like *Nilgirianthus circarensis, Toxocarpus roxburghii, Argyreia arakuensis, Kalanchoe cherukondensis, Phyllanthus narayanswamii* and *Memecylon madgolense*. The local endemics which are not very narrow in the strict sense, but nevertheless are confined to the range of northern E. Ghats and which are of some indicator value are *Maytenus bailadillana, Atylosia cajanifolia, Wendlandia gamblei, Phlebophylum jeyporense, Leucas mukerjiana,* and *Bupleurum andhricum*. In this region, wild rice, wild pigeon-pea and wild banana are very significant genetic resources whose habitats deserve protection.

4.2 Southern Eastern Ghats

The southern dry deciduous zone lying between Seshachalam hills and Madura hills spread across Andhra—Tamil Nadu region is represented by the dry type of 'Sal' *Shorea tumbuggaia* indicating ecological adaptation of the genotype. The Nallamalai-Cuddapah range is floristically rich, with a marked change seen in its dry type of vegetation. The hill ranges

of this area are Velikonda, Seshachalam, Palakonda, Lankamalas and Nallamalais which have an evergreen scrub type of vegetation in the lower plains or ravines and deciduous type on the hills and in the relatively wet valleys. The mean annual rainfall of this range is 73.6 cm while the annual temperature ranges 30.4°C to 40.6°C. Geologically the range comprises gneissic or metamorphic rock and stratified rock with quartzite, limestone and shale. *Acacia farnisiana*, *Azadirachta indica*, *Balanites aegyptica*, *Cassia auriculata*, *Diospyros chloroxylon*, *D. melanoxylon*, *Euphorbia antiquorum*, *Gardenia latifolia*, *Hardwickia binata*, *Manilkara hexandra*, *Morinda citrifolia*, *Premna tomentosa*, *Prosopis spicigera*, *Sapindus emarginatus*, *Soymida febrifuga*, *Ventilago maderaspatana* and *Ziziphus mauritiana* are some of the major components of the vegetation of southern E. Ghats. *Tectona grandis* and *Terminalia tomentosa* are some of the timber resources, besides the endemic trees like *Pterocarpus santalinus* and *Shorea tumbuggaia*. Tirupati hills have a rich flora with *Ceiba pentandra*, *Pterospermum heyneanum*, *Grewia tiliaefolia*, *Erythroxylum monogynum*, *Aglaia roxburghiana*. *Santalum album* is abundant in Javadi hills of North Arcot district.

The southern E. Ghats have many interesting endemic plants. *Pterocarpus santalinus* or the Red Sanders tree with its narrow range of distribution occurs at elevations above 600 m in Cuddapah and Tirupati hills. This interesting endemic tree is threatened due to indiscriminate felling and could soon be on the verge of depletion. The narrow distribution of the Red Sanders tree is attributed to the transitional rainfall regime of the tract from dissymetric to tropical type (Legris & Meher-Homji, 1982). The northern *Cycas revoluta* is replaced by local endemic *Cycas beddomei* of Cuddapah series rock-type in Tirupati hills. It is also becoming rare now as it is exploited for its professed medicinal properties. *Boswellia ovalifoliolata* and the narrow endemic *Pimpinella tirupatiensis* are interesting and are adapted to specialised ecological conditions. *Shorea tumbuggaia* is another endemic dipterocarp needing specialised conditions. It normally occurs at higher elevations above 650 or 700 m in deep humus-rich ravines, forming singularly pure stands under congenial conditions. *Argyreia choisyana*, *Boswellia ovalifolia*, *Crotalaria sundoorensis*, *Chamaesyce senguptae*, *Pimpinella tirupatiensis* and *Pterocarpus santalinus* are some interesting endemics occupying the disturbed 'Bamboo'—'Teak' ecotone region. The Nallamalais, besides harbouring local endemics like *Andrographis nallamalayana*, *Eriolaena lushingtonii*, *Crotalaria madurensis* var. *kurnoolica*, *Dicliptera beddomei* and *Premna hamiltonii* also have three taxa each of *Oryza* and *Piper* at Gundabrahmeswaram making it a prospective germplasm site. The drier region of Shevaroys, North and South Arcot and Chingleput is endowed with local endemics *Dioscorea katkapershadii* *Neuracanthus neesianus*, *Cordia domestica*, *C. evolutior*, etc. in isolated patches.


78
79
80
81
82
83
84
85
86
87
21
20
19
18
17
16
15
14
13
12
11
10
9
8
MAHENDRAGIRI
VISAKHAPATNAM
HILLS
BAY OF BENGAL
0
200 kms

4.3 Conservation needs of E. Ghats

Most of the endemic taxa of E. Ghats are palaeoendemics and the survival of some rare ones which have narrow distributional range and adapted to specialised conditions, is dependent on the biotic, edaphic and climatic factors, their genetic structure in totality and past history of their populations in accord with the 'Gene-pool-nich-interaction theory' (Stebbins, 1980). The Eastern Ghats have some 'ecological islands' that harbour endemic plants. These areas are Ganjam-Koraput range in Orissa, Visakhapatnam hills (including Araku valley and Madgol hills), Nallamalai-Cuddapah range, and Tirupati hills of Andhra Pradesh, Shevaroys, North and South Arcot districts of Tamil Nadu. In some of these areas only vestiges of the once luxuriant and verdant forests remain. Most of these areas are under commercial exploitation of land by way of quarrying and mining (Koraput, Araku, Gudem, Papi hills) dam building (Nagarjuna sagar, Polavaram, Srisailam), monocultures and forest plantations (Koraput, Jeypore, Gudem, Tirupati, Shevaroy) and hydrothermal project (Machkund, Sileru, Kondapalli). These factors have had a devastating effect on the vegetation and natural habitats of the region. Further detailed study is warranted for the areas of endemic concentrations or gene-pool niches in areas like Mahendragiri, (Ganjam) Koraput, Araku, Nallamalais, Cuddapah hills, Tirupati and Shevaroys. It is prudent to consider these areas of narrow endemics as biosphere reserves for preservation of the interesting flora. The distribution pattern of the endemic plants in E. Ghats is quite different from that of W. Ghats. The species-rich zones are isolated primarily because the E. Ghats do not form a continuous range, but form rather broken hill ranges with plains in between. Thus the isolation and restricted distribution of the narrow endemic plants due to geographical, ecological edaphic and climatic barriers is much more pronounced in E. Ghats, in comparison to W. Ghats, where there is a continuity of mountain system and an almost same humid climatic regime, for which reason the endemic plants of W. Ghats have a relatively wider distributional range.

4.4 Enumeration of Endemic and Rare Taxa of Eastern Ghats

ACANTHACEAE

Andrographis beddomei C. B. Clarke : A much branched, nearly glabrous undershrub ; Andhra Pradesh: Circars, Nallamalais, 670 m & Cuddapah hills, 330 m.

A. nallamalayana Ellis. : A procumbent herb ; Andhra Pradesh : Kurnool dist.

Barleria morrisiana Bor ex Fisch. : Small shrub or undershrub ; Andhra Pradesh : Circars.

Dicliptera beddomei C.B. Clarke : A slender herb with flowers in rather short trichotomous cymes ; Andhra Pradesh : Nallamalais, Kurnool dist.

Neuracanthus neesianus C.B. Clarke : A procumbent hoary undershrub ; Tamil Nadu : Arcot dist.

Nilgirianthus circarensis (Gamble) Bremek. : An erect shrub ; Andhra Pradesh : Circars, hills of Visakhapatnam dist., 670 –1700 m.

Phlebophyllum jeyporensis (Bedd.) Bremek. : A large shrub with white flowers ; Orissa : Koraput. Andhra Pradesh: Circars, hills of Visakhapatnam & Godavari.

Rostellularia vahlii (Roth) Nees var. **rupicola** Ellis : Slender prostrate herb ; Andhra Pradesh : Srisailam, Nallamalais, Kurnool dist.

Santapaua madurensis Balakr. & Subr. : Erect glabrous herb with purple flowers ; Tamil Nadu : Alagar hills, Madura, 200 m.

ANNONACEAE

Alphonsea madraspatana Bedd. : Tree with bright yellow flowers ; Orissa : Barkuda island-Chilka lake. Andhra Pradesh : Visakhapatnam-Cuddapah dist. Tamil Nadu : N. Arcot, 1000 m.

Uvaria eucincta Bedd. : Large scandent/straggling shrub ; Orissa : Ganjam, Mahandragiri hills –Goomsur forest—West Russelkonda, 670 m.

APIACEAE

Bupleurum andhricum Nayar & Banerji : A herb ; Orissa : Koraput, Ganjam, Kalahandi. Andhra Pradesh : Circars-Araku, Palakonda, Devagiri.

Pimpinella tirupatiensis Balakr. & Subramanyam; A herb ; Andhra Pradesh: Tirupati hills—Japalatirtha.

ASCLEPIADACEAE

Brachystelma ciliatum Arekal & Ramakrishna : A herb ; Karnataka ; Kolar dist. 920 m.

B. glabrum Hook. f. : A short slender herb ; Andhra Pradesh : Cuddapah hills.

B. kolarensis Arekal & Ramakrishna : A herb ; Karnataka : Kolar dist.

B. volubile Hook. f. : Slender twining herb ; Andhra Pradesh : Cuddapah hills, 670 m.

Caralluma indica N.E. Br. : A small fleshy herb ; Andhra Pradesh : Circars & Nellore dist. Tamil Nadu : Arcot dist.

C. lasiantha N.E. Br., A many-branched fleshy herb : Andhra Pradesh ; Hills of Chittoor and Anantapur dist.

Toxocarpus roxburghii Wt. & Arn. : Slender twining shrub ; Andhra Pradesh : Circars.

ASTERACEAE

Notonia shevaroyensis Fyson : Scapigerus, glabrous herb ; Tamil Nadu : Shevaroys, Salem dist. 1500 m.

Vernonia shevaroyensis Gamble, A small tree ; Andhra Pradesh : Southern Circars, Tamil Nadu : Salem dist.

BORAGINACEAE

Cordia domestica Roth: Apparently a shrub or small tree ; Tamil Nadu ; Kambakam hills of Chingleput.

C. evolutior Gamble: A small tree with low spreading crown ; Karnataka : Mainhalli ; Tamil Nadu : Melpat, S. Arcot.

BURSERACEAE

Boswellia ovalifoliolata Balakr. & Henry : Tree with papyraceous bark ; Andhra Pradesh : Circars, Nallamalais, Kurnool dist., Tirupati hills, Chittoor dist. 300 m.

CELASTRACEAE

Maytenus bailadilaana (Swamy & Mooney) Raju & Biswas : Large shrub or small tree; Orissa : Kalahandi-Koraput ; Madhya Pradesh : Bastar.

CONVOLVULACEAE

Argyreia arakuensis Balakr. : A twiner : Andhra Pradesh : Araku valley, Visakhapatnam dist.

CRASSULACEAE

Kalanchoe cherukondensis Subba Rao & Kumari ; Perennial erect succulent herb ; Andhra Pradesh : Cherukonda, 1100 m. Visakhapatnam dist.

CYCADACEAE

Cycas beddomei Dyer : A shrub ; Andhra Pradesh : Cuddapah & Tirupati hills, Chittoor dist. 340-1000 m.

DIPTEROCARPACEAE

Shorea tumbuggaia Roxb., : A lofty resinous tree ; Andhra Pradesh : Cuddapah, Nellore-velikonda, Tirupati hills, Chittoor ; Tamil Nadu N. Arcot, Chingleput, 1000 m.

EUPHORBIACEAE

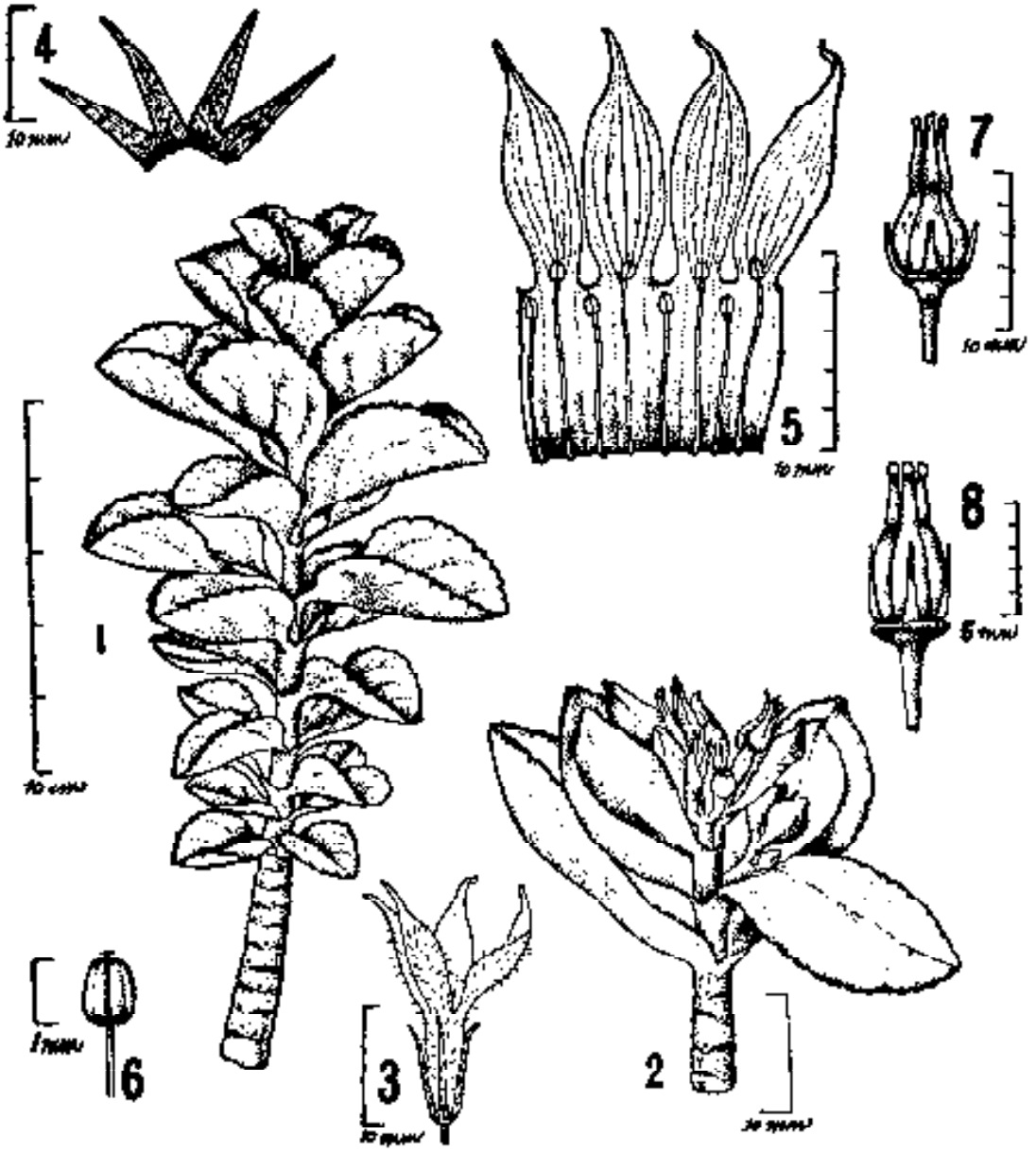
Bridelia cinerascens Gehrm. : A moderate-sized tree ; Andhra Pradesh : Palkonda hills, Cuddapah ; Velvikonda-Nellore.(Kambakam hills.) ; Tamil Nadu : Chingleput.

Chaemaesyce linearifolia (Roth) J. Sojak var. **nallamalayana** (Ellis) V. S. Raju & P. N. Rao : A glabrous herb ; Andhra Pradesh : Nallamalais, Kurnool dist.

C. **senguptae** (Bal. & Subr.) V. S. Raju & P. N. Rao : Erect herb ; Andhra Pradesh : Guvalacheruvu, Cuddapah dist., Ramanapenta, Nallamalais, Kurnool dist.

Croton scabiosus Bedd. : A moderate sized tree ; Andhra Pradesh : Cuddapah & Kurnool dist. 300-1200 m.

Lasiococca comberi Haines : A small tree ; Andhra Pradesh : N. Circars, Visakhapatnam dist, 1000-1400 m.



Kalanchoe cherukondensis Subbarao & Kumari

1. Part of plant. 2. Terminal part of plant with flower buds. 3. Flower. 4. Calyx spread open. 5. Corolla spread open. 6. Stamen. 7. Gynoecium. 8. Partly ripe carpels.

Courtesy : Bull. Bot. Surv. India

Phyllanthus narayanswamii Gamble : Small wiry undershrub ; Andhra Pradesh : N. Circars, Rampa hills, Godavari, Chenukonda Visakhaptnam dist. 1500 m.

Tragia gagei Haines : A perennial herb ; Andhra Pradesh : Circars.

FABACEAE

Atylosia cajanifolia Haines ; Erect undershrub ; Orissa : Khurda-Ganjam Andhra Pradesh : Visakhapatnam, Godavari ; Madhya Pradesh : Bastar.

Crotalaria paniculata Willd. var. **nagarjunakondensis** Thothathri : Erect undershrub, sticky and odorous ; Andhra Pradesh : Nagarjunakonda, Nalagonda dist.

C. sandoorensis Bedd. : Erect undershrub ; Tamil Nadu : Shevaroy hills, Salem. 1000 m. Dharampuri, Madurai.

Indigofera barberi Gamble : Erect canescent undershrub with slender branches ; Andhra Pradesh : Cuddapah, Nallamalais. 325 m. Kurnool dist, Chittoor dist. ; Tamil Nadu : S. Arcot dist.

Mucuna minima Haines : Slender climber ; Orissa: Sambalpur.

Pterocarpus santalinus Linn. *f.* : Moderate-sized tree ; Andhra Pradesh : Cuddapah, Kurnool ; Tamil Nadu : Arcot, Chingleput.

Rhynchosia beddomei Baker : A stiff undershrub with bright yellow flowers ; Andhra Pradesh : Cuddapah hills, Tirupati & Horsleykonda ; Karnataka : Bellary dist.

Sophora interrupta Bedd. : A large shrub or small tree with yellow flowers & oddly winged, jointed pod ; Andhra Pradesh : Cuddapah, Nellore and Mehboobnagar ; Tamil Nadu: Arcot, 1000 m.

Tephrosia roxburghiana Drumm : A slender undershrub with single leaflet, rarely more ; Orissa : South of Ganjam. Andhra Pradesh : Circars, hills of Visakhaptnam and Godavari dist. ; Karnataka : Bellary dist.

LAMIACEAE

Leucas diffusa Benth. : Small diffuse herb ; Andhra Pradesh : Godavari southwards ; Tamil Nadu: Shevaroys

L. lavandulifolia Rees var. **nagalapuramiana** Chand. : Erect herb ; Andhra Pradesh : Nagalapuram hills, Chittoor dist.

L. mollisima Wall. var. **sebastiana** Rao & Kumari : A straggling herb ; Andhra Pradesh : Visakhapatnam dist.

L. mollisima Wall. var. **silvestriana** Rao & Kumari : A struggling herb ; Andhra Pradesh : Visakhapatnam dist.

L. **mukerjiana** Rao & Kumari : Woolly or villous herb/undershrub: Andhra Pradesh : Cherukonda, Ballikonda near Araku valley, Visakhapatnam.

L. nepetaefolia Benth. : Hoary shrub ; Andhra Pradesh : Guntur dist. extending into Deccan (Hyderabad).

LAURACEAE

Actinodaphne madraspatana Bedd. : A tree with long leaves, white beneath ; Andhra Pradesh : Cuddapah, Nellore, Nagari hills, Chittoor 1000 m; Tamil Nadu: Chingleput dist. 600-800 m.

MALPIGHIACEAE

Aspidopteris hutchinsonii Haines : Climbing shrub ; Orissa : Mayurbhanj at high elevation, 900 m.

MALVACEAE

Decaschistia cuddapahensis T. K. Paul & Nayar : A perennial shrub ; Andhra Pradesh : Cuddapah, Chittoor dist. ; Tamil Nadu: North Arcot dist. 150-600 m.

MELASTOMACEAE

Memecylon madgolense Gamble : A shrub ; Andhra Pradesh : Circars, Madagol hills, Visakhapatnam dist., 1000-1500 m.

MELIACEAE

Aglaia haslettiana Haines : Evergreen tree ; Orissa : Angul, Mals of Puri.

MIMOSACEAE

Acacia donaldii Haines : A small tree ; Orissa: Sambalpur dist.

Albizia orissensis Sahni & Bennet. : A tree ; Orissa : Near Palasa.

A. sikharamensis Sahni & Bennet. : Large shrub or small tree ; Andhra Pradesh : Sikharam, Srisailam.

ORCHIDACEAE

Habenaria panigrahiana Misra : Terrestrial erect herb ; Orissa: Ganjam dist., Mohana on foot hills.

H. panigrahiana Misra var. **parviloba** S. Misra : Erect herb ; Orissa: Ganjam dist., Bhanjanagar.

POACEAE

Arundinella setosa Trin. var. **lanifera** Fischer : Erect herb ; Andhra Pradesh : Cuddapah, Magillikuppa, 1000 m.

Chrysopogon velutinus (Hook. f.) Bor : Perennial erect herb ; Andhra Pradesh : Cuddapah dist.

Dimeria orissae Bor : Slender herb ; Orissa : Koraput dist.

Iseilema venkateswarlui Satyavathi : Prostrate annual herb ; Andhra Pradesh : Guntur.

Oryza jeyporensis Govind. & Krish. : Tall herb ; Orissa: Koraput dist, Biorgumma, Boipariguda-Jeypore.

Themeda mooneyi Bor : Erect perennial grass ; Orissa : Near Potangi Koraput dist. 1300 m.

T. saxicola Bor : Perennial grass with a single raceme terminating the tip of an unbranched culm. ; Orissa : Raissili village, Koraput dist. 1000 m.

RUBIACEAE

Lasianthus truncatus Bedd. : A shrub ; Orissa: Mahendragiri, Ganjam, 1500 m. Andhra Pradesh : Visakhapatnam hills.

Ophiorrhiza chandrasekharanii G. V. Subba Rao & G.R. Kumari : A herb ; Andrah Pradesh : Visakhapatnam dist. Vankachinta.

Pavetta madrassica Bremek : A large shrub ; Andhra Pradesh : Krishna, Nellore & Visakhapatnam dist ; Tamil Nadu: Odyan Kolopatte, Andyar-beach, Madras.

Wendlandia gamblei Cowan : A small glabrous tree ; Orissa : Mahendragiri hills, Ganjam, 1500 m. Andhra Pradesh : Ventala-Rampa hills, Visakhapatnam dist.

RUTACEAE

Triphasia reticulata Smith var. **parviflora** Santapau : A spiny shrub; Andhra Pradesh : Balapalle, Seshachalam hills, Cuddapah dist.

STERCULIACEAE

Eriolaena lushingtonii Dunn. : A tree ; Andhra Pradesh ; Circars, Kurnool-Nallamalai hills ; Tamil Nadu : Ramanathpuram.

VERBENACEAE

Premna hamiltonii (Buch.-Ham.) Ellis : A large tree, Andhra Pradesh : N. Circars, Nallamalais, Rampa hills of Godavari dist.

5

Centres of Endemism in Peninsular India

Peninsular India is a part of the Gondwanaland landmass with a geological lineage of great antiquity. It is seen the Indian plate of the Gondwanaland detached itself during Middle Eocene and moved northwards from its original position near Madagascar in southern latitudes to crash aganist Laurasia in the northern tropical latitudes during late Cretaceous (Powell & Conaghan, 1973). Raven & Axelrod (1974) are of the opinion that the Indian plate was subjected to different climatic stresses during its passage northwards resulting in the impoverishment of its flora. Sahni (1936) mentioned that the Glossopteris flora of Peninsular India was of southern temperate origin and is different from the Gigantopteris flora which is of tropical origin. Nayar (1977, 1980) surmised that the history of the flora of Peninsular India is one of floristic impoverishment due to flow of deccan lavas during Cretaceous-Eocene times and spreading aridity in Neogene-Quarternery times causing depletion of its characteristic flora leaving few relict taxa. Also the closing of Tethys sea and the opening of the Indian ocean brought about a new climatic pattern of trade winds and monsoon regimes which contributed to the preservation of a few endemic taxa in the mountain systems of Peninsular India.

Turrill's (1964) contention that next to islands, the peninsular regions provide favourable conditions for endemism is acceptable so far Peninsular India is concerned. Peninsular Indian region has a high degree of endemism making it the second richest endemic centre after the Himalayas.

5.1 Analysis of endemic taxa in Peninsular India

Of the estimated 15,000 species of angiosperms in India almost 12% are found to be endemic to Peninsular India.

There are as many as 1932 taxa (incl. 1788 species & 144 infraspecific taxa) endemic to Peninsular India. These endemic taxa cover 108 families of flowering plants. 1384 endemic taxa belong to 96 families of dicotyledons while the remaining 548 endemic taxa cover 14 families of monocotyledons. It is seen at the family level, there are no endemic family in the Peninsular India, but at the generic level there are as many as 58 genera (incl. 47 monotypic genera) endemic to Peninsular India. The families with

the largest representation of endemic taxa are Poaceae, Rubiaceae, Acanthaceae, Orchidaceae and Fabaceae (in decreasing order) ; families having more than 50 endemic taxa in Peninsular India are listed below.

Family	Total species in India (incl. wides)	Endemic species*	Percentage of endemics
Acanthaceae	344	143	41.5%
Asclepiadaceae	209	62	29.6%
Asteraceae	723	71	9.8%
Balsaminaceae	178	72	40.4%
Cyperaceae	446	58	13%
Euphorbiaceae	344	73	21.2%
Fabaceae	1000	103	10.3%
Poaceae	1214	178	14.6%
Labiatae	340	62	18.2%
Orchidaceae	956	111	11.6%
Rubiaceae	286	132	46.1%

*excluding infraspecific taxa.

The endemic species of flowering plants occurring in Peninsular India are mostly palaeoendemics as evidenced by their high degree of isolation (endemics of Peninsular India inhabit mountainous/hilly regions) and arborescent habit (of the 1932 endemic taxa 958 taxa are herbaceous while the rest are woody or arborescent). The prescence of 27 genera, endemic and common to Peninsular India and Sri Lanka also reflects the past geological ancestry of the two regions (Nayar and Ahmedullah, 1985).

5.2 Centres of Endemism

The distribution and concentration of endemic plants in a particular region is an index to the overall biogeography of the area. Most of the endemic plants of Peninsular India are palaeoendemics having found favourable ecological niches in the hill-ranges on either side of the Peninsula. A large concentration of endemic species is found in the tropical moist deciduous and tropical semi-evergreen patches of W. Ghats and to a much lesser degree in the E. Ghats. Subramanyam and Nayar (1964) considered that the W. Ghat hill tops resemble islands so far as the distribution of endemic species is concerned.

On the basis of the distribution of endemic plants the following regions can be considered as centres of endemism in Peninsular India.

Northern W. Ghats: —(R. Tapti to Goa)

The vegetation of the W. Ghats in general can be differentiated into altitudinal zones. In the N.W. Ghats, the lower elevation, 200-500 m constitutes scrub and semi-deciduous type of vegetation; at elevations

between 500-1166 m are the dry deciduous hill forests. The windward-side of this sector of Ghats which receive the maximum rainfall (100-200 cm.) are the moist deciduous forests having pockets of evergreen type in regions of higher rainfall. Though the W. Ghats of Maharashtra receive rainfall ranging from 625-750 cm the evergreen trees are characteristically dwarfish, not having typical trees of evergreen tropical forest (Qureshi, 1965).

Some of the monotypic genera strictly confined to this area are *Bhidea*, *Bonnayodes*, *Frerea*, *Helicanthes*, *Pogonachne*, *Pseudodichanthium* and *Seshagiria*. Many endemic plants, predominantly belonging to families like Asclepiadaceae, Liliaceae and Poaceae occur in the Sahyadri range. The genus *Frerea* is on the brink of extinction having a few surviving pockets in the Pune district. Many species like *Abutilon ranadei*, *Achyranthus coynei*, *Barleria sepalosa*, *Cissus arenosus*, *Dichanthium compressum*, *D. woodrowii*, *Dysophylla stocksii*, *Glyphochloa santapaui*, *Gymnema khandalense*, *Habenaria caranjensis*, *Salacia brunoniana*, *Synnema anomalum*, and *Viscum mysorense* are very rare and probably extinct as no record of collections exist since the original type collection. *Arisaema caudatum*, *Canscora concanensis*, *Ceropegia fantastica*, *C. huberi*, *C. lawii*, *C. odorata*, *Dichanthium maccannii*, *Dysophylla salicifolia*, *Eriocaulon humile*, *Heracleum concanense*, *H. pinda*, *Dipcadi minor*, *D. ursulae*, *Gymnema cuspidatum*, *Hypoestis lanata*, *Lepidagathis lutea*, *Maytenus puberula*, *Oianthus deccanensis*, *O. urceolatus*, and *Scurrula stocksii* are some of the plants which are rare within a narrow range of distribution, even restricted to the type locality itself. Though some species like *Arthraxon hispidus* and *A. junnarensis* could not stand detailed revisionary studies, many species, particularly those belonging to the genera *Ceropegia*, *Crinium*, *Dichanthium*, *Eriocaulon* and *Isachne* are strictly confined to the northern W. Ghats region. Some areas of the Sahyadri range like Ratnagiri and Panchgani deserve special mention for their rich endemic content.

Central W. Ghats (R. Kalinadi to Coorg)

The rivers Kalinadi, Gangavali—Bedti, Tadri and Sharavati cause a small break in the W. Ghats chain. This sector forms the Archean series of the W. Ghats and its highest point is Kudremukh (2071 m) where rich deposits of magnetice are found. These ghats have mineral deposits like those of limestone & quartzite. Gold (Kolar, Gulbarga) copper (Gulbarga, Chikmaglur, Hassan) uranium (N. Kanara, Chikmaglur) etc. are other resources of these ghats.

The vegetation ranges from tropical wet evergreen, deciduous (666-1000m) to scrub type as in the other parts of W. Ghats though the hill-top flora of this region is different from that of southern W. Ghats

owing to their relatively lower elevations. Alpine species of *Gaultheria*, *Mahonia*, *Rhododendron* and *Rhodomyrtus* are prominent by their absence. The family Podostemaceae is particularly well represented in S. Kanara. The evergreen belt of Shimoga has interesting associations of the endemic *Poeciloneuron* with *Mesua* at the crest or with *Dipterocarpus—Hopea* or *Elaeocarpus-Lagerstroemia*.

The genera *Hubbardia* and *Paraeautleya* are exclusively endemic in this region while genera like *Carvia*, *Danthonidium*, *Erinocarpus*, *Moullava* and *Polyzygus* find a common distributional range here along with the northern section. Other endemic genera like *Ascopholis*, *Blepharistemma*, *Phlebophyllum* and *Poeciloneuron* are distributed in this central section as well as the southern portion of the W. Ghats.

Some of the extremely threatened or endangered plants of this central sector of the W. Ghats are *Caralluma truncato-coronata*, *Cynoglossum ritchiei*, *Hubbardia heptaneuron*, *Leea talbotii*, *Leucas angustissima*, *Neanotis ritchiei* and *Viscum mysorense*. These plants are on the verge of extinction, if not already so. The monotypic genus *Hubbardia* is feared to be already extinct as is *Viscum mysorense*, both of which could not be located even in their type localities. Plants like the newly described *Dalechampia stenoloba*, as well as *Lepidagathis clavata* and *Oianthus disciflorus* are also under severe threat. No known collections other than the type exist for them. Plants like *Ceropegia fantastica*, *Dichanthium paranjpyeanum*, *Dimeria woodrowii*, *Gymnema cuspidatum*, *Manisuris divergens* and *Rungia crenata* are also rare in this region.

Some of the plants that are strictly endemic and restricted in the Central W. Ghats are *Acanthopale jogensis*, *Aglaia littoralis*, *Bulbophyllum mysorense*, *Calamus nagbettai*, *Croton lawianus*, *Eulophia emilianae*, *Glyphochloa mysorensis*, *Hoya retusa*, *Hubbardia heptaneuron*, *Hugonia belli*, *Iphigenia mysorensis*, *I. veldkampii*, *Ischaemum dalzellii*, *I. ritchiei*, *Loxoma maculata*, *Luisia macrantha*, *Memecylon terminale*, *Marsdenia raziana*, *Nervilia hispida*, *Oberonia brachyphylla*, *O. josephii*, *Ochlandra talbotii*, *Oldenlandia prainiana*, *O. sedgewickii*, *Paracautleya bhattii*, *Phalaenopsis mysorensis*, *Phlebophyllum canaricum*, *Phyllanthus talbottii*, *Psychotria canarensis*, *Schizachyrium sudhanshui*, *Tarenna agumbensis*, *Theriophonum uniseriatum*, *Vernonia dalzelliana* and *V. ornata*.

Agumbe, Bababudan hills, Coorg, N. Kanara, S. Kanara, Shimoga are areas of high endemic content.

Southern Western Ghats (Travancore, Malabar, Nilgiri, Anamalai, Palni, Tirunelveli hills complex).

The southern section of the W. Ghats is by far the richest area in context to floristic composition and concentration of endemic taxa. This is influenced directly by the high rainfall (fed by the southwest monsoon) of this area. The southern W. Ghats are a conglomerate of hill ranges : Travancore hills of Kerala and Nilgiri, Anamalais, Palni, Tirunelveli hills of Tamil Nadu. These hills together form the richest centre of endemism in Peninsular India. The vegetation of this area also bears strong similarities to the hill vegetation of Sri Lanka. As many as 27 genera of angiosperms are common and endemic to these two regions (Nayar & Ahmedullah 1985).

Travancore hills (which include Cardomom hills, Anamalai) and Malabar hills comprise the W. Ghats of Kerala. Genera like *Janakia*, *Kanjaram*, *Limnopoa*, *Otonephilium* and *Silentvalleya* are exclusively endemic in these mountain ranges.

Some of the endemic species of the Travancore region are:—*Aglaia maiae*, *Asteriastigma macrocarpa*, *Begonia aliciae*, *Bombax scopulorum*, *Buchanania barberi*, *B. lanceolata*, *Clematis bourdillonii*, *Colubrina travancorica*, *Coscinium fenestratum*, *Cyclea fissicalyx*, *Cynometra beddomei*, *Dysoxylon beddomei*, *D. ficiforme*, *Garcinia imbertii*, *Impatiens aliciae*, *I. anaimudica*, *I. cochinica*, *I. coelotropis*, *I. johnii*, *I. leptura*, *I. macrocarpa*, *I. munnarensis*, *I. pallidiflora*, *I. pandata*, *I. platyadena*, *I. rivulicola*, *Loeseneriella bourdillonii*, *Paphiopedilum druryi*, *Phaeanthus malabaricus*, *Polyalthia rufescens*, *Pterospermum reticulatum*, *Sageraea grandiflora*, *Schefflera bourdillonii*, *Smithia venkoborowii*, *Taeniophyllum scaberulum* and *Vanilla wightiana*.

Nilgiris

The Nilgiri hills rise steeply to high elevations (2657m) and level off at the top, to form a sort of plateau with grassy meadows interspersed with patches of shola vegetation, which commence from 1500 m. The vegetation of Nilgiris shows interesting similarities with that of Assam flora. In comparison with Palni-Anamalai hills, the sholas of Nilgiris are richer by virtue of their higher elevation. Many temperate species like those of *Hypericum*, *Lonicera*, *Lysimachia*, *Rhododendron*, *Thalictrum*, *Turpinia*, etc. are found in the Nilgiris. The vegetation also resembles the high altitude vegetation of Sri Lanka particularly in the presence of peat bogs where characteristic species of *Eriocaulon*, *Exacum* and *Utricularia* occur.

The genus *Baeolepis* is strictly endemic to Nilgiris. Other endemic genera distributed in the southern W. Ghats including Nilgiris are—*Ascopholis Campbellia*, *Diplocentron*, *Jerdonia*, *Taeniandra*, etc.

Some of the endemic and threatened plants of this region are *Agrostis schmidii, Andropogon longipes, Andrographis lawsonii, Arisaema tuberculatum, A. tylophorum, Bulbophyllum fusco-purpureum, Carex christi, C. pseudo-aperata, Cinnamomum perrottetii, Clematis theobromina, Coelogyne angustifolia, Eria albiflora, Eriocaulon gamblei, Garnotia schmidii, Habenaria denticuluta, H. fimbriata, Impatiens neo-barnesii, I. nilagirica, Lasianthus ciliatus, Liparis biloba, L. duthiei, Mackenziea homotropa, Memecylon sisparense, Microtropis densiflora, Ophiorrhiza pykarensis, Ochlandra beddomei, O. setigera, Pavetta hohenackeri, Senecio kundaicus, Sonerila elegans, Thunbergia bicolor* and *Youngia nilagiriensis*.

Anamalai-Palni-Tirunelveli hills

Because of the abrupt changes in their topography, this group of hills is considered more complex than the Nilgiris (Spate, 1957) The W. Ghats reach their highest point at Anaimudi peak (2947 m). The vegetation ranges from dry deciduous (rainfall 160-260 cm) moist deciduous (500-900 m alt. ; 240-350 cm. rainfall) to wet evergreen forest (500-2500m alt. ; 250-500 cm. rainfall) on the windward side. Besides the typical rainforest element, the presence of the south Indian conifer *Decussocarpus wallichianus* is interesting.

The Anamalais (Coimbatore dist.) support many endemic taxa, primarily distinct genera like *Pseudoglochidion, Utleria* and *Willisia* which are strictly confined to these parts. Some of the endemic, rare and threatened species of these region are *Acrocephalus wightii, Antistrophe serratifolia, Desmos viridiflorus, Didymocarpus fischeri, Didyplosandra andersonii, Hedyotis anamalayana, Helichrysum perlanigerum, Impatiens wightiana, Liparis platyphylla, Peucedanum anamallayense, Premna paucinervis, Pseudoglochidion anamalayanum, Salacia beddomei, Symplocos anamallayna, Trichosanthes anamallayana* and *Vernonia recurva*, etc.

Palni hills (Madura dist.) have their own share of endemic and rare plants. Besides those endemics with wider distribution, some of the species restricted to the Palni hills are *Anaphalis beddomei, Crotalaria conferta, C. fysoni, Isachne angladei, Ixora saulierei, Liparis beddomei, Ophiorrhiza roxburghiana, Pimpinella pulneyensis, Sonerila pulneyensis, Vernonia fysoni, V. pulneyensis*, etc.

Tirunelveli hills which form the southernmost tip of W. Ghats have endemic plants restricted to this area. They are *Aerva wightii, Ehretia wightiana, Exacum courtallense* var. *courtallense, Fimbristylis contorta, Hedyotis barberi, Hetaeria ovalifolia, Hopea erosa, Nothopegia aureo-fulva, Piper barberi, Plectranthus beddomei, Psychotria globicephala, Symplocos barberi*, etc.

Eastern Ghats

On an analysis it is seen that as many as 77 taxa (68 species and 9 varieties) spread over 60 genera and 27 families, are endemic to Eastern Ghats.

These 77 endemic taxa include 67 dicotyledons, 9 monocotyledons and a single gymnosperm. The families with the largest representation of endemic taxa are Acanthaceae (with 10 endemic taxa), Euphorbiaceae (with 7 endemic taxa) and Fabaceae (with 9 endemic taxa) followed by Asclepiadaceae and Poaceae (with 7 endemic taxa each). There is no endemic genus strictly confined to the Eastern Ghats.

The Eastern Ghats can further be divided into two centres: Northern E. Ghats and Southern E. Ghats. Regions like Ganjam-Koraput and Visakhapatnam hills in the northern sector and Nallamalais, Cuddapah, Tirupati and Shevaroy hills in the southern sector are rich in both plant/genetic diversity and endemic content (for details refer Chapter 4).

Central & Southern Gujarat

The central southern portion of Gujarat has much of the dry arid vegetation characteristic of Sind and also dry deciduous type in the hills, with the highest elevation is 1050 m in Dangs forest area. Some of the endemic plants of this region are *Cyperus dwarkensis*, *Fuirena tuwensis*, *Helichrysum cutchicum* and *Tephrosia jamnagarensis*, Some of the plants restricted to W. Ghats, have extended distribution in S. Gujarat, e.g. *Dendrobium microlulbon*, *Eulophia ramentacea*, *Chlorophytum borivilianum* and *Ischaemum santapaui*, etc.

5.3 Dynamics of Endemic species, Conservation in Peninsular India

Many habitats in the centres of endemism in Peninsular India are under threat due to mining, plantations, dam building and other anthropogenic factors. The human impact on the environment of these localities has already taken its toll.

The centres of endemism in Peninsular India are also the centres of genetic diversity and consequently centres of speciation as well. The genetic make-up of endemic plants being unique, with lesser amplitude in plasticity or adaptive radiation, the chances of survival against threat are limited. As population systems cannot be replicated they are doomed to extinction. This in essence was explained by Stebbins (1980) in his '*Gene-pool-niche-interaction theory*'.

Hence, to safeguard these endemic species, (or rather the links in evolutionary sequence) from extinction, one has to protect their natural habitats to enable plants to follow their natural evolutionary course.

There is a need to preserve all the diversity of ecosystem types in reserves or protected areas incorporating as much of the different biogeographical types as possible.

It is suggested here that many more biosphere reserves be established at the species rich areas of the centres of endemism mentioned earlier. Only such biosphere reserves could encompass and sustain the rich genetic diversity of the Indian Peninsula. Unless *in situ* and *ex situ* conservation methods are applied, the important wild relatives of cultigens and the rare endemic plants in particular have no chance of survival.

Class : Magnoliopsida

(Dicotyledons)

ANNONACEAE

The Annonaceae constitute *ca* 120 genera and *ca* 2100 species distributed in the tropics of both the hemispheres. They are mainly concentrated in the Old World rather than the New World. They are abundant in the main forest areas of S. America, W. Africa, India, Sri Lanka, Malay Peninsula and eastwards.

In India the family is represented by *ca* 23 genera and 130 species. In Peninsular India, 25 species are endemic. No taxa of this family at the generic level are known to be endemic to this region. In Peninsular India, the percentage of endemism in context to the Indian Annonaceae figures about 20%. The endemic species are spread over 12 genera.

The genera with the highest representation of endemic species in Peninsular India are *Goniothalamus* (4 spp.) and *Miliusa* (4 spp.).

The endemic species are mainly concentrated in the Southern Western Ghats up to elevations of 1400 m. *Polyalthia cerasoides* is widespread, albeit restricted, in the Peninsular region. *Alphonsea madraspatana* and *Uvaria eucincta* are confined to the Eastern Ghats.

Endemic species

Alphonsea madraspatana Bedd. : Tree ; Eastern Ghats, almost throughout up to N. Arcot in south, 900 m.

Desmos lawii (Hook. f. & Thoms.) Safford : Woody climber ; Western Ghats, throughout up to Tirunelveli & Coimbatore in south, 600 - 900 m.

D. viridiflorus (Bedd.) Safford : Gigantic climber ; Southern W. Ghats, Travancore, Coimbatore. Rare & Endangered.

Goniothalamus cardiopetalus (Dalz.) Hook. f. & Thoms. : Small tree ; Southern W. Ghats, Kanara, Coorg, Wynaad, Anamalais, 800 1200 m. Shevaroys of E. Ghats.

G. rhynchanthus Dunn. : Small tree ; Southern W. Ghats, Tirunelveli, Travancore.

G. wightii Hook f. et Thoms. : Small tree ; Southern W. Ghats, Travancore, Anamalais & Tirunelveli, 900 1500 m.

G. wynaadensis Bedd. : Erect shrub ; Southern W. Ghats, Wynaad & Nilgiri, 500 1050 m. Rare & Threatened.

Meiogyne pannosa (Dalz.) Sinclair : Small tree ; W. Ghats, throughout 600 1400 m.

M. **ramarowii** (Dunn) Gandhi : Small tree ; Southern W. Ghats, Hassan, S. Kanara, Travancore & Nilgiri up to 1200 m.

Miliusa eriocarpa Dunn. ex Gamble : Shrub ; Southern W. Ghats, Kanara, Travancore & almost all dists. of Tamil Nadu including Salem of E. Ghats.

M. **montana** Gard. ex Hook. f. et Thoms. : Shrub ; Southern W. Ghats, Malabar, Anamalais, Nilgiri & Tirunelveli, Cuddapah of E. Ghats.

M. nilagirica Bedd. : Large shrub ; Southern W. Ghats, Anamalais (Coimbatore) Nilgiri & Tirunelveli. Rare & Threatened.

M. wightiana Hook. f. et Thoms. : Small tree ; Southern W. Ghats, Nilgiri, Tirunelvli & Coimbatore up to Kanyakumari, Chingleput of E. Ghats. 1500 m.

Mitrephora grandiflora Bedd. : Tree ; W. Ghats of Karnataka, (Mysore, Shimoga S. Kanara) & Kerala (Wynaad), 600 m.

Orophea erythrocarpa Bedd. : Medium sized tree ; Southern W. Ghats, Travancore & Anamalai (Coimbatore) 600 m.

O. thomsonii Bedd. : Small tree ; Southern W. Ghats Travancore, Anamalai (Coimbatore) Tirunelveli. 750 m. Rare & Threatened.

O. uniflora Hook. f. et Thoms. : Shrub/small tree ; Southern W. Ghats, in Coorg, Wynaad, Travancore, Nilgiri, Anamalai & Tirunelveli, 1200 m. Rare & Threatened.

Phaeanthus malabaricus Bedd. : Small tree ; Southern W. Ghats, Trambrachari ghats, Wynaad, 600 m.

P. cerasoides (Roxb.) Bedd. : Evergreen tree ; Peninsular India, exteuding up to Bihar, up to 1000 m, less common in W. Ghats.

P. fragrans (Dalz.) Bedd. : Tall tree ; Southern & Central W. Ghats up to 1200 m. Kanara, Travancore, Anamalais (Coimbatore).

P. rufescens Hook. f. et Thoms. : A tree ; Forests of W. Coast/Ghats, Cochin, Travancore Malabar & Tirunelveli. Rare.

Papowia beddomeana Hook. f. & Thoms. : Small tree ; Southern W. Ghats, Travancore & Tirunelveli, 900 1500 m. Rare & Endangered.

Sageraea dalzellii Bedd. : Small evergreen tree ; Southern W. Ghats, Travancore, Anamalais, up to 600 m.

S. grandiflora Dunn : Medium to large sized tree ; Southern W. Ghats, Travancore. Rare & Threatened.

Uvaria eucincta Bedd. ex Dunn : Scandent/straggling shrub ; Eastern ghats, Ganjam, up to 600 m. Rare & Threatened.

MYRISTICACEAE

This is a rather small family comprising *ca* 18 genera and 300 species, distributed in the tropical region, particularly in the low land rain forests of Asia. The placotropical genus *Myristica* with *ca* 120 species is centered in New Guinea while species of the tropical south and American genus *Virola* form a major component of the forest vegetation of Amazon basin. The genus *Knema* confined to southeast Asia and Malaysia is centered in Borneo.

In India the family is represented by *ca* 4 genera and 15 species. Only 2 species and a variety are endemic to Peninsular India. *Knema attenuata* is a lofty endemic tree growing in the moist shady valleys of the W. Ghats of Maharashtra, Karnataka, Kerala and Tamil Nadu. *Myristica fatua* var. *magnifica* and *Myristica malabarica* are rare.

ENDEMIC TAXA

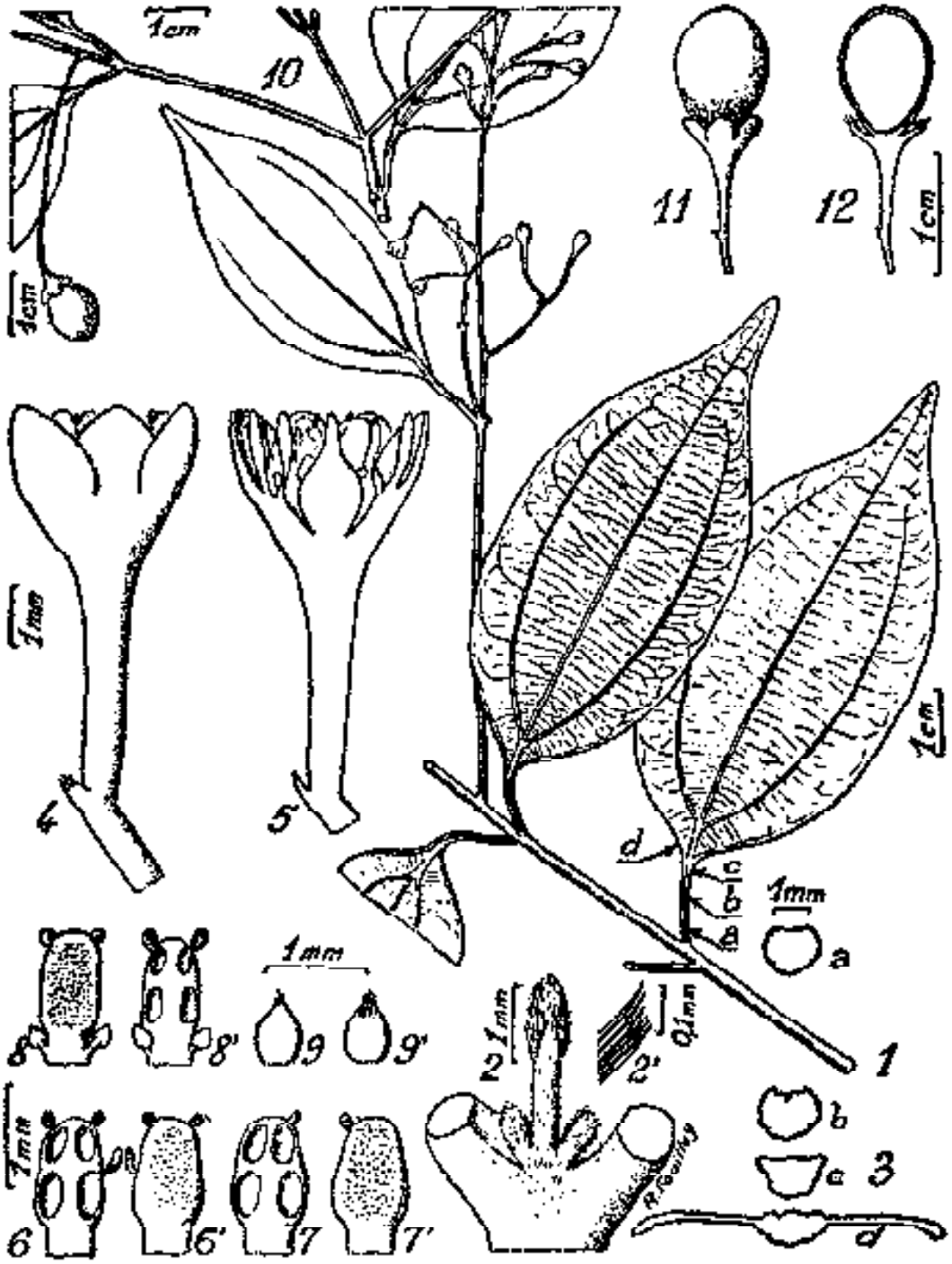
Knema attenuata (Hook. f. et Thoms.) Warb. : A. moderate sized tree ; W. Ghats, Konkan, Kanara & Southwards upto 600 m.

Myristica fatua Hautt. var. **magnifica** (Bedd.) J. Sinclair : A. lofty tree ; Southern W. Ghats, N. Kanara & Southwards to Kerala, Travancore & Tirunelveli of Tamil Nadu. Rare & Threatened.

M. malabarica Lamk. : A tall tree ; W. ghats, Konkan, N. Kanara, Shimago, S. Kanara & N. Malabar, 300 m. Rare & Threatened.

LAURACEAE

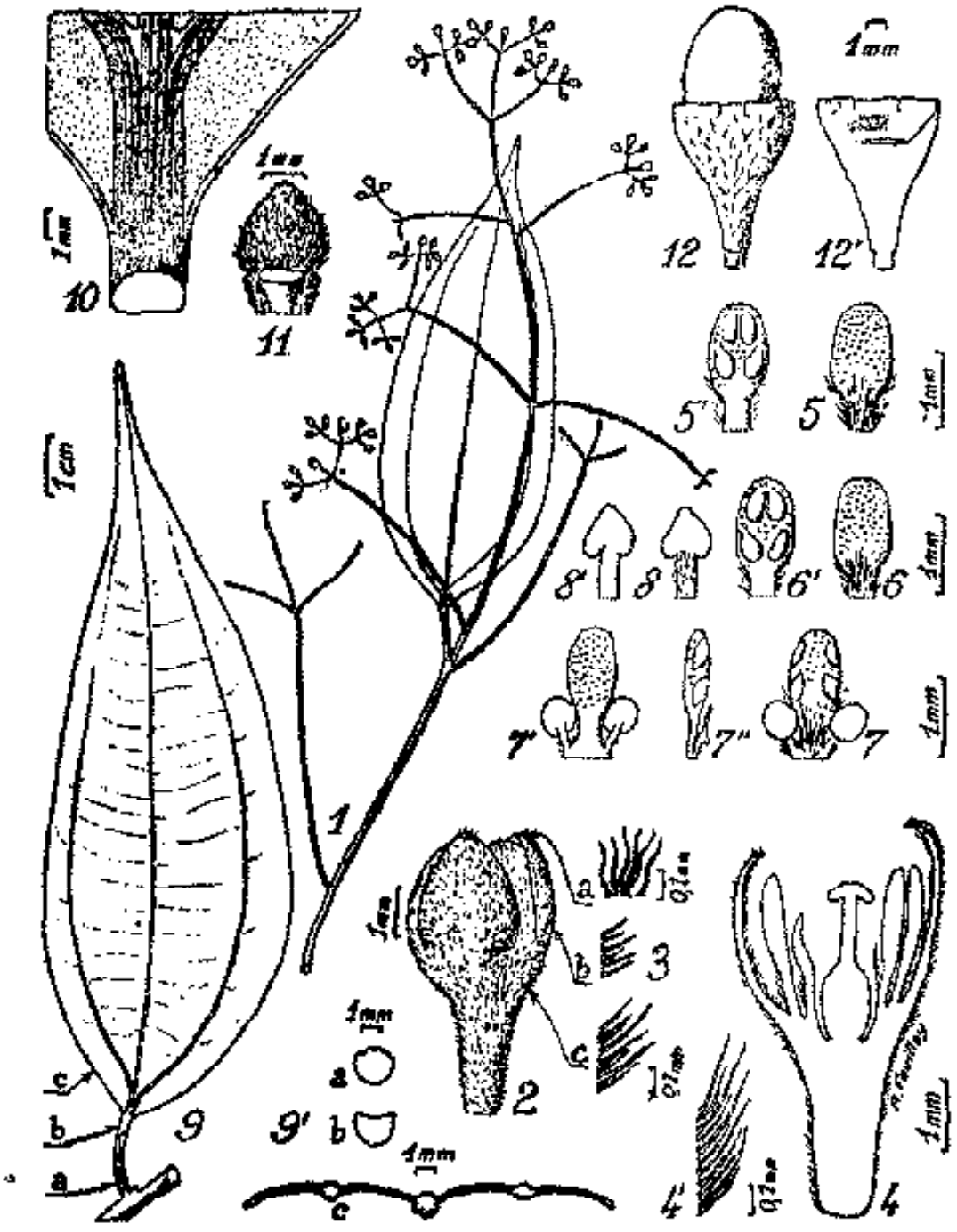
This is essentially a tropical and subtropical family comprising *ca* 32 genera and 2000 - 2500 species. Montane rain forests at Southeast Asia and Brazil are the main centres of development of this family. Some genera like *Lindera*, *Persea* and *Sassafras* extend to the temperate regions, while many like *Apollonias*, *Laurus* and *Persea* occur in the relict laurel forest of Canary Islands and Madeira.



Cinnamomum filipedicellatum Kosterm.

1. Flowering branch 2. Terminal bud 3. a. b. c. T.S. 4. Flower 5. Flower section 6. Stamens whorl 7.8.9. Idem whorl 10. Fruiting branch 11. Fruit 12 Fruit Section

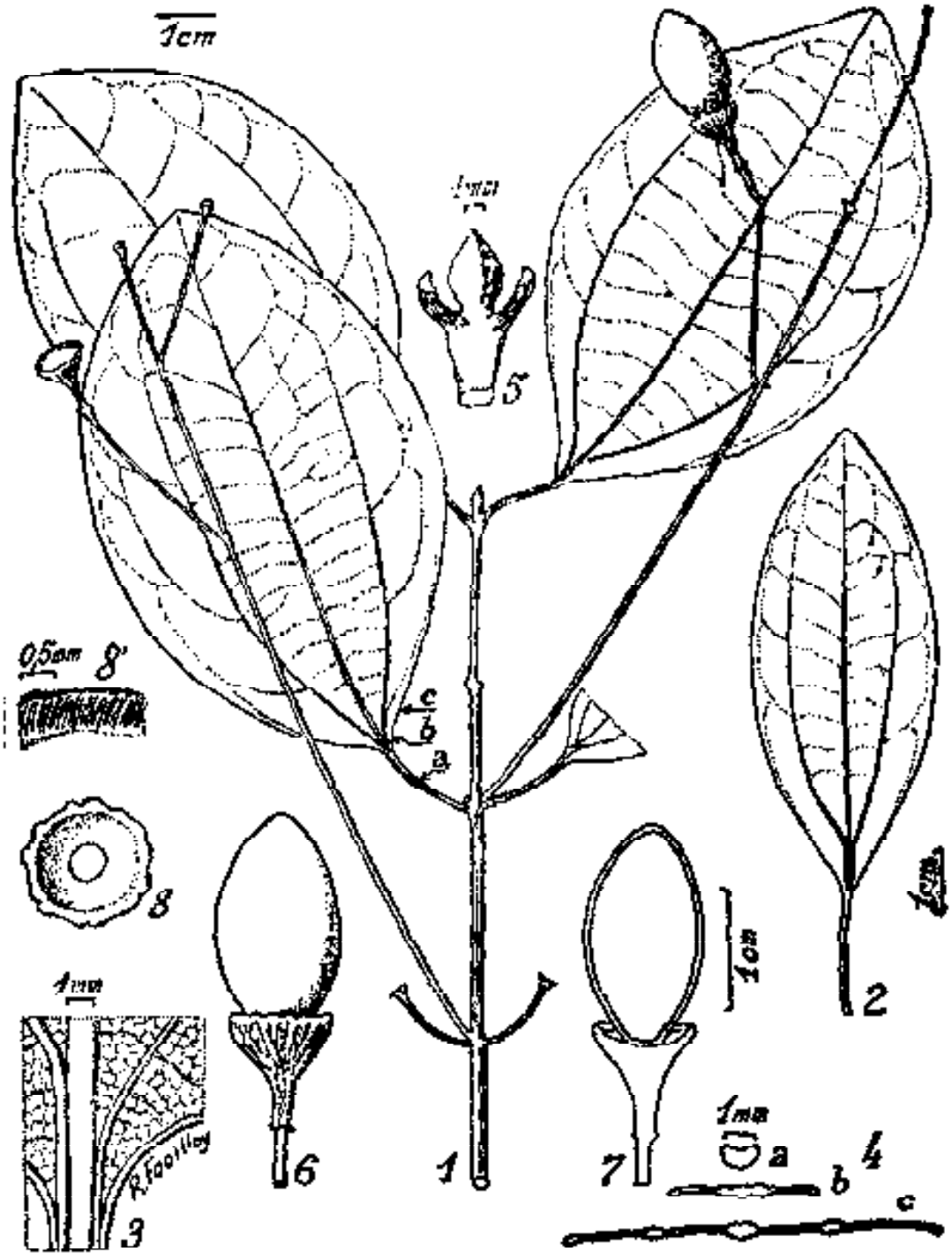
Courtesy : Bull. Bot. Surv. India



Cinnamomum goaense Kosterm

1. Inflorescence 2. Flower 3. a.b.c. indumentum of flower whorl 4. Flower in Section 5. Stamens whorls 6. 7. 8. Idem whorl 9. a.b.c. sections 10. Base of lamina 11. Bud 12. Fruit 13. Fruit cup.

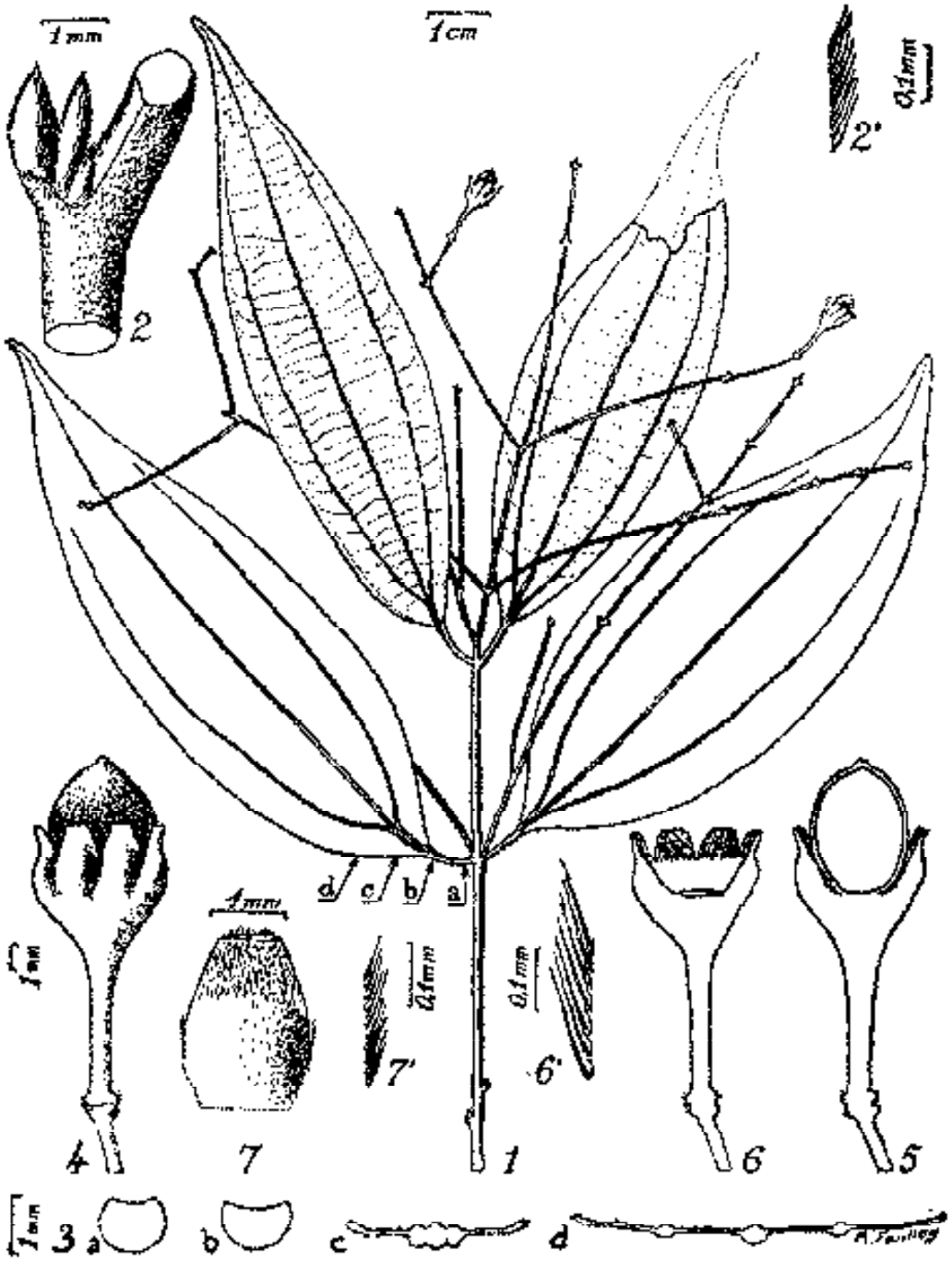
Courtesy : Bull. Bot. Surv. India



Cinnamomum keralaense Kosterm.

1. Branch with fruit 2. Young Leaf 3. Base of lower leaf 4. Sections a, b, c, 5. Terminal bud 6. Fruit 7. Fruit section 8. Hairs at the cuprim 8' cup from above

Courtesy : Bull. Bot. Surv. India



Cinnamomum wataiwarense Kosterm.

1. Fruiting branch 2. Terminal bud 3. a.b.c. sections 4. Lower vein enlarged 5. Flower 6. Sections 7. Tepals inside 8.9.10.11 Idem whorl 12. Filament 13. Pistil

Courtesy : Bull. Bot. Surv. India

The family is represented in India by *ca* 17 genera and 163 specise of which 43 species and 4 varieties i. e. approx. 22% are endemic to Peninsular India. The genus *Litsea* (with 14 endemic species and 2 varieties) has the highest representation of endemic species followed by *Cinnamomum* (with 12 endemic species) and *Actinodaphne* (with 9 endemic species 1 variety). The Indo malaysian genus *Neolitsea* which is represented in India by 6 species has 2 species and a variety endemic to Peninsular India.

The genus *Apollonias* shows an interesting disjunction in its distribution as one of its 2 species components, occurs in south India while the other species occurs in Canary islands and Madeira.

ENDEMIC TAXA :

Actinodaphne bourdillonii Gamble : Small tree ; W. Ghats, Kanara to Nilgiris, Anamalais & Travancore hills, 1800 m.

A. bourneae Gamb. : A small tree ; Southern W. Ghats, Sholas of Palni hills, 1800 m. Rare & Threatened.

A. campanulata Hook. f. var. **campanulata** : Medium sized tree (or apparently a shrub) ; Southern W. Ghats, Tirunelveli, 1300 m. Rare & Threatened.

A. **campanulata** Hook. f. var. **obtusa** Gamble : A small tree ; Southern W. Ghats, Travancore, 900 1200 m. Rare & Threatened.

A. lanata Meissn. : A tree ; W. Ghats, Nilgiris, 1500 m. Rare & Threatened.

A. lawsonii Gamb : A small tree ; W. Ghats, Wynaad, 1200 m.

A. madraspatana Bedd. : A tree ; E. Ghats, hills of Cuddaph, 900 m, Chingleput 600 m & Pulicat hills.

A. malaburica Balakr. : A large tree ; Southern W. Ghats Wynaad, Anamalais & Travancore hills, 900 m.

A. salicina Meissn. : A tree ; W. Ghats, Nilgiris, 1550 2000 m. Rare & Threatened.

A. tadulingamii Gamb. : A large tree ; W. Ghats Kanara to Anamalais, Travancore & Tirunelveli hills, 600 m.

Apollonias arnottii Nees ; A moderate sized tree ; Southern W. Ghats, Tirunelveli, Travancore & Nilgiri hills, 750 1550 m.

Beilschmiedia wightii (Nees) Benth. : A large tree ; Southern W. Ghats, Anamalais, Travancore & Palni hills. Rare & Threatened.

Cinnamomum filipedicellatum Kosterm. : Small tree ; Southern W. Ghats, Tirunelveli & Travancore, 750 1550 m.

C. goaense Kosterm. : A tree ; Goa & Kanara.

C. heyneanum Nees : A tree ; W. Ghats of Karnataka, Coorg.

C. keralense Kosterm. : A tree ; Southern W. Ghats, Idduki, (Kerala), Coimbatore & Tirunelveli (Tadulingam), 1000 m.

C. macrocarpum Hook. f. ; A tree ; W. Ghats, Kanara Nilgiris, Coimbatore, 1800 m.

C. malabatrum (Burm. f.) Bl.: Tall tree ; Southern W. Ghats of Hassan, Travancore (Calicut, Kottayam, Palghat, Cannanore) & Anamalais, 900 1000 m.

C. perrottetii Meissn. : A small tree/shrub ; Southern W. Ghats of Kerala (North of Munnar) & Nilgiris, above 1800 m. Rare & Threatened.

C. riparium Gamble. ; A small tree ; W. Ghats, Travancore, Coorg to Anamalais, at low altitudes. Rare & Threatened.

C. sulphuratum Nees : A tree ; W. Ghats, Coorg, Hassan, Coimbatore, Nilgiri & Anamalai hills, 1200 1800 m.

C. travancoricum Gamble. : Small/medium tree ; Southern W. Ghats, Travancore, 1200 m. & upwards. Rare & Threatened.

C. walaiwarense Kosterm. ; A tree ; Southern W. Ghats, Tirunelveli.

C. wightii Meissn. : A stout tree ; W. Ghats, Coorg, Nilgiris, Anamalais & Palni hills, Ooty, above 1800 m.

Cryptocarya anamalayana Gamble. : A tree ; Southern W. Ghats, Anamalais, 1000 m.

C. beddomei Gamble. : A tree ; W. Ghats, Plains of Kanara & Anamalais.

C. neilgherrensis Meissn. : A large tree ; Southern W. Ghats, Nilgiris, Anamalais, 750 1800 m.

C. stocksii Meissn. : Large or moderate tree ; W. Ghats, Kanara to Palni hills, Anamalais, Travancore, 1200 1550 m.

Litsea beddomei Hook. f. : A small tree ; Southern W. Ghats, Tirunelveli & Travancore hills, 1200 m.

L. bourdillonii Gamble. : Medium/large tree ; Southern W. Ghats, Anamalais & Travancore hills, 750 - 1800 m.

L. coriacea Hook. f. : A small tree ; W. Ghats, Kanara - Coorg, Wynaad, Anamalais & Travancore hills, 1200 m.

L. glabrata Hook. f., A tree ; Southern W. Ghats, Nilgiri & Palni hills, above 1820 m., Hills of Karnataka at 1550 m.

L. keralana Kosterm. : A lofty tree ; Southern W. Ghats, Anamalai & Travancore hills at low altitude, 3000 m.

L. laevigata Gamble. : A tree ; Southern W. Ghats, Tirunelveli hills & hills of Karnataka, 600 m.

L. ligustrina Hook. f. : A small tree ; Deccan, Coimbatore hills, 600 - 1550 m. W. Ghats, Nilgiri, Palni, Tirunelveli hills, 900 - 1800 m.

L. mysorensis Gamble. : A small or medium sized tree ; W. Ghats, hills (Aglatti) of Karnataka, Wynaad, 900 - 1200 m. Rare & Threatened.

L. nigrescens Gamble. : A moderate sized tree ; Southern W. Ghats, Tirunelveli & Travancore hills at low altitudes.

L. oleoides Hook. f. : A large tree ; Southern W. Ghats, Anamalai, Travancore & Nilgiri hills, above 1200 m.

L. stocksii Hook. f. var. **stocksii** : A small tree ; Southern W. Ghats, Nilgiris, Anamalais & Travancore hills, 600 - 1800 m.

L. stocksii Hook. f. var. **glabrescens** Hook. f. : A small tree ; Southern W. Ghats, Nilgiris, 1200 - 1800 m.

L. travancorica Gamble. : A tree ; Southern W. Ghats, hills of Travancore. Rare & Threatened.

L. venulosa Hook. f. : A straggling shrub ; Southern W. Ghats, Tirunelveli hills, 900 - 1200 m.

L. wightiana (Nees) Hook. f. var. **wightiana** : A large tree ; W. Ghats, Nilgiris above 1800 m. Travancore & Tirunelveli, above 1200 m.

L. wightiana Hook. f. var. **tomentosa** Meisn. : A large tree ; Southern W. Ghats, Anamalais, Nilgiris, Palni hills above 1800 m.

Neolitsea fischeri Gamble. : A large tree ; Southern W. Ghats, Anamalais & hills of Cochin, Travancore, 1800 m.

N. foliosa Gamble var. **caesia** Meissn. : A tree ; E. Ghats, N. Circars, Visakhapatnam, Godavari district, 600 m, Seshachalam hills of Cuddapah, Arcot dist. ; W. Ghats, hills of Karnataka, Coimbatore, Travancore up to 1550 m.

N. scrobiculata Gamble. : A tree ; W. Ghats, Tirunelveli hills & Nilgiris, 1800 m.

PIPERACEAE

This family of *ca* 4 genera and 4000 species is pantropical in distribution occurring mostly in rain forest regions.

In India the family is represented by 2 genera and 51 species of which 11 species are endemic to Peninsular India. The tropical/subtropical genus *Peperomia*, which is centered in America, is represented in India by 22 species of which 2 are endemic to Peninsular India. The tropical and economically important genus *Piper* is represented in India by *ca* 50 species of which 9 species are endemic to Peninsular India. *Piper barberi* and *Piper hapnium* are rare and threatened species.

ENDEMIC TAXA :

Peperomia dindigulensis Miq. : Erect succulent herb ; W. Ghats, Konkan, southwards ; E. Ghats, N. Circars to Shevaroys ; Kollimalai hills of Trichinapolly.

P. meeboldii C. DC. : Herb ; Karnataka, Kalabatti (Mysore).

Piper barberi Gamble : Climbing shrub ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

P. galeatum C. DC. : Woody climber ; W. Ghats, Karnataka, Anamalais, Travancore & Tirunelveli hills.

P. hapnium Buch.-Ham. ex Hook. f. ; Slender climbing undershrub ; Southern W. Ghats, Travancore & Tirunelveli. Rare & Threatened.

P. hookeri Miq. : A climbing shrub ; W. Ghats, Konkan, hills of Karnataka (Coorg, N. Kanara, Shimoga).

P. hymenophyllum Miq. : Slender climber ; W. Ghats, hills of Karnataka, southwards to Nilgiris & Travancore hills.

Piper ootacamundse C. DC. : Shrub ; Southern W. Ghats, Nilgiris.

P. schmidtii Hook. f. : Large climbing shrub ; W. Ghats, Mysore dist. & Nilgiris, above 1500 m.

P. trichostachyon C. DC. : Large woody climber ; W. Ghats, Konkan, Coorg to Wynaad, Tirunelveli & Nilgiris.

P. wightii Miq. : Stout climber ; Southern W. Ghats, Nilgiri & Palni hills, 1800 m.

ARISTOLOCHIACEAE

The family constitutes of *ca* 7 genera and *ca* 900 species which occur mostly in the tropical and warm temperate regions, with the exception of Australia.

The family is represented in India by 4 genera and 21 species of which only one species is endemic to the Southern Western Ghats. *Thottea barberi* is also rare and threatened.

ENDEMIC TAXA :

Thottea barberi (Gamble) Ding Hou : Shrub ; Southern W. Ghats, Tirunelveli, Travancore.

RANUNCULACEAE

The Buttercup family comprises *ca* 50 genera and *ca* 1800 species of cosmopolitan distribution but concentrated in the temperates and arctics of both the hemispheres.

In India the family is represented by 28 genera and 185 species most of which are concentrated in the Himalayan range. Some species, however, occur in the temperate mountains of Southern W. Ghats as well. The endemic species *Clematis bourdillonii*, *C. theobromina* and *Thalictrum dalzelli* are rare/threatened in their respective regions of narrow distribution.

ENDEMIC TAXA :

Clematis bourdillonii Dunn : Climbing shrub ; Southern W. Ghats, Travancore. Rare & Threatened.

C. theobromina Dunn : Climbing shrub ; Southern W. Ghats, Nilgiris (Naduvatam), 1800-2400 m. Rare & Threatened.

Delphinium malabaricum (Huth) Mung. var. **ghaticum** Billore : A herb; Maharashtra.

Thalictrum dalzellii Hook. : Erect perennial herb ; W. Ghats, Hills of Karnataka (Chikmagalur, Hassan, Mysore). Rare & Threatened.

BERBERIDACEAE

The family Berberidaceae has 4 genera and *ca* 575 species occurring in tropical mountains, N. temperate regions and South America.

The family is represented in India by 3 genera and 68 species of which 3 species and 1 variety are endemic. 2 species each from the genera *Mahonia* and *Berberis* are endemic to the Southern W. Ghats. ***Berberis hainesii*** occurs in Madhya Pradesh at the northern extremity of the Peninsular India.

ENDEMIC TAXA :

Berberis hainesii Ahrendt : Shrub ; Madhya Pradesh.

B. hainesii var. **brevifilipes** Ahrendt : Shrub ; Madhya Pradesh.

B. nilghiriensis Ahrendt : Shrub ; Southern W. Ghats, Nilgiris.

Mahonia leschenaultii (Wall. ex Wt.) Takeda : Shrub ; Southern W. Ghats, Nilgiri. Anamalais ; Coimbatore & Madurai ; Salem of E. Ghats, above 1500 m.

MENISPERMACEAE

The family comprises *ca* 65 genera and 350 species distributed in the tropical rain forests and to a lesser extent in the subtropical and warm temperate zones.

In India the family is represented by *ca* 17 genera and 44 species. *Cyclea* is a genus of tropical Asia having about 30 species of which 8 species are represented in India. *Cyclea fissicalyx* is a rare endemic occurring in the Southern W. Ghats of Kerala.

ENDEMIC TAXA :

Cyclea fissicalyx Dunn ex Gamble : Climbing shrub ; Southern W. Ghats, Malabar in Wynaad of Kerala. Rare & Threatened.

URTICACEAE

The family comprises *ca* 45 genera and 550 species which are mostly distributed in the tropical and temperate regions, though its representation is poor in Australia.

In India the family is represented by *ca* 23 genera and 115 species of which 4 species and 2 varieties are endemic to Peninsular India. The Old World genus *Elatostema* and the tropical genus *Pouzolzia* have some endemic representatives.

ENDEMIC TAXA :

Elatostema lineolatum Wt. var. **setosum** Henry : Herb/undershrub ; Tamil Nadu.

E. wightii Hook. f. : A succulent herb ; Southern W. Ghats, Nilgiris, Anamalais.

Pouzolzia cymosa Wt. : A herb : Southern W. Ghats, Nilgiris & Coimbatore ; Southern E. Ghats, Shevaroys & Kollimalai hills, 1200-1800 m.

P. meeboldii Smith & Ramas. : An erect undershrub ; Southern W. Ghats, Anamalai, Travancore & Cochin.

P. wightii Benn. var. **wightii** : Tall robust herb ; Peninsular India, throughout.

P. wightii Benn. var. **nilghirensis** (Wt.) f. Hook : Tall herb ; Southern W. Ghats, Nilgiris.

MORACEAE

The family comprises *ca* 53 genera and 1400 species which are distributed in the tropical and subtropical regions while some occur in the temperate regions as well. The genus *Artocarpus* occurs chiefly in Southeast Asia and Malaysia while *Ficus* which is the largest genus of the family is essentially tropical in the Indomalaysian region, concentrated in Malaysia and S. Burma.

In India the family is represented by *ca* 10 genera and 106 species. Only 4 species and a variety are endemic to Peninsular India. The genus *Artocarpus* is represented in India by about 18 species of which only a single species is endemic. The genus *Ficus* which is represented in India, by about 70 species has 2 species and 1 variety that are endemic to Peninsular India.

ENDEMIC TAXA :

Artocarpus hirsuta Lamk. : Large tree ; W. Ghats/Coast, Konkan, southwards to Coorg, N. Kanara, Shimoga, S. Kanara, Wynaad, Anamalai & Travancore, up to 1100 m.

Ficus angladei C.E.C. Fisch. : A tree ; Southern W. Ghats, Palni hills, 810 m.

F. beddomei King : A large tree ; Southern W. Ghats, Chikmagalur, Shimoga, Travancore, Nilgiris, Anamalai & Tirunelveli, 900-1500 m.

F. dalhousiae Miq. ; A small tree ; W. Ghats, Nilgiris & Cuddapah Southwards in E. Ghats.

F. laevis Bl. var. **macrocarpa** (Miq.) Corner : Scandent shrub ; W. Ghats, Chikmagalur, Nilgiris & Palni hills.

AMARANTHACEAE

The family consists of *ca* 65 genera and *ca* 850 species distributed in both tropical and temperate regions of the world. The tropical members are centered mostly in Africa and America.

The family is represented in India by 16 genera and 60 species of which only 6 are endemic to Peninsular India. Thus the percentage of endemism in Peninsular India with respect to the Indian species of the family is 10%. *Aerva wightii* and *Psilostachys sericea* are rare plants.

ENDEMIC TAXA :

Achyranthes coynei Sant. : Herb ; Maharashtra.

A. aspera Linn. var. **rubro-fusca** Hook. f. : Erect herb ; Southern W. Ghats, Nilgiri hills.

Aerva wightii Hook. f. : Bushy undershrub ; Southern W. Ghats, Courtallum, Tirunelveli & Travancore. Rare & Threatened.

Amaranthus caturus Heyne : Erect herb ; Deccan.

Indobanalia thyrsiflora (Moq.) Henry & Roy : Tall slender herb ; Southern W. Ghats, Wynaad, Nilgiris, 1800 m.

Psilostachys sericea Hook. f. : Erect silky herb ; Coromandel Coast, Nellore, Bombay & Gujarat. Rare & Threatened.

Psilotrichium nudum (Heyne ex Wall.) Moq. : Much branched undershrub ; Deccan, dry districts of South Karnataka & North Tamil Nadu, Courtallum.

CARYOPHYLLACEAE

This is a cosmopolitan family of about 70 genera and 1750 species most of which are concentrated in the north temperate regions and a few in the south temperate regions as well as on the mountains of the tropics.

In India the family is represented by 21 genera and 110 species. concentrated mostly in the Himalayan range where there is a high degree of endemism and only one species *Polycarpaea diffusa* is endemic to the Tirunelveli district of W. Ghat.

ENDEMIC TAXA :

Polycarpaea diffusa Wt. & Arn. : Undersbrub ; Southern W. Ghats, Tirunelveli dist.

DILLENIACEAE

The family comprises *ca* 10 genera and 400 species. It is more or less a pantropical family, with its greatest development in Asia and Australasia.

The Indian representatives of the family are spread over 3 genera and 12 species of which only 2 are endemic to South India. *Acrotrema* which is essentially an Indomalaysian genus, centred mainly in Sri Lanka, is represented in India by only one species (*A. arnottianum*) which is endemic to the Southern Western Ghats of Peninsular India, growing in shady and damp places. The relatively widespread genus *Dillenia* is also represented by a single endemic species, namely *Dillenia bracteata*.

ENDEMIC TAXA :

Acrotrema arnottianum Wt. ; Herb, with woody rhizomes ; Southern W. Ghats, Kerala, Travancore, Tirunelveli & Kanyakumari, 340-900 m.

Dillenia bracteata Wt. : A tree ; W. Ghats, hills of Karnataka, Nilgiris & Coimbatore ; E. Ghats, N. Arcot & Chingleput.

OCHNACEAE

The family is composed of *ca* 40 genera and 600 species distributed in the tropical regions but its centre of greatest development is South America.

Of the 7 species which represent the genus *Ochna* in India, only a single variety, i.e. *Ochna obtusata* var. *beddomei* is endemic to Peninsular India. The variety is fairly widespread occurring in Mahrashtra, Orissa, Andhra Pradesh, Karnataka and Tamil Nadu from ground level to altitudes of 1350 m. It is adapted to drier habitats.

ENDEMIC TAXA :

Ochna obtusata DC. var. **gamblei** (King ex Brandis) Kanis : A small tree ; Central & Northeast Peninsular India, Chengalpattu, N. Arcot, Dharmapuri, Salem. Rare.

DIPTEROCARPACEAE

The dipterocarps are a palaeotropical family comprising *ca* 15 genera and 580 species distributed throughout humid tropical Asia and Indomalaysia. The chief centres of development of this family are Indonesia, Malaya, Palawan and Borneo. The species of this family form one of the most dominant components of the evergreen tropical rain forests of Malaysia, while some gregarious species of the family form almost pure natural stands in the monsoon rain forests of India and Burma.

The family is represented in India by *ca* 6 genera and 31 species of which 14 species are endemic to Peninsular India. In India the family has its greatest development in North Eastern region and Peninsular region. The degree of endemicity is relatively higher in Peninsular India accounting for 45% of the Indian representatives of the Dipterocarpaceae.

The endemic species of this family are spread over 4 genera of which none is monotypic or specifically endemic to Peninsular India. The genus with the highest representation of endemic species in Peninsular India is *Hopea* (with endemic 8 spp.). The genera *Dipterocarpus*, *Shorea* and *Vateria* (which is confined to Seychelles, Sri Lanka and South India) have 2 endemic species each. *Hopea erosa*, *H. jacobii* and *Vateria macrocarpa* are rare in their respective habitats. The dipterocarps as a whole are a dwindling group because the constant demand for their valuable wood/ timber is bringing about a much greater degree of unjudicious felling, than any replenishment can ever hope to recompense.

ENDEMIC TAXA :

Dipterocarpus bourdillonii Brandis : Tall tree ; Southern W. Ghats, Malabar & Travancore at low altitudes.

Dipterocarpus indicus Bedd. : Tall tree ; W. Ghats. Kanara to Tirunelveli, 900 m.

Hopea canarensis Hole : Large tree ; W. Ghats, S. Kanara.

H. erosa (Bedd.) van Slooten : Large tree ; Southern W. Ghats, Cannanore & Tirunelveli. Rare & Threatened.

H. glabra Wt. & Arn. : Large resinous tree ; W. Ghats, S. Kanara, Travancore & Tirunelveli, 900-1200 m.

H. jacobii C.E.C. Fisch. : A small tree ; W. Ghats of Coorg. Rare & Threatened.

H. parviflora Bedd. : Large tree ; W. Ghats of Kanara & southwards to Coimbatore, Madurai, Tirunelveli & Nilgiri, 1200 m.

H. ponga (Dennst.) Mabberly : Moderate-sized tree ; W. Ghats, throughout up to 1150 m.

H. racophloea Dyer : Large tree ; W. Ghats, Kanara & Travancore, up to 900 m.

H. utilis (Bedd.) Bole : Large tree ; Southern W. Ghats, south of Courtallum & Tirunelveli hills, 300-900 m.

Shorea roxburghii G. Don. : Large tree ; Almost throughout S. Peninsular India.

S. tumbuggaia Roxb. : Large tree ; E. Ghats, Cuddapah, Chittoor, Nellore, Velligonda, Tirupati hills, N. Arcot, Chingelput up to 900 m.

Vateria indica Linn. : Resinous tree ; W. Ghats, N. Kanara to Coimbatore & Tirunelveli hills, up to 800 m.

V. macrocarpa B.L. Gupta : Resinous tree ; Southern W. Ghats, Bolampatty Range, Palghat dist. Rare & Threatened.

THEACEAE

This is a small family of *ca* 16 genera and 500 species distributed in tropical and subtropical regions. The family is centered chiefy in America and Asia.

In India the family is represented by 8 genera and 23 species of which only 1 species, i.e. *Gordonia obtusa* is endemic to Peninsular India.

ENDEMIC TAXA :

Gordonia obtusa Wall. : A tall tree ; W. Ghats, throughout Konkan to Travancore hills, 1500-2100 m.

BONNETIACEAE

A family of arborescent shrubs or trees comprising *ca* 4 genera and 24 species distributed in tropical Asia and America (The family is accepted by some taxonomists under Theaceae). The family is mainly centred in South America.

In India the family is represented by a single endemic genus *Poeciloneuron* with 2 species complements. (This genus was treated until recently under the family Clusiaceae). The presence of this sole genus in Peninsular India has a phytogeographical significance in so far as tracing the geological lineage/ancestry of the Indian land mass.

ENDEMIC TAXA :

Poeciloneuron indicum Bedd. : A large tree ; W. Ghats of Karnataka (Chikmagalur, Mysore, Shimoga, S. Kanara) and southwards to Travancore & Coimbatore, 1300 m.

P. pauciflorum Bedd. : A large tree ; Southern W. Ghats, Travancore & Tirunelveli, 600 1350 m.

GUTTIFERAE

(nom. altern. Clusiaceae)

This cosmopolitan family comprises *ca* 40 genera and 1000 species. Though the species of the family have a worldwide distribution, they are mainly centred in the tropics.

As many as 8 species and 1 variety are strictly endemic to Peninsular India. Of the 14 Indian representatives of the genus *Calophyllum*, 2 species are endemic to Peninsular India. The genus *Garcinia* with 6 endemic species has the highest representation of endemics. *G. wightii* is a rare plant. *Mesua* has *ca* 48 species in the world of which only 1 species (*M. ferrea*) is represented in India. The *Mesua* complex in India warrants further study.

ENDEMIC TAXA :

Calophyllum apetalum Willd. : A moderate sized tree ; W. Ghats, Konkan, N. Kanara to Travancore, Coimbatore, Tirunelveli and Thanjavur, low altitudes up to 330 m.

C. austroindicum Kosterm. ex Stevens : A tree ; W. Ghats of Karnataka (Coorg), Kerala & Tamil Nadu (Kanyakumari & Tirunelveli).

Garcinia imbertii Bourd : Medium sized tree ; W. Ghats, Travancore, 1000 m.

G. indica Chois : Slender tree ; W. Ghats, Konkan, N. Kanara, to Coorg, Wynaad.

G. rubro echinata Kosterm. : A tree ; W. Ghats, Tirunelveli.

G. talbotii Raizada ex Sant. : Small/medium tree ; W. Ghats, Kanara-Karnataka & Coimbatore.

G. travancorica Bedd. : Ornamental tree ; W. Ghats, Travancore, Tirunelveli & Kanyakumari, 1200 m.

G. wightii T. And. ; A small tree ; W. Ghats, Coimbatore & Travancore, up to 600 m. Rare.

Mesua ferrea Linn. subsp. **pulchella** (Planch. & Triana) Trimen var. **coromandeliana** (Wt.) Mahesh. : A tree ; W. Ghats, Karnataka (Mysore) & Tirunelveli of Tamil Nadu.

ELAEOCARPACEAE

The family comprises *ca* 12 genera and 350 species distributed in the tropical and subtropical parts of eastern Asia, Indomalaysia, Australasia, the Pacific area, South America and the West Indies.

It is represented in India by 2 genera and 32 species. The genus *Elaeocarpus*, which is represented in India by *ca* 20 species, has 5 species that are restricted or endemic to Peninsular India. The endemic species generally occur at elevations ranging from 750 to 1800 m. *Elaeocarpus venustus* is rare and endangered plant of the southern W. Ghats.

ENDEMIC TAXA :

Elaeocarpus blascoi Weibel. : Tree ; W. Ghats, Palni hills-Kodaikanal.

Elaeocarpus gaussenii Weibel. : A tree ; Ghats of S. India (?), 1400 m.

E. munronii (Wt.) Mast. : Large tree ; W. Ghats, throughout Konkan to Nilgiris, Tirunelveli, Coimbatore, Madurai & Kanyakumari, 750 1800 m.

E. recurvatus Corner : Tree : Southern W. Ghats, Nilgiris, Anamalais, Palni & Travancore hills, 1800 - 2200 m.

E. venustus Bedd. : Large tree ; Southern W. Ghats, Travancore & Kanyakumari, 1100 -1400 m. Rare & Endangered.

TILIACEAE

The family comprises *ca* 50 genera and 450 species distributed throughout the temperate and tropical regions of the world. The species of the family are well developed in Southeast Asia and Brazil. *Grewia* is the largest genus of the family occurring in tropical parts of Asia, Africa and Australasia. The only herbaceous genus of the family, *Corchorus*, occurs in Africa and Asia. The genus *Triumfetta* occurs in the New World tropics. The genus *Tilia* is essentially north temperate extending to Indo-China and Mexico.

In India the family is represented by *ca* 8 genera and 65 species, of which 7 species are endemic to Peninsular India. Most of the endemic species belong to the genus *Grewia* which is represented in India by *ca* 42 species. *Grewia gamblei, G. heterotricha* and *G. pandalca* are rare in their respective distributional ranges.

ENDEMIC TAXA :

Grewia barberi Drumm. ex Gamble : A shrub ; Deccan plateau, Karnataka, Bellary , Mysore, Tumkur, & Coimbatore, W. Ghats of S. Kanara to Nilgiris & Tirunelveli, up to 1500 m.

G. gamblei Drumm. ex Gamble : A shrub ; Southern W. Ghats, Wynaad, Nilgiris & Coimbatore, 900 1800 m. Rare.

G. heterotricha Mast. : A climbing shrub ; W. Ghats, N. Kanara, Chikmagalur, Shimoga, S. Kanara, Coorg, Coimbatore & Nilgiris, 900 1800 m. Rare.

G. lawsoniana Drumm. ex Gamble : A shrub ; W. Ghats, Karnataka (Chikmagalur, Hassan, Mysore) Malabar to Travancore, Nilgiri & Coimbatore.

Grewia pandaica Drumm. ex Gamble : A tree ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

G. umbellifera Bedd.: A large scandent shrub; W. Ghats, throughout Konkan to Malabar, hills of Karnataka, Kerala & Tamil Nadu (Nilgiri, Tirunelveli & Tiruchirapalli).

Triumfetta tungarensis Billore : Herb/undershrub ; Maharashtra.

STERCULIACEAE

The family comprises *ca* 60 genera and 700 species which are chiefly tropical in distribution, a few extending to the subtropical regions.

The family is represented in India by *ca* 10 (?) genera and 68 species of which 6 species are endemic to Peninsular India. The genus *Pterospermum* which is distributed mostly in eastern Himalaya, southeast Asia, and western Malaysia is represented in India by *ca* 12 species of which 3 are endemic to Peninsular India. *Eriolaena lushingtonii* and *Pterospermum reticulatum* are rare and threatened plants of this region.

ENDEMIC TAXA :

Eriolaena lushingtonii Dunn. : A tree ; E. Ghats, Nallamalais, Kurnool dist. & Ramanathapuram of Tamil Nadu. Rare & Threatened.

Heritiera papilio Bedd. : A lofty tree ; W. Ghats, Hassan, Nilgiris, Tirunelveli, Coimbatore & Travancore, 600 1200 m.

Melhania cannabina Wt. ex Mast. : A shrub ; W. Ghats, Tirunelveli, Nilgiris.

Pterospermum obtusilfolium Wt. ex Mast : A tree ; Southern W. Ghats, Travancore, Tirunelveli, Coimbatore, Ramanathapuram & Tiruchirapalli.

P. reticulatum Wt. & Arn. : A large tree ; W. Ghats, Konkan, N. Kanara (rarely planted), Malabar & Travancore, at low elevations, Coimbatore & Tiruchirapalli. Rare & Threatened.

P. rubiginosum Heyne ex Wt. & Arn. : A tall tree ; W. Ghats, Coorg, S. Kanara, Travancore, Wynaad, Anamalais (Coimbatore), Tirunelveli, up to 900 m., Tiruchirapalli.

MALVACEAE

The family Malvaceae, comprising *ca* 88 genera and 2300 species is cosmopolitan in both tropical and temperate regions, having reached its greatest development in S. America. The largest genus *Hibiscus* is essentially tropical in distribution (with a few exceptions), and so is the genus *Abutilon*. The members of the family are adapted to warm and dry terrain rather than to montane zone.

The family is represented in India by *ca* 24 genera and 104 species of which 6 species and 2 varieties are strictly endemic to Peninsular India. The genus *Decaschistia* which is restricted to India, Hainan and the Malay Peninsula is represented in India by about 4 species of which 3 are endemic to Peninsular India. All the three endemics of this genus, i.e. *D. rufa*, *D. trilobata* and *D. cuddapahensis* are rare and threatened though only *D. rufa* has a very narrow distribution. All endemics of this family grow in particularly xeric conditions.

ENDEMIC TAXA :

Abutilon neelgherrense Munro ex. Wt. var. **neelgherrense** : Tomentose shrub/herb ; W. Ghats, Nilgiris. Deccan Parts of Andhra Pradesh, Bellary, Orissa & Coimbatore, Madurai, Raghunathapur of Tamil Nadu.

A. **neelgherrense** Munro ex Wt. var. **fischeri** T.K. Paul & Nayar : Shrub or undershrub ; Tamil Nadu, Coimbatore.

A. ranadei Woodr. & Stapf. : Undershrub ; W. Ghats of Maharashtra Ambaghat, Ratnagiri dist. Rare or E tinct.

Decaschistia rufa Craib. : Tomentose shrub ; E. Ghats, northern parts of Tamil Nadu-Chingleput. Rare & Threatened, perhaps Extinct.

D. trilobata Wt. : An erect shrub ; W. Ghats of Maharashtra, Karnataka, Tamil Nadu & Kerala. Rare and Threatened.

D. cuddapahensis T.K. Paul & Nayar : Perennial shrub ; E. Ghats, Chittoor & N. Arcot, 150-600 m.

Hibiscus talbotii (Rakshit) T.K. Paul & Nayar. : Erect herb ; W. Ghats, Konkan to Karnataka.

FLACOURTIACEAE

The family comprises *ca* 93 genera and 1000 species spread widely in the tropical and subtropical regions. A few species also occur in the temperate regions.

The family is represented in India by *ca* 8 genera and 35 species. Most of those species are related to their Malaysian counterparts. Only 3 species and 2 varieties are endemic to Peninsular India.

ENDEMIC TAXA :

Casearia rubescens Dalz. var. **gamblei** N. Mukh. ; A large shrub ; Karnataka, N. Kanara.

Hydnocarpus pentandra (Buch.-Ham.) Oken : A large tree ; Southern W. Ghats in Nilgiri, Tirunelveli, Coimbatore, Kanyakumari & Madurai.

H. macrocarpus (Bedd.) Warb. ; Evergreen handsome tree ; Southern W. Ghats, Travancore.

Scolopia crenata (Wt. & Arn.) Clos. var. **brevifolia** N. Mukh. : A tree ; W. Ghats, Tirunelveli, Tiruchirapalli, Salur to Vallarum.

Xylosma latifolium Hook. f. & Thoms. : Large thorny tree ; W. Ghats, Bababudan hills of Karnataka & Nilgiris.

VIOLACEAE

This medium sized family of *ca* 16 genera and 900 species is cosmopolitan in distribution. However, it is typical of the temperates and in the tropics, rather restricted to higher elevations or montane zones.

In India the family is represented by *ca* 3 genera and 40 species of which only one is endemic to Peninsular India. Of the two Indian representatives of the genus *Hybanthus*, 1 species (*H. travancoricus*) is endemic, rare and also endangered.

ENDEMIC TAXA :

Hybanthus travancoricus (Bedd.) Melch. ; Small shrub ; Southern W. Ghats, Tirunelveli & Travancore hills, 600-900 m. Endangered.

CUCURBITACEAE

The Cucurbitaceae, comprising *ca* 110 genera and 840 species, is essentially a tropical family occurring in the moist and moderately dry tropics of both Old and New Worlds, with a greater development in the rain forest areas of America and bushland areas of Africa. They also form a marginal composition of desert or semi-desert vegetation. The cucurbits are rather poorly represented in the temperate regions.

The family is represented in India by 37 genera and *ca* 100 species including wild cultivated species. Only 7 species and 1 variety are endemic to Peninsular India. According to Chakravarty (1982), 25 species are endemic to India.

ENDEMIC TAXA :

Cucumis setosus Cogn. ; Scandent herb ; W. Ghats, Maharashtra.

Cucurbita maxima Duch. var. **badagarensis** Mudaliar : Herb ; Kerala.

Luffa umbellata (Klein) Roemer : Scandent herb ; Southern W. Ghats, Kerala, Mirittupadu. Rare & Threatened.

Melothria ritchiei Chak. : Slender pilose herb ; W. Ghats of Kerala, Maharashtra.

Solena angulata (Chak.) Babu : Herb ; Deccan, Madurai.

Trichosanthes anaimalaiensis Bedd. "anamallayana" ; Scandent herb ; Southern W. Ghats, Anamalais (Coimbatore) & Madurai, 1200 m.

T. **cuspidata** Lamk. : Scandent herb ; Southern W. Ghats, Travancore, Kerala.

Zehneria maysorensis (Wt. & Arn.) Arn. var. **umbellata** (Chak.) Kumari : Scandent herb ; Southern W. Ghats of Tamil Nadu, Madurai. Rare.

BEGONIACEAE

The family Begoniaceae is basically a tropical one consisting of *ca* 5 genera and 920 species.

In India the genus *Begonia* is represented by about 45 species of which 7 species are endemic to Peninsular India. Three rare Begonias namely *B. aliciae*, *B. canarana* and *B. trichocarpa* have very restricted distribution.

ENDEMIC TAXA :

Begonia albo-coccinea Hook. : Scapigerous succulent herb ; W. Ghats, Tirunelveli, Deccan—Karnataka.

B. aliciae C.E.C. Fisch. : Herb ; Southern W. Ghats, Nilgiris & Travancore (?). Rare & Threatened.

Begonia anamalayana Bedd. : Scapigerous herb ; Southern W. Ghats, Anamalais (Coimbatore).

B. canarana Miq. : Slender herb ; W. Coast & W. Ghats from S. Kanara, Wynaad, up to 900 m. Rare & Threatened.

B. crenata Dryand. : Slender herb ; W. Ghats from N. Kanara, Shimoga, Wynaad, at low altitudes.

B. floccifera Bedd. : Large herb ; W. Ghats, Travancore, Tirunelveli & Kanyakumari, at 900 m.

B. trichocarpa Dalz. : Large fleshy herb ; W. Ghats, Bababudan hills, Chikmagalur. Rare & Threatened.

CAPPARACEAE

The capers family comprises *ca* 30 genera and 650 species confined to the tropics and subtropics. The majority of the species are xerophytic in nature.

The family is represented in India by 5 genera and 36 species of which 8 are endemic to the Peninsular India. The predominant genus *Capparis* is represented in India by 26 species of which 7 species are restricted to the Western Ghats. *C. fusifera* is a rare plant of the Southern W. Ghats.

The genus *Maerua* is represented by a single species, *M. apetala* which is mostly found in the E. Ghats.

Endemic Taxa :

Capparis cleghornii Dunn : Large woody climber ; W. Ghats, Kanara of Karnataka.

C. diversifolia Wt. & Arn. : Thorny shrub ; Southern W. Ghats, South of Pondicherry & Anamalais (Coimbatore), Travancore & Tirunelveli.

C. fusifera Dunn : Scandent shrub ; Southern W. Ghats, Coimbatore Tirunelveli & Kerala hills. Rare & Threatened.

C. grandiflora Wall. ex Hook. f. & Thoms. : Spreading shrub ; W. Ghats, Karnataka & Tamil Nadu (Coimbatore, Nilgiris), up to 1350 m.

Capparis nilgirensis Subbarao, Kumari & Chandras. : Scandent shrub ; Coimbatore, Tirunelveli, Nilgiri & Madurai, 366-1000 m.

C. **shevaroyensis** Sundarar. : Spreading shrub ; Southern W Ghats, Coimbatore, Tirunelveli and Ramanathapuram.

C. **tomentella** Dunn : Spreading, much branched shrub ; Southern W. Ghats, Travancore.

Maerua apetala (Roth) Jacobs : Small unarmed tree ; E. Ghats, Krishna, Kurnool & Cuddapah districts ; Southern W. Ghats, Tirunelveli.

ERICACEAE

The Heath family comprises *ca* 50 genera and 1350 species which are cosmopolitan in distribution. The members are mostly confined to high mountainous regions of the tropics and almost absent in Australasia.

In India the family is represented by *ca* 10 genera and 150 species most of which are concentrated in the Himalayas. Only a single species *Vaccinium neilgherrense* occurring at high altitudes of South Indian mountains is endemic.

ENDEMIC TAXA :

Vaccinium neilgherrense Wt. : A large shrub/small tree ; Southern W. Ghats, hills of Karnataka, Travancore, Nilgiris, Anamalais, Palni, Tirunelveli & Tiruchirapalli ; E. Ghats, Shevaroys & Kollimalai hills.

SAPOTACEAE

The family comprises *ca* 35-75 ill-defined genera and 800 species which are pantropical in distribution. They normally occur in lowlands and lower montane rain forests.

The family is represented in India by *ca* 11 genera and 31 species of which 8 are endemic to Peninsular India. The genus *Isonandra* which is distributed in India, Borneo, Malay Peninsula and Sri Lanka has about 10 species of which five occur in India. 4 species of the genus are endemic to Peninsular India. *Madhuca bourdillonii* is a rare and threatened plant of ths Western Ghats of Kerala.

ENDEMIC TAXA :

Isonandra candolleana Wt. : A tree ; Southern W. Ghats, Nilgiris, Palni & Travancore hills, 1200-1800 m.

I. perrottetiana Wt. : A tree ; Southern W. Ghats, Nilgiris, above 1200 m.

I. stocksii Clarke : A small tree ; Deccan, Coimbatore.

I. villosa Wt. ; A tree ; W. Coast, Quilon. Southern E. Ghats, hills of Nellore & Chingleput.

Madhuca bourdillonii (Gamble) H.J. Lam : A moderate sized tree ; Southern W. Ghats, Travancore, up to 300 m. Rare & Threatened.

Manilkara roxburghiana (Wt.) Dub. ; A large tree ; E. Ghats, hills of Kurnool dist. ; Southern W. Ghats, Nilgiris, Coimbatore hills, Tirunelveli & Travancore, up to 1500 m.

Palaquium bourdillonii Brand. : A medium sized tree ; Southern W. Ghats, Travancore, up to 1200 m.

P. ellipticum Engl. : A large tree ; W. Ghats, throughout, 300-1200 m.

EBENACEAE

The family comprises 3 genera and 500 species of tropical trees, centred chiefly in the tropical rain forests of the Malay Archipelago. To a lesser degree, the members also occur in tropical Africa and Latin America and a very minimal number of species also occur in the north temperate zone.

The family is represented in India by 1 genus and 47 species of which 10 species are strictly confined or endemic to Peninsular India. This brings the degree of endemism in Peninsular India to 21% of the Indian Ebenaceae.

The trees of this family find commercial utility on account of their ebony hardwood.

ENDEMIC TAXA :

Diospyros assimilis Bedd. : Large tree ; E. Ghats, N. Circars, hills of Visakhapatnam; W. Ghats, Konkan, Kanara & Travancore, 300 900 m.

Diospyros barberi Ramas. : Small tree ; Southern W. Ghats. Tirunelveli & Travancore, 600 1300 m.

D. bourdillonii Brand. : A large tree ; Southern W. Ghats, Anamalais, Tirunelveli & Travancore, 800 m.

D. foliolosa Wall. : Moderate sized tree ; Southern W. Ghats, Tirunelveli & Travancore, 900 m.

D. humilis Bourd. : Small tree ; Southern W. Ghats, Travancore & Tirunelveli, 600 m.

D. nilagirica Bedd. : Moderate-sized tree ; Southern W. Ghats, Anamalais to Travancore & Nilgiris, 900 1550 m.

D. paniculata Dalz. : Medium sized tree ; W. Ghats, Konkan, Kanara, Malabar—Travancore, up to 900 m.

D. saldanhae Kosterm. : Tree ; Hassan dist. of Karnataka.

D. sulcata Bourd. : Small tree ; W. Ghats, Travancore at low altitudes.

Maba nigrescens Dalz. ; Large shrub/small tree ; W. Ghats, Konkan, Karnataka hills.

SYMPLOCACEAE

The family comprises *ca* 2 genera and 500 species distributed in the tropical and subtropical regions, excepting Africa. They occur mostly in the eastern parts of the Old World ; reaching from Bombay in the west to Fiji in the east and from Manchuria in the north to New South Wales and Lord Howe Island in the south. In the New World the species of the family occur from the state of Washington to South Brazil.

The family is represented in India by *ca* 2 genera and 45 species of which 13 species and 1 variety are endemic to Peninsular India. All the endemic species of Peninsular India belong to the genus *Symplocos* which comprises *ca* 350 species distributed in Asia, Australia and Polynesia. *Symplocos anamalayana* and *S. barberi* are rare plants of the region.

ENDEMIC TAXA :

Symplocos acuminata Bedd. : A small tree ; Southern W. Ghats, Malabar Wynaad, Travancore & Tirunelveli, 1500 m.

S. anamalayana Bedd. : A small tree ; Southern W. Ghats, Anamalais, above 1500 m. Rare & Threatened.

Symplocos barberi Gamble : A small tree ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

S. candolleana Braid. : A large tree : Southern W. Ghats, Anamalais, 750 m.

S. foliosa Wt. : A medium/large tree ; Southern W. Ghats, Travancore, Nilgiri & Palni hills.

S. kanarana Talb. : A medium sized tree ; W. Ghats, N. Kanara, Anamalai, Tirunelveli & Travancore hills, 600 m.

S. macrocarpa Wt. : A moderate sized tree ; Southern W. Ghats, Tirunelveli & Travancore, "Courtallum", 600 900 m.

S. **microphylla** Wt. : A glabrous shrub ; Southern W. Ghats, Nilgiris.

S. monantha Wt. : A shrub ; Southern W. Ghats, Tirunelveli hills.

S. nairii Henry, Gopalan & Swamin. : Shrub/tree ; Tamil Nadu, Kanyakumari Dt. Muthukuzhivayal, 1400 m.

S. oligandra Bedd. : Small/medium sized tree ; Southern W. Ghats, hills of Travancore & Tirunelveli, 900 1500 m.

S. pulchra Wt. : A diffuse shrub ; Southern W. Ghats, Nilgiris, 1200 1500 m.

S. rosea Bedd. var. **rosea** : Large shrub/small tree ; W. Ghats, Chikmagalur, Anamalais & Tirunelveli hills, 600 1200 m.

S. rosea Bedd. var. **glabrior** Clarke : A large shrub ; Southern W. Ghats, Wynaad, hills of Travancore (Cochin), "Courtallum", 300 900 m.

MYRSINACEAE

This family of *ca* 35 genera and 1000 species is tropical, subtropical and temperate in distribution, ranging mainly from South Africa and New Zealand in the south to Japan, Mexico and Florida in the north.

The family is represented in India by *ca* 10 genera and 115 species of which 12 species i.e. approx. 10% are endemic to Peninsular India. The Indomalaysian genus *Antistrophe* has 4 species of which 2 are represented in India. *A. serratifolia* occurs in the Anamalai hills. Of the 45 representatives of the genus *Ardisia*, 4 species are endemic to Peninsular India. The species *A. amplexicaulis* is rare. *Embelia gardneriana*,

Rapanea striata and *R. thwaitesii* are also rare with narrow restricted distributions.

ENDEMIC TAXA :

Antistrophe serratifolia (Bedd.) Hook. f. : An erect shrub ; Southern W. Ghats, Anamalais (Coimbatore), 900 m. Rare & Threatened.

Ardisia amplexicaulis Bedd. : A glabrous shrub ; Southern W. Ghats, Wynaad & Travancore hills, 900 1200 m. Rare & Threatened.

A. blatteri Gamble : A small tree ; W. Ghats, hills of Travancore, 600 1200 m., Madurai dist., 1200 1650 m.

A. **rhomboidea** Wt. : A glabrous shrub/small tree ; W. Ghats, Travancore, Anamalai & Tirunelveli hills, 600 1800 m.

A. **sonchifolia** Mez. : A small tree ; W. Ghats, Anamalai & Tirunelveli hills, 1200 m.

Embelia adnata Bedd. : Large climbing shrub ; W. Ghats, Coimbatore & Madurai, 1200 1500 m.

E. **gardneriana** Wt. : A climbing shrub ; Southern W. Ghats, Nilgiris, 1500 m. Rare & Threatened.

Maesa velutina Mez. : A large shrub ; Southern W. Ghats, Wynaad.

Myrsine capitellata Wall. ex Roxb. : Tree ; W. Ghats, Anamalai & Travancore hills, 1800 m.

Rapanea daphnoides Mez. : A low shrub ; W. Ghats, Tirunelveli & Travancore, 1800 m.

R. **striata** Mez. : Apparently a small tree ; W. Ghats, hills of Karnataka, Chikmagalur. Rare & Threatened.

R. **thwaitesii** Mez. : A small tree ; W. Ghats, Palni-Madurai dist., 2000 m. Rare & Threatened.

PRIMULACEAE

The family comprising *ca* 20 genera and 1000 species is cosmopolitan especially in the North temperate zone, with a few alpine species.

In India the family Primulaceae is represented by 3 genera and 165 species most of which are Himalayan. The presence of a single species

(*Lysimachia leschenaultii*) which is endemic to hill tops of Southern W. Ghats is interesting.

ENDEMIC TAXA :

Lysimachia leschenaultii Duby : A tall herb ; Southern W. Ghats, other Nilgiris, Anamalais & Palni hills, 1800 m.

CONNARACEAE

This is a pantropical or circumtropical family of 16 genera and about 350 species. About 2 genera and 13 species represent this family in India. Only 1 species is endemic to the Peninsular India.

ENDEMIC TAXA :

Connarus sclerocarpus Schell. : Large climbing shrub ; W. Ghats, south of S. Kanara, Anamalai & Tirunelveli hills, 1000 m.

PITTOSPORACEAE

This is a small family of *ca* 9 genera and 200 species distributed in the tropical and warm temperate regions of the Old World and having its centre of greatest development in Australia which has a high degree of endemism.

The family is represented in India by a single genus *Pittosporum* and 13 of its species. The genus *Pittosporum* of *ca* 150 species is widely distributed from West Australia to Africa, Madagascar through Asia, Malaysia and to Polynesia. Of the 13 Indian representatives of the genus only 3 species are endemic to Peninsular India. All the 3 endemic species occur from moist lowlands to the upper montane zone.

ENDEMIC TAXA :

Pittosporum anamallayense Nayar & Giri : Shrub; Southern W. Ghats, Anamalai hills.

P. dasycaulon Miq. : A shrub/small tree ; Western Ghats, Kanara to Travancore & Nilgiri ; E. Ghats, Salem, 900 m. Rare.

P. viridulum Nayar, Giri & Chandras : Small tree ; Southern W. Ghats, Nilgiri.

CRASSULACEAE

This is a cosmopolitan family of *ca* 35 genera and 1500 species, mainly centred in South Africa.

The family is represented in India by *ca* 6 genera and 72 species. In Peninsular India there are 4 endemic species, all belonging to genus *Kalanchoe* which is represented in India by only 10 species. These succulent plants occur in hot dry and exposed rocky habitats often subject to long periods of drought. *Kalanchoe olivacea* is a rare and threatened plant.

ENDEMIC TAXA :

Kalanchoe bhidei T. Cooke : Erect succulent herb ; W. Ghats, Palni & Coimbatore hills, Shirgaon Ghat, 1200 1500 m.

K. cherukondensis Subbarao & Kumari : Erect succulent herb ; E. Ghats, Cherukonda, Visakhapatnam dist., 1100 m.

K. grandiflora Wall. ex Wt. & Arn. : Tall succulent herb ; W. Ghats, Nilgiris & Palni hills, above 1800 m.

K. olivacea Dalz. & Gibson ; Erect succulent herb ; W. Ghats, Anamalais & northwards, 1100 1850 m. Rare & Threatened.

ROSACEAE

This is a large family comprising *ca* 124 genera and 3375 species widely distributed in almost all parts of the world with maximum concentrations in the North temperate regions.

The family is represented in India by *ca* 31 genera and 217 species. In India the family is relatively much more developed in the Himalayan belt than in the south. The Rosaceae members found in Peninsular India occur in temperate regions of the Southern W. Ghats. Only 3 species and 2 varieties of this family are known to be endemic to Peninsular India. The *Alchemilla indica* complex is an apomictic group of which the recently described *A. indica* var. *madurensis* is endemic to Madurai of Tamil Nadu. *Rubus* is a cosmopolitan genus also known to have apomictic forms. The genus is represented in India by *ca* 50 species of which only 2 species are endemic to Peninsular India. The endemic species *Rubus fockei* is apparently rare.

ENDEMIC TAXA :

Alchemilla indica Gard. var. **madurensis** (Rothm.) Panigrahi & Purohit : A perennial herb ; Tamil Nadu, Madurai.

Photinia serratifolia (Desf.) Kalkman var. **tomentosa** (Gamble) Vivek. & Shetty : A small tree ; W. Ghats, Nilgiris, above 2100 m.

Rosa leschenaultiana Red. & Thory ex Wt. & Arn. : Large climbing shrub ; Deccan, W. Ghats, Bangalore, Nilgiris, Chikmaglur, Coorg, Palni hills (Madurai), Coimbatore, above 1500 m.

Rubus fockei Gandhi : A straggling/climbing shrub ; W. Ghats, Mysore, Chikmagalur, Hassan, Malabar-Nilgiris (?), Coimbatore (?). Rare & threatened.

R. racemosus Roxb. : A straggling shrub ; Southern W. Ghats, Nilgiri & Palni hills, above 1800 m.

CHRYSOBALANACEAE

The family comprises *ca* 10 genera and 400 species distributed in the tropical and subtropical regions of the world.

In India the family is represented by 1 genus (*Atuna*) and two of its species. Both species, i.e. *Atuna indica* and *Atuna travancorica* are rare endemic plants of the Southern W. Ghats.

ENDEMIC TAXA :

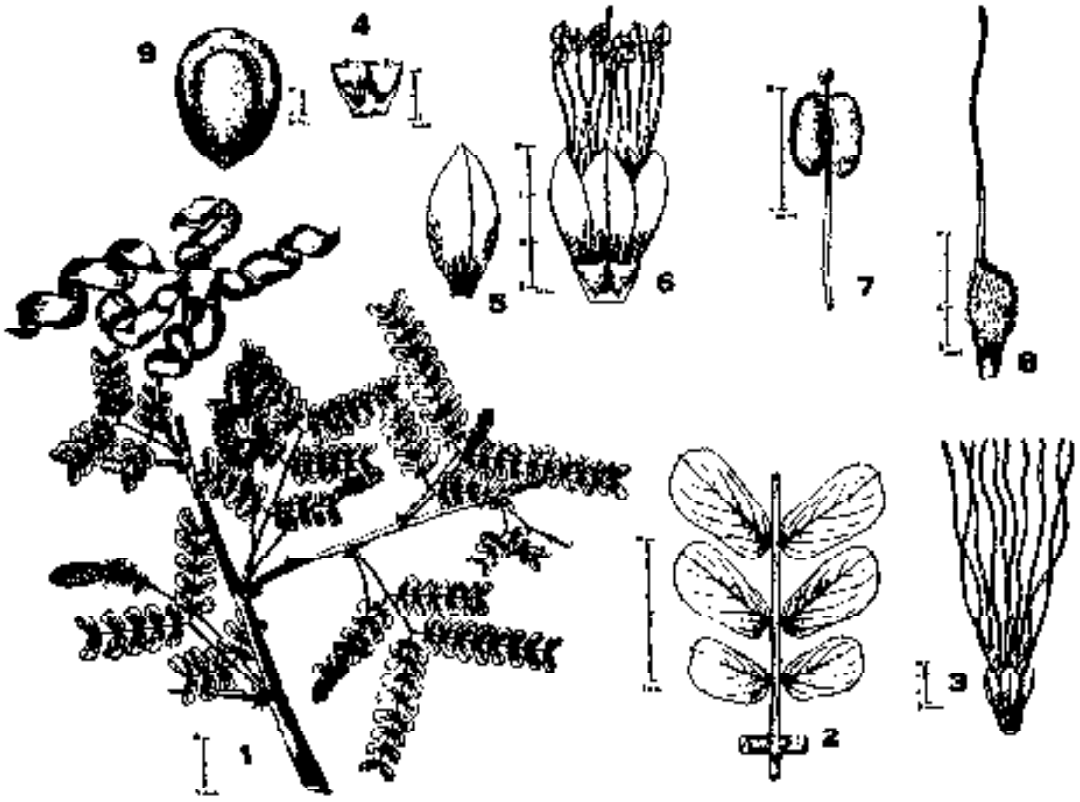
Atuna indica (Bedd.) Kosterm. : An evergreen tree ; Southern W. Ghats, Wynaad and Nilgiris, 600 900 m.

A. travancorica (Bedd.) Kosterm. : A small tree ; Southern W. Ghats, Travancore, "near Courtallum".

MIMOSACEAE

The family is basically tropical and subtropical in distribution. No exact figures are available relating to the number of genera and species, though it is tentatively believed to comprise *ca* 86 genera and 500-3000 species. *Acacia* is a tropical and subtropical genus and so is *Mimosa* with concentrations in America and a few members also occurring in Asia and Africa. The relatively smaller genus *Albizia* is confined to the warmer forests of the Old World. *Dichrostachys* occurs from Africa (especially Madagascar) to Australia.

The family is represented in India by *ca* 15 genera and 76 species of which 11 species are endemic to Peninsular India. Thus 13% of the Indian representatives are endemic to Peninsular India. *Acacia campbelli*, *A.*



1. *Dichrostachys santapaui* Sebastine & Ramam.

1. Branch showing inflorescence and fruits. 2. Portion of leaf showing arrangement of leaflets. 3. Neuter-flower from base of inflorescence. 4. Calyx. 5. Petal. 6. Portion of flower from upper part of inflorescence. 7. Anther. 8. Pistil. 9. Seed.
Courtesy : *Bull. Bot. Surv. India.*

hohenackeri, *A. wightii*, *Albizia lathamii*, *Dichrostachys santapaui* and *Calliandra cynometroides* are rare plants. *Acacia campbellii* and *Albizia sikharamensis* are confined to the E. Ghats.

ENDEMIC TAXA :

Acacia campbellii Arn. : A small tree ; E. Ghats, Circars, Godavari to Nellore, Cuddapah & Northern Tamil Nadu. Rare & Threatened.

A. **hohenackeri** Craib : A climbing scandent shrub ; Southern W. Ghats, Nilgiris, Coonoor. Rare & Threatened.

A. **wightii** Baker : Small tree ; Southern W. Ghats, Travancore & Tirunelveli. Rare & Threatened.

Albizia lathamii Hole : A small tree ; W. Ghats, Tirunelveli & Ramnad, Ramanathapuram, 350 m. Rare.

Albizia sikharamensis Sahni & Bennet : Small tree/large shrub ; Andhra Pradesh, Srisailam.

Calliandra cynometroides Bedd. : A medium sized tree ; Southern W. Ghats, Travancore (Kerala), 750-1100 m. Rare & Threatened.

Dichrostachys santapaui Sab. & Ramam. : Thorny shrub/small tree ; Southern W. Ghats, Tirunelveli. Rare.

Entada monostachya : DC. : A liana ; Southern W. Ghats, Kerala.

Mimosa angustisiliqua Gamble : A shrub ; E. Ghats, Tummulau, Godavari & Southern W. Ghats.

M. prainiana Gamble : A straggling shrub ; E. Coast, Krishna dist., Deccan, Hyderabad to Anantapur.

Pithecellobium gracile Bedd. : Slender shrub/ small tree ; W. Ghats, Wynaad, Coorg, Nilgiris, 900 m.

CAESALPINIACEAE

The family is represented in India by 23 genera and 84 species of which 15 species are endemic to the Peninsular India, bringing the percentage of endemism in this region (in relation to the Indian species) to approx. 18%.

Three species of *Cynometra* are rare and threatened.

The Indo-Ceylonese genus *Humboldtia* comprising 6 species is in the Southern W. Ghats of India. *H. laurifolia* is also found in Sri Lanka. All other 5 species are endemic to the peninsular India being restricted to the Southern W. Ghats at altitudes ranging from 150 to 1250 m.

The endemic genus *Moullava* is monotypic.

ENDEMIC TAXA :

Cassia intermedia Sharma, Vivek. & Rathakr. : Erect shrub ; Southern W. Ghats, Kerala (Thekkady, Idukki dist.) and Nilgiri dist. of Tamil Nadu.

C. kolabensis Kothari, Moorthy & Nayar : Herb ; Maharashtra, Kolaba dist. and Thana dist.

C. montana Heyne ex Roth : Handsome shrub ; Peninsular India Deccan, Karnataka, Tamil Nadu, Coimbatore, Madurai, Dharmapuri and Nilgiris of W. Ghats ; N. Arcot, S. Arcot and Salem of E. Ghats, up to 900 m.

Cynometra beddomei Prain : Large tree ; W. Ghats, Wynaad & S. Kanara (?). Rare.

C. bourdillonii Gamble : Moderate sized tree ; W. Ghats, Hassan, (?), S. Kerala, 150 m. Rare & Threatened.

C. travancorica Bedd. : Lofty tree ; Southern W. Ghats, Travancore & Tirunelveli, 600-900 m. Rare.

Dialium travancoricum Bourd. : Large tree ; Southern W. Ghats, Kerala, 300-900 m.

Humboldtia bourdillonii Prain : Medium sized tree ; Southern W. Ghats, Travancore & Tirunelveli, 900 m. Rare & Endangered.

H. brunonis Wall. ; A diffuse shrub or small tree ; W. Ghats of Karnataka, Malabar & Nilgiris.

H. decurrens Bedd. : Moderate sized tree ; W. Ghats, Travancore, Tirunelveli, 150-900 m. Rare & Endangered.

H. unijuga Bedd. : Large tree ; Southern W. Ghats, Travancore & Tirunelveli, 900-1250 m. Rare, & Endangered.

H. unijuga Bedd. var. **trijunga** Joseph & Chandras. : Tree ; Kerala, Trivandrum.

H. vahliana Wt. ; Moderate sized tree ; W. Ghats, Malabar, Travancore, Tirunelveli & Nilgiris. Rare.

Kingiodendron pinnatum (Roxb. ex DC.) Harms : Large evergreen tree; Southern W. Ghats, from S. Kanara to Travancore, Tirunelveli, Coimbatore, Nilgiri, up to 900 m. ; Deccan in Karnataka & Andhra Pradesh ; E. Ghats, Godavari, southwards to Chingleput & Salem.

Moullava spicata (Dalz.) Nicolson : Prickly climber ; W. Ghats, S. Kanara of Karnataka, Malabar, up to 900m.

FABACEAE

(Papilionaceae)

Fabaceae is one of the largest families of flowering plants with a wide range of habit and habitat. It is the largest family in the dicotyledonous group of plants. No exact figures in context to the number of genera and species are available. It is estimated to cover *ca* 400-500 (?) genera and

well over 10,000 species. The family is cosmopolitan, particularly in both tropical and temperate regions.

There could be well over a 1000 species (?) representing the family in India (867 species, Chatterjee, 1959). The family developed fairly well in the major endemic zones of India, viz. Himalayas, North East Region and Peninsular India. There are 98 species and 14 varieties endemic to Peninsular India.

In India the cosmopolitan genus *Astragalus* and the Asian (C. Asia Himalaya & China) genus *Caragana*, both have their greatest development in the Himalayas, while the tropical and subtropical genus *Milletia* has found a strong foothold in the North East Region. The tropical and subtropical genus with the highest representation of endemic species in Peninsular India is *Crotalaria* (with 35 endemic species & 5 endemic varieties) reflecting its high degree of development in this continental area. *Crotalaria* is represented in India by about 86 species of which approx. 40% are strictly endemic to Peninsular India. Other genera with more than 5 endemic species in Peninsular India are *Tephrosia*, *Dalbergia*, *Indigofera*, *Rhynchosia* and *Smithia*.

ENDEMIC TAXA :

Alysicarpus beddomei Schindl. : Erect Herb ; W. Ghats, hills of Karnataka & Nilgiris. Rare.

A. pubescens Laws. var. **vasavadae** (Hemadri) Sanjappa : Annual, erect, herb ; Karnataka (N. Kanara), Madhya Pradesh (Julwania) & Maharashtra, (Poona, Sholapur, Aurangabad).

A. racemosus Benth. : An erect viscid herb ; E. Ghats, N. Circars, Ganjam; Deccan, hills of Karnataka; W. Ghats, Konkan (?), Wynaad, Nilgiri & Anamalais (Coimbatore), 900-2100 m.

Atylosia lineata Wt. & Arn. : Ashy-grey, bushy shrub ; W. Ghats, Konkan, Karnataka to Travancore, 900-1500 m.

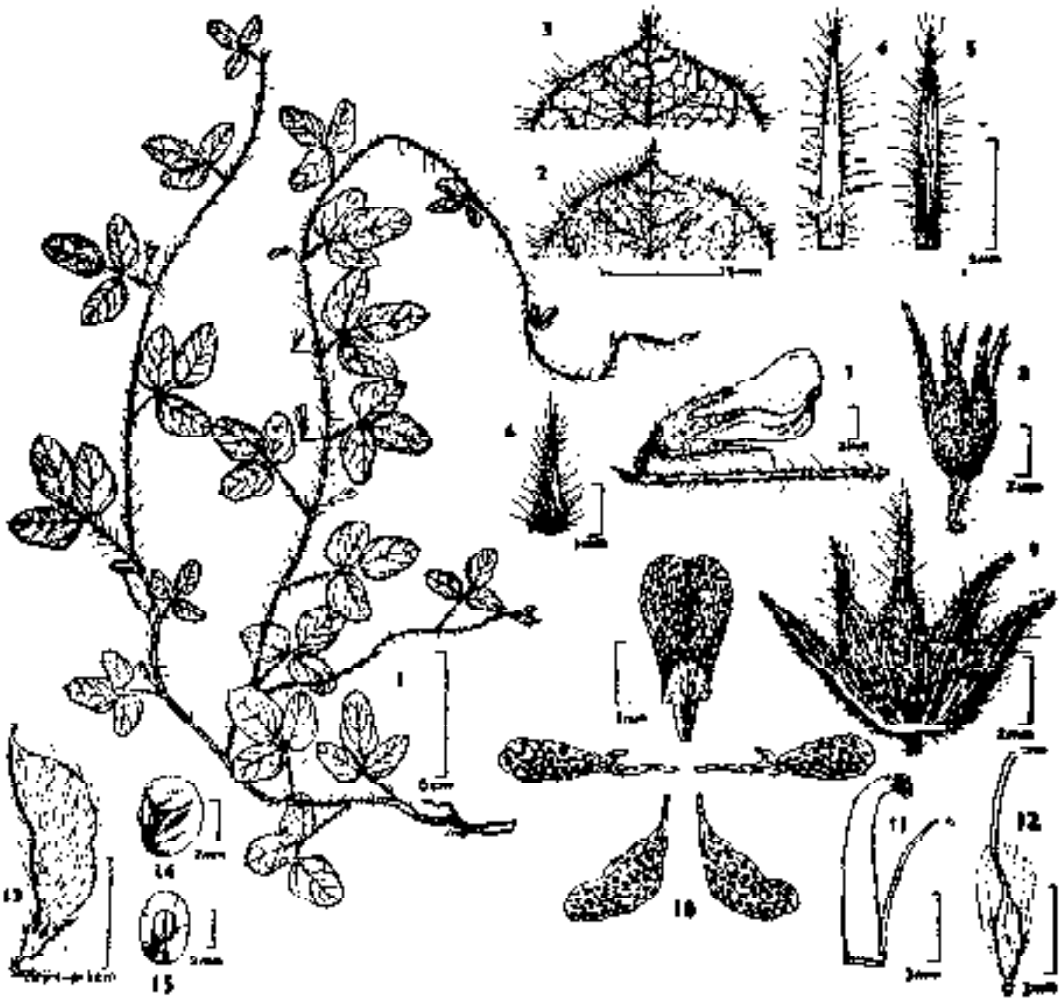
A. sericea Benth. : An erect shrub ; W. Ghats, Konkan, Deccan & E. Ghats, Visakhapatnam hills, above 1200 m.

Crotalaria barbata Grah.ex Wt. & Arn. : Large shrub ; Southern W. Ghats, Nilgiris, Tirunelveli, 1800-2400 m.

C. bidiei Gamble : An erect undershrub ; Southern W. Ghats, Wynaad & Nilgiris, 900-1200 m. Rare.

C. bourneae Fyson : Small undershrub ; Southern W. Ghats, Palni (Madurai) & Nilgiri hills, 1800 m. Rare.

C. candicans Wt. & Arn. : A stiff erect undershrub ; Southern W. Ghats, Nilgiris, Coimbatore, 800 m.



Rhynchosia jacobii Chandr. & Shetty

1. Branch with flowers and legume. 2. Portion of leaf showing the upper surface. 3. Portion of leaf showing the lower surface. 4. Dorsal view of stipule. 5. Ventral view of stipule. 6. Ventral view of bract. 7. Flowers with pedicel, bract and rachis. 8. Calyx. 9. Calyx split open, showing the inner side. 10. Petals. 11. Androecium. 12. Gynoecium. 13. Legume. 14 & 15. Two views of seed.

Courtesy : Bull. Bot. Surv. India.

Crotalaria clarkei Gamble : A stout herb with yellow flower ; Southern W. Ghats, Nilgiris, Palni (Madurai), Tirunelveli hills & Coimbatore, up to 1650 m. Rare & Threatened.

C. conferta Fyson : A bushy shrub ; Southern W. Ghats, Palni hills (Madurai), 2100 m. Rare.

C. decasperma Naik : Shrub ; Maharashtra, Osmanabad.

C. digitata Hook. : A low velvety shrub ; Hills of Coorg, Salem & Madurai. Rare & Threatened.

C. epunctata Dalz. : Erect undershrub ; E. Ghats, N. Circars, Ganjam, & W. Ghats, Tirunelveli, 1350 m.

Crotalaria filipes Benth. : Slender trailing plant ; W. Ghats/Coast, Konkan, Kanara. Rare & Threatened.

C. formosa Grah. ex Wt. & Arn. : A low tawny pubescent shrub, yellow flowers ; Southern W. Ghats, Nilgiris, above 2100 m.

C. fysonii Dunn var. **fysonii** : Trailing sub-shrubby herb ; Southern W. Ghats, Palni hills & Anamalais, up to 2100 m.

C. fysonii Dunn var. **glabra** Gamble : A herb ; Southern W. Ghats, Palni hills, Madurai. Rare.

C. grahamiana Wt. & Arn. ; Erect undershrub ; Southern W. Ghats, Anamalai, Palni, Tirunelveli & Travancore, up to 1800 m. Rare.

C. heyneana Grah. ex Wt. & Arn. : A low, pubescent undershrub ; W. Coast, Ghats Karnataka, Travancore-Malabar, Wynaad, Anamalai, Palni, Tirunelveli & Nilgiris, up to 900 m.

C. lanata Bedd. : A shrub ; Southern W. Ghats, Travancore, Anamalai (Coimbatore), Palni (Madurai), Nilgiri hills, Dharmapuri, 900-1200 m.

C. leschenaultii DC. : Herbaceous undershrub ; Southern W. Ghats, Nilgiris & Palni hills (Madurai), Tiruchirapally ; Southern E. Ghats, Shevaroys, above 1500 m.

C. longipes Wt. & Arn. : A stiff undershrub ; Southern E. Ghats Kollamalai hills of Salem ; Tiruchirapalli of Southern Ghats & Nilgiri, Rare.

C. lutescens Dalz. : Erect herb ; W. Coast/Ghats, Konkan (Plains), Kanara. Rare & Threatened.

C. madurensis Wt. ex Wt. & Arn. var. **madurensis** : A tall herb with yellow flowers ; Southern W. Ghats, Nilgiris & Palni hills (Madurai), Tiruchirapalli of E. Ghats.

C. madurensis Wt. ex. Wt. & Arn. var. **kurnoolica** Ellis & Swam. : An erect herb ; E. Ghats, Kurnool dist.

C. naikiana Zate ; Erect herb ; Maharashtra, Nanded, Ambadji.

C. notonii Wt. & Arn. : An erect shrub ; Gujarat, Surat Kathiawar (?), Southern W. Ghats, Nilgiri, & Anamalais (Coimbatore), 1200-1800 m.

C. obtecta Grah. ex Wt. & Arn. var. **obtecta** : A large shrub ; Southern W. Ghats, Nilgiris, above 1200 m, Cochin (?).

Crotalaria obtecta Grah. ex Wt. & Arn. var. **glabrescens** (Benth.) Baker : Large shrub ; Southern W. Ghats, Hassan, Tirunelveli, Nigiris, Coimbatore & Kanyakumari.

C. ovalifolia Wall. ex Fyson : A spreading shrub ; Southern W. Ghats, Nilgiri, Palni hills (Madurai) & Coimbatore, Salem of E. Ghats, 1800-2400 m.

C. paniculata Willd. var. **nagarjunakondensis** Thoth. : A sticky viscid undershrub ; Deccan, Nalgonda dist.

C. peduncularis Grah. ex Wt. & Arn. : An erect herb ; Southern W. Ghats, Bangalore, Nilgiris, Anamalais, Coimbatore & Travancore, up to 1500 m. Rare.

C. priestleyoides Benth. ex Baker : Low trailing undershrub ; W. Ghats, Konkan, Kanara to Nilgiris & Anamalais (Coimbatore), up to 1500 m. Rare & Threatened.

C. pulchra Andr. : Viscous shrub ; Deccan, Karnataka (Bellary & Kolar) ; Chingelput, Salem of E. Ghats ; Nilgiris of W. Ghats, 1350 m.

C. rigida Heyne ex Roth : Stiff shrub ; E. Coast, South of Krishna river, Thanjavur, Coimbatore to Tirunelveli. Rare.

C. sallcifolia Heyne ex Wt. & Arn. : Herbaceous undershrub ; Southern W. Ghats, Coorg, Hassan, Travancore—Wynaad, Nilgiris & Madurai ; Salem & S. Arcot. of E. Ghats.

C. sandoorensis Bedd. : Viscous undershrub ; Deccan, Bellary dist. of Karnataka. Rare & Threatened.

C. scabra Gamble : Large shrub ; W. Ghats, Tirunelveli, Coimbatore ; Kanyakumari, Salem of E. Ghats, 1800 m.

C. shevaroyensis Gamble : A tall shrub ; E. Ghats, Shevaroys, Salem ; Dharmapuri, Madurai dist. Rare.

C. speciosa Heyne ex Roth : Trailing undershrub ; Deccan, hills of Karnataka, E. Ghats, Nagari hills, N. Arcot, Kambakam hills, Chingleput, Dharmapuri, Ramanathapuram & Tirunelveli of W. Ghats. Rare.

C. subperfoliata Wt. & Arn. : Tall herb ; Southern W. Ghats, Travancore, Palni hills (Madurai) ; Ramanathapuram ; Salem of E. Ghats, Rare.

C. willdenowiana DC. subsp. **willdenowiana** : Erect shrub ; E. Ghats/ Coast. South of river Krishna, Chingleput, Dharmapuri, N. Arcot, Salem, Thanjavur, westward to Ramanathapuram & Coimbatore.

C. willdenowiana DC. subsp. **glabrifoliolata** Ellis : Erect shrub : Deccan, Coimbatore dist. Rare.

Dalbergia acaciaefolia Dalz. : Woody climber ; W. Coast/Ghats, S. Kanara, Tirunelveli & Ramanathapuram.

Dalbergia congesta Grah. ex Wt.& Arn. : Large climbing shrub ; Southern W. Ghats, Nilgiris, 1500 m. Rare.

D. coromandeliana Prain : Erect spinous shrub ; Southern W. Ghats, Tirunelveli, Madurai ; Kanyakumari, Ramanathapuram.

D. gardneriana Benth. : Climbing shrub ; Southern W. Ghats, Nilgiris, 1500-2100 m. Rare.

D. malabarica Prain : A climbing shrub ; W. Coast/Ghats, of Maharashtra, Karnataka to Travancore & Tirunelveli, Rare.

D. sympathetica Nimmo : A climbing shrub ; W. Ghats, Konkan, Kanara to Travancore, Tirunelveli, Nilgiri & Coimbatore ; Salem of E. Ghats.

D. tinneveliiensis Thoth. : A large climbing shrub ; Southern W. Ghats, Tirunelveli.

Derris benthamii Thw. var. **wightii** (Baker) Thoth. : Large climber ; Southern W. Ghats, Tirunelveli Shevagherry.

D. brevipes (Benth.) Baker var. **brevipes** : A large climbing shrub ; W. Ghats of Maharashtra, Karnataka, Travancore hills, Nilgiris, Tirunelveli, Coimbatore & Madurai, 1500 m.

D. brevipes (Benth.) Baker var. **coriacea** Baker : Climbing shrub; W. Ghats, N. Kanara, Shimoga, Nilgiris, Madurai.

D. brevipes (Benth.) Baker var. **travancorensis** Thoth. : Climbing shrub; Southern W. Ghats, Kerala.

D. heyneana (Wt. & Arn.) Benth : Climber ; Maharashtra, Goa & Karnataka.

D. ovalifolia (Wt. & Arn.) Benth. : Climber ; Pondicherry. Very rare, probably extinct.

D. thothathrii Benn. : Climber ; W. Ghats of Maharashtra, Karnataka (Coorg) & Tamil Nadu (Coimbatore). Rare.

Desmodium barbatum (Linn.) Benth. subsp. **saulierei** (Schindler) Ohashi : An erect herb ; Southern W. Ghats, Palni hills, 1200 m.

D. dolabriforme Benth. : Erect undershrub ; W. Ghats, Tirunelveli, "Courtallum", Kanyakumari. Rare.

D. ferrugineum Wall. ex Thw. ssp. **wynaadense** Ohashi : Erect undershrub; Southern W. Ghats, Nilgiri, Anamalais (Coimbatore) & Travancore hills, 600-1500 m. Rare.

D. ritchie Sanjappa : Erect herb ; Maharashtra (Plains).

Erythrina variegata var. **orientalis** (Linn.) Merr. f. **mysorensis** (Gamble) Maheshwari : A small tree ; Deccan, Chickanhalli-Karnataka.

Flemingia grahamiana Wt. & Arn. : Erect shrub ; Southern W. Ghats, Travancore, Nilgiri, Anamalais (Coimbatore) & Palni (Madurai) : Salem of E. Ghats, 1200-2100 m.

F. gracilis (Mukerjee) Ali : Trailing herb ; W. Ghats, Khandala, Chikmagalur.

F. nilgheriensis (Baker) Wt. ex Cooke : Trailing herb/shrub; W. Ghats of Maharashtra, Karnataka (Chikmagalur, Hassan) & southwards to Nilgiri & Palni hills, Coimbatore, 1200-2100 m.

F. praecox Clarke ex Prain var. **robusta** (Mukerjee) Anand Kumar : Tall shrub ; W. Ghats of Maharashtra (Bombay & Thane) & Madhya Pradesh (Chanda).

F. rollae (Billore & Hemadri) Anand Kumar : Erect herb ; Maharashtra, Sahyadri ranges, Thane & Ahmadnagar dist., above 1200 m.

Geissaspis tenella Benth. : Slender herb ; W. Coast, Konkan, Kanara (Karnataka Plains).

Indigofera barberi Gamble : Erect undershrub ; E. Ghats, Cuddapah, Kurnool, (Nallamalais) Chittoor, Salem & S. Arcot dist., 320 m. Rare.

I. caerulea Roxb. var. **monosperma** (Sant.) Sant. : Erect undershrub ; Gujarat.

I. datzelli T. Cooke : Prostrate herb ; N.W. Ghat, Satara dist. (Panchgani), Goa to N. Kanara dist., up to 1200 m.

I. deccanensis Sanjappa ; Erect shrub ; Maharashtra.

I. duthiei Drumm. ex Naik : Erect undershrub ; Maharashtra, Chanda, Betul & Aurangabad dist.

I. glandulosa Wendl. var **sykesii** Griff. ex Baker : Erect herb ; Madhya Pradesh (Indore) & Maharashtra (Aurangabad, Satara, Pune).

I. karuppiana Pallithanam ; A pubescent herb ; W. Ghats, Nilgiri, Coimbatore, Malabar, Palni hills (Madurai), 900-1200 m.

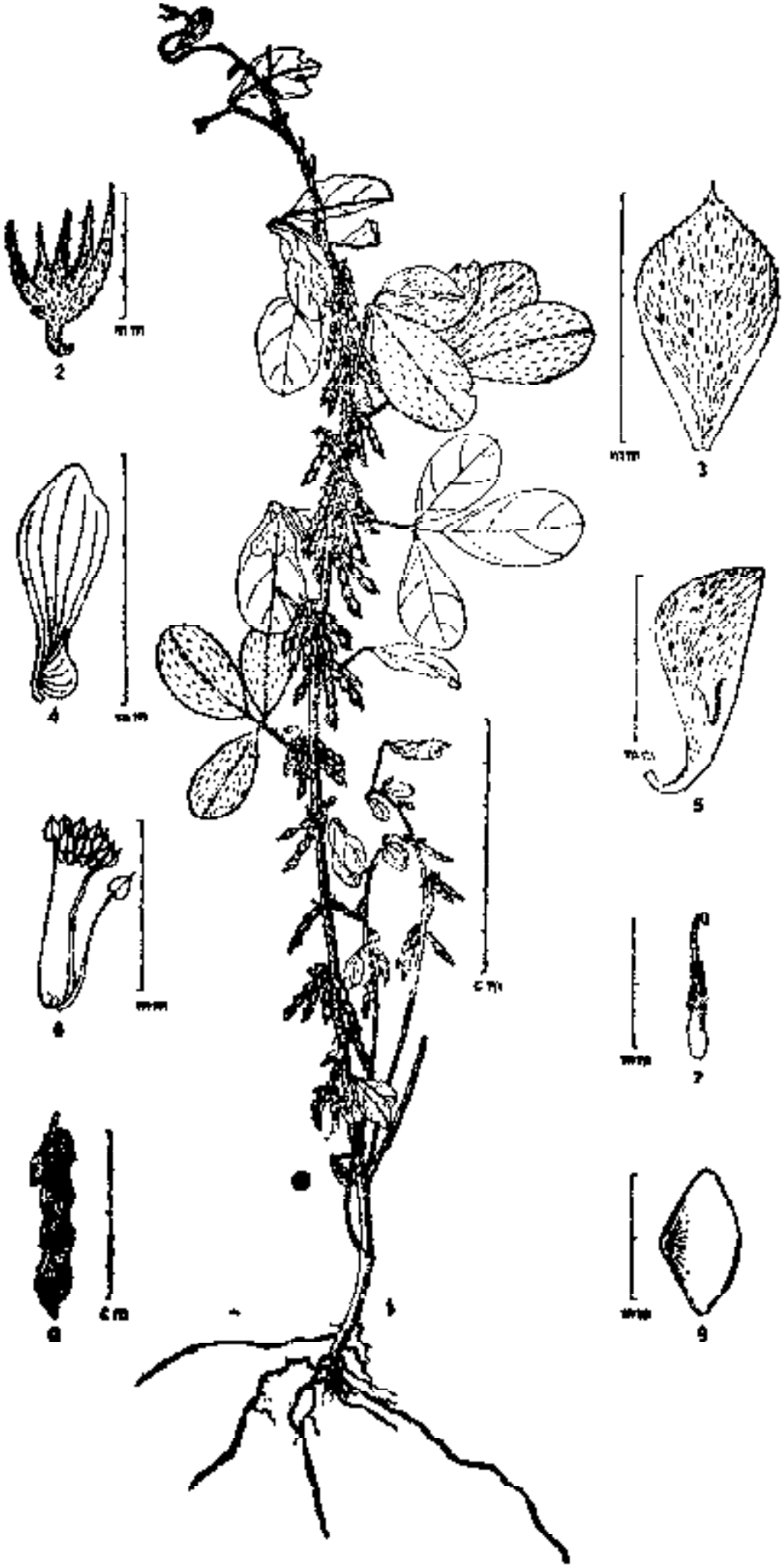
I. mysorensis Roth ex DC. : Pubescent shrub ; E. Ghats, Chingleput hills, N. Arcot, Salem ; Deccan hills of Karnataka ; W. Ghats, Nilgiris, up to 1200 m.

I. pedicellata Wt. & Arn. : Undershrub with rootstock ; Southern W. Ghats, Nilgiri, Anamalai (Coimbatore), Palni hills (Madurai), Tirunelveli, above 1500 m.

I. santapaui Sanjappa : Slender herb ; Maharashtra, Pune.

I. tirunelvelica Sanjappa : Annual erect herb ; Southern W. Ghats, Tirunelveli.

I. trita L.f. var. **marginulata** (Grah. ex Wt. & Arn.) Sanjappa : Weak undershrub ; W. Ghats, Konkan (?) Nilgiris & Dindigul hills of Madurai, Ramanathapuram, 600 m. Rare.



Indigofera zantapaui Sanjappa
1. Habit. 2. Calyx. 3. Standard petal. 4. Wing petal.
5. Keel petal. 6. Androecium. 7. Gynoecium.
8. Fruit. 9. Seed.
Courtesy : Bull. Bot. Surv. India.

Indigofera uniflora Buch.- Ham. ex Roxb. : Prostrate perennial herb ; Deccan plains & northern parts of Tamil Nadu (Coimbatore dist.).

Kunstleria keralensis Mohanan & N.C. Nair : A liana ; Kerala, Quilon dist., Kodumon, near Adoor, 125 m.

Leptodesmia congesta (Wt.) Benth. ex Baker : Trailing herb ; Southern W. Ghats, Palni hills (Madurai), Nilgiris, 1200-2100 m.

Milletia rubiginosa Wt. & Arn. : Large climbing shrub ; W. Ghats, Tirunelveli & Travancore, up to 1500 m.

M. splendens Wt. & Arn. : Large climbing shrub ; Southern W. Ghats, Nilgiris & Anamalais (Coimbatore), up to 1200 m.

Mucuna hirsuta Wt. & Arn. : A large climber ; W. Ghats, Belgaum, Chikmagalur, Mysore, Nilgiri & Palni hills (Madurai), Tirunelveli ; Salem of E. Ghats.

Neonotonia wightii (Grah. ex Wt. & Arn.) Lackey var. **coimbatorensis** (A. Sen) Karthik. ; Climbing herb ; W. Ghats, Kerala & Tamil Nadu-Coimbatore ; E. Chats, Salem.

Ormosia travancorica Bedd. : A lofty tree ; W. Ghats, Kanara (Karnataka), Travancore to Anamalais (Coimbatore) & Tirunelveli hills, up to 900 m.

Pterocarpus santalinus Linn. f. : Medium sized tree ; E. Ghats, Cuddapah, Kurnool, N. & S. Arcot & Chingleput, Salem, Dharmapuri, up to 500 m. Threatened.

Rhynchosia beddomei Baker : Stiff undershrub ; E. Ghats, Cuddapah, Tirupati hills & Bellary dist. Rare & Threatened.

R. **filipes** Benth. : A trailing herb ; Southern W. Ghat. Nilgiri, Palni hills (Madurai) at low altitudes ; Shevaroys (Salem) of E. Ghats.

R. **heynei** Wt. & Arn. : Herbaceous trailing undershrub ; W. Deccan, in Karnataka hills of Bellary & Cuddapah in E. Ghats & Tirunelveli & Nilgiri of W. Ghats. Rare.

R. **jacobii** Chandr. & Shetty : A trailing herb ; Southern W. Ghats, Tirunelveli.

R. **velutina** Wt. & Arn. : Trailing herb ; W. Ghats, Nilgiris, Tanjore & Tirunelveli (Thanjavur). Rare.

Sesbania procumbens (Roxb.) Wt. & Arn. : Prickly annual herb ; Coastal districts of Peninsular India (incl. Chingleput, Ramanathpuram & Tirunelveli of Tamil Nadu).

Smithia agharkarii Hemadri : Erect or sub-erect, annual herb ; Maharashtra, Poona & Satara dist.

S. **bigemina** Dalz. : Diffuse annual herb ; W. Ghats, Konkan (Poona, Mahabaleshwar) in Karnataka, Nilgiris & Coimbatore, 1150 m.

Smithia capitata Dalz. : Branching annual herb ; W. Ghats, Konkan, hills of Karnataka to Wynaad, Anamalais (Coimbatore), Nilgiris & Madurai, 600-900 m.

S. gracilis Benth. : Slender diffuse perennial herb ; Southern W. Ghats, Nilgiris & Palni hills (Madurai), Coimbatore, 1500-2100 m.

S. setulosa Dalz. : Tall annual Pubescent herb ; W. Coast/Ghats, Konkan (Plains), Kanara, Wynaad & Nilgiris, up to 900 m.

S. venkobarowii Gamble : Trailing herb ; Southern W. Ghats, Travancore, Rare & Threatened.

Sophora interrupta Bedd. : Large shrub/small tree ; Peninsular India - E. Ghats, Cuddapah, Nellore, Mehboobnagar, southwards to North & South Arcot, 900 m. (extending up to Madhya Pradesh).

S. wightii Baker : A small tree ; W. Ghats, Konkan, hills of Karnataka & Nilgiris & Tirunelveli, 1200 m.

Spatholobus purpureus Benth. : Long climbing shrub ; W. Ghats, Konkan, Karnataka, Travancore.

Tephrosia barberi Drumm. : An undershrub ; W. Ghats, Tirunelveli, Tuticorin. Rare.

T. calophylla Bedd. : A woody perennial ; W. Ghats, Hassan, Coimbatore, Nilgiris ; Salem of E. Ghats, 900 m. Rare.

T. jamnagarensis Santapau : A shrub ; Gujarat, Kutch-Jamnagar.

T. roxburghiana Drumm. : Slender undershrub ; E. Ghats, Circars, South of Ganjam, Vizag & Godavari hills, Bellary dist. of Karnataka, 1350 m.

T. wynaadensis Drumm. : Erect undershrub ; Southern W. Ghats, Wynaad.

Vigna bourneae Gamble : Stout climber ; W. Ghats, Shimoga, Palni hills, Madurai & Tirunelveli, at low elevations.

V. khandalensis (Sant.) Raghavan & Wadhwa : Erect herb ; Maharashtra.

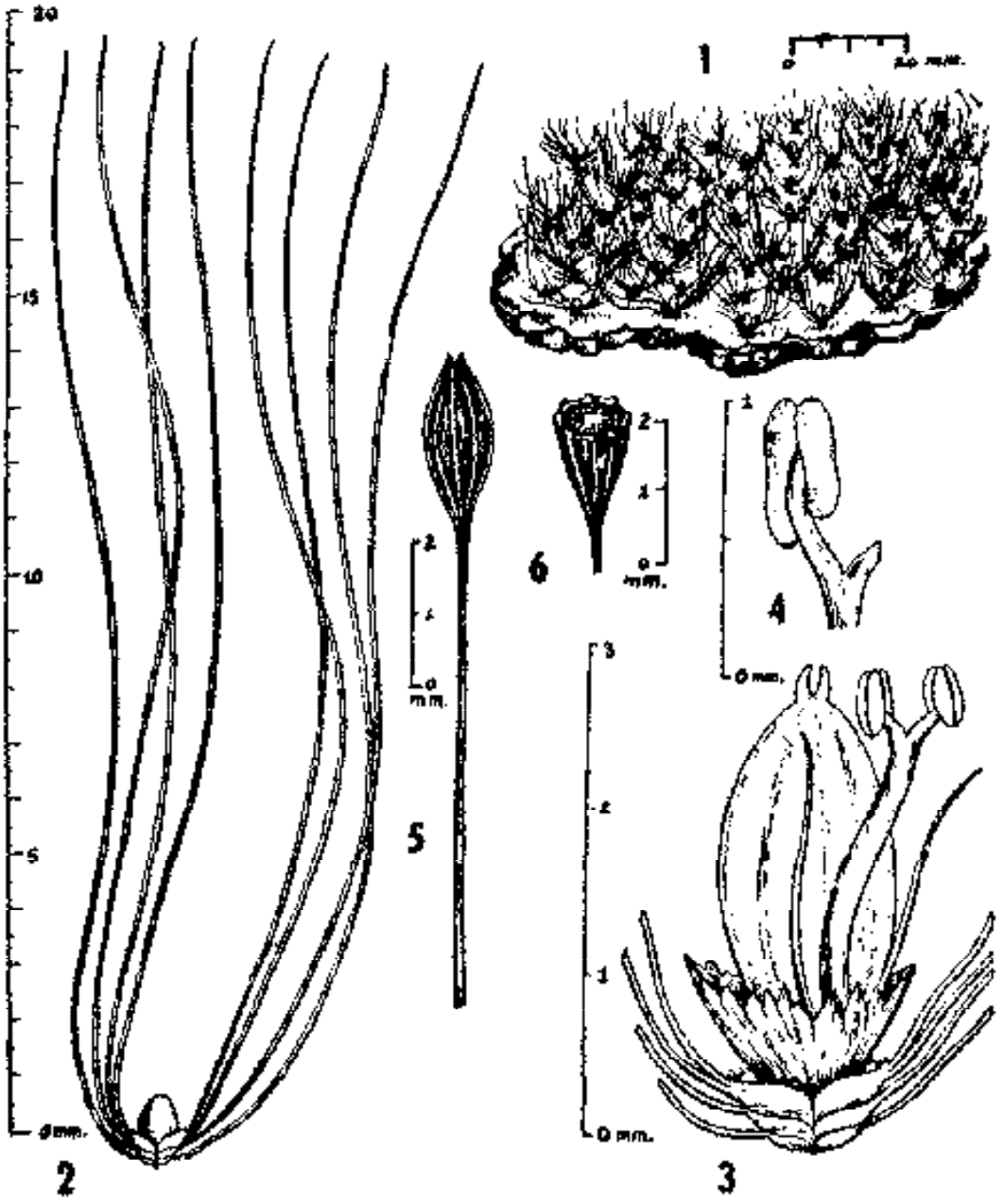
V. wightii Benth. : A slender climber ; Southern W. Ghats, Coorg, Mysore, Wynaad, Coimbatore, Nilgiri & Palni hills, Tirunelveli ; Salem of E. Ghats, 1500 m.

Zornia quilonensis Ravi : A perennial herb ; Kerala, Quilon.

ELAEAGNACEAE

The family consists of *ca* 3 genera and 50 species distributed mostly in Northern Hemisphere. The members occur mostly on steppe lands and coastal areas.

The family is represented in India by 2 genera and *ca* 10 species of which only one plant is endemic to peninsular India. The genus *Elaeagnus* of *ca* 45 species distributed in Europe, Asia and North America, is represented in India by *ca* 8 species with majority of them occurring in North India. *Elaeagnus indica* is the only plant that is known to be endemic to Peninsular India.



Dicraeia filifolia Ramam. & Joseph

1. Habit sketch (without scale). 2. A young secondary shoot. 3. Older shoot with the terminal flower. 4. The substantial anther lobes. 5. Pedicellate capsule. 6. Capsule across.

Courtesy : Bull. Bot. Surv. India

ENDEMIC TAXA :

Elaeagnus indica Serv. : Slender straggling shrub ; Deccan, Coimbatore hills ; E. Ghats, Arcot & Salem dist. extending westwards to Madurai & W. Ghats, 1200 m.

PODOSTEMACEAE

This family of aquatic herbs comprises *ca* 45 genera and 130 species which are tropical in distribution. The genus *Dicraeia* is represented in India by about 3 species. *Dicraeia filifolia* is the only species of the genus that is endemic to Peninsular India. The monotypic endemic genus *Griffithella* with its minute, lichen-like, polymorphic herb is a curious plant. The genus *Willisia*, besides being endemic is also monotypic. The single species complement *W. selaginoides* is another interesting plant ; the small tufted herb with erect imbricate shoots resembles the club moss *Lycopodium selago* Linn. The plant grows attached to rocks of fast flowing mountain streams. The genus *Indotristicha* with two species is endemic to the W. Ghats.

ENDEMIC TAXA :

Dicraeia filifolia Ramam. & Joseph : Minute herb ; Southern W. Ghats, Kerala, Tirchur dist. (Parambikulam).

Griffithella hookeria (Tul.) Warm. : Herbs attached to moist rocks ; W. Ghats.

Indotristicha ramosissima (Wt.) van Royen : Aquatic herb ; Southern Western Ghats.

I. tirunelveliana Sharma, Karthik. & Shetty : Aquatic herb ; Southern W. Ghats, Tirunelveli.

Willisia selaginoides (Bedd.) Warm. ex Willis : Tufted herb anchored to moist rocks ; Southern W. Ghats, Anamalai hills.

LYTHRACEAE

This small family comprises *ca* 25 genera and 550 species which are distributed in both tropical and temperate zones.

In India the family is represented by 8 genera and 59 species of which only 3 are endemic to Peninsular India. The genus *Rotala* comprises 50 species of which 14 are represented in India. *Rotala malampuzhensis* occurs in the damp wet places of coastal Kerala.

Indotristicha tirunelveliana Sharma, Karthik. & Shetty

1. Habit. 2. Flower-bearing leafy shoot. 3. Leafy shoot. 4. Linear leaf of the flower-bearing leafy shoot. 5. Leaf of the leafy shoot. 6. Sheath formed by linear leaves at the base of the pedicel. 7. Enlargement of the sheath. 8. Ordinary leaves below the sheath. 9. Enlargement of the perianth segment. 10. Enlargement of the ovary. 11. Stamen. 12. Ovary showing ovules. 13. Transverse section of the ovary. 14. Branch with flowers and capsules. 15. Capsule view from above showing ribs. 16. Dehisced capsule. 17. Seeds.

Courtesy : Bull. Bot. Surv. India.

ENDEMIC TAXA :

Lagerstroemia lindonii Teysm. & Binn. : A tree ; Deccan without locality.

L. microcarpa Wt. : A tree ; W. Ghats, Konkan, North & South Kanara, Coorg, Mysore, Hassan & Malabar.

Rotala malampuzhensis R.V. Nair ex C.D.K. Cook. : Annual herb ; Coastal plains of Kerala Palghat dist.

MYRTACEAE

This relatively large family of *ca* 100 genera and 300 species is distributed in the tropical and subtropical regions of the world. The chief centres of development of this family are Australia (eg. Leptospermoideae : *Metrosideros*, *Tristania*, *Eucalyptus*, *Leptospermum*, *Callistemon*, *Melaleuca* and *Baeckea*) and South America (eg. Chamaelaucleae : *Calycothrix*, *Chamaelaucium*, *Darwinia* and *Verticordia*).

The family is represented in India by *ca* 11 genera and 63 species of which 29 species and a variety, i.e. 46% are endemic to Peninsular India. The two genera *Eugenia* and *Syzygium* are well established in the continental Peninsular India showing a relatively high degree of endemism. *Eugenia rottleriana* is on allied viccariant of *E. cotonifolia* ssp. *phyllyraeoides* of Sri Lanka. The genus *Meteoromyrtus* is monotypic : the single species complement, *M. wynaadensis* is endemic to Wynaad and Nilgiris of Southern W. Ghats. The palaeotropical genus *Syzygium* is represented in India by *ca* 50 species of which 19 species, i.e. 36% are endemic to Peninsular India. Some of the endemics that are rare/threatened/ endangered are *Syzygium benthamianum*, *S. chavaran*, *S. myhendrae*, *S. palghatense*, *S. stocksii* and *S. travancoricum*.

Note : Merrill and Perry (*Amer. Acad. Arts* 18 : 135 202. 1939) consider *Eugenia* Linn. to be primarily a New World genus and are of the opinion that most *Eugenia* species of the Old World ought to be treated under *Syzygium* Gaertn. However, Schmid [*Amer. J. Bot.* 59(4) : 423 436. 1972] reinstated *Syzygium* as a distinct genus placing species of *Jambosa* under it. His interpretation was based on anatomical studies and gross morphological characters.

ENDEMIC TAXA :

Eugenia argentea Bedd. : A shrub or small tree ; Southern W. Ghats, Wynaad, 900 m.

Eugenia calcadensis Bedd. : A small tree ; Southern W. Ghats, Idukki-Silent valley, Nilgiri & Tirunelveli, 600 900 m.

E. **discifera** Gamble : A small tree ; Southern W. Ghats, Travancore & Ramanathapuram. Rare & Threatened.

E. floccosa Bedd. : A large tree ; Southern W. Ghats, Tirunelveli & Kanyakumari, 900-1200 m.

E. indica (Wt.) Chitra : A small tree/shrub ; Southern W. Ghats, Palghat dist. of Kerala & hills of Tirunelveli. Rare & Threatened.

E. rottleriana Wt. & Arn. : A small tree : Southern W. Ghats, Tirunelveli & Travancore, 1200m.

E. singampattiana Bedd. : A small tree ; Southern W. Ghats, Tirunelveli, 900 m. Rare & Threatened.

E. utilis Talbot : A tree ; W. Ghats, Chikmagalur, Coorg, N. Kanara & Shimoga.

Jambosa bourdillonii Gamble : A moderate sized tree ; Southern W. Ghats, Travancore, 600 m. Rare & Threatened.

J. mundagam Gamble : A medium sized tree ; Southern W. Ghats, Travancore, 1200 m.

Meteoromyrtus wynaadensis (Bedd.) Gamble : A small tree/large shrub ; Southern W. Ghats, Wynaad, Nilgiri, 650—950 m. Rare & Threatened.

Syzygium beddomei (Duthie) Chithra : A large tree ; Southern W. Ghats, Tirunelveli, 1200—1500 m. Rare & Threatened.

S. benthamianum (Wt. ex Duthie) Gamble : Small tree/large shrub ; Southern W. Ghats, Nilgiris, Madurai & Kanyakumari, 1800 m. Rare & Endangered.

S. chandrasekharanii Chandrab. & Chandras. : A medium sized tree ; Coimbatore dist. of Tamil Nadu.

S. chavaran (Bourd.) Gamble : A large tree ; Southern W. Ghats, Travancore. Rare & Threatened.

S. codyensis (Munro) Chandr. : A shrubby little tree : W. Ghats, Kanara, Coorg, Nilgiris & Travancore, 900 m.

S. courtallense (Gamble) Alston : A tree ; Southern W. Ghats, Tirunelveli. Endangered.

Syzygium densiflorum Wall. ex Wt. & Arn. : A large tree ; Southern W. Ghats, Nilgiris, Anamalais, Coimbatore, Palni, Madurai hills, Travancore.

S. kanarensis (Talb.) Raizada : A tree ; W. Ghats, N. Kanara & Shimoga.

S. lactum (Buch.-Ham.) Gandhi : A medium sized tree ; W. Ghats, Konkan, Karnataka, southwards to Coimbatore, Kanyakumari, Nilgiri & Tirunelveli.

S. malabaricum (Bedd.) Gamble : A moderate sized tree ; W. Ghats, Mysore, Wynaad, Coimbatore, Nilgiri, 600-1200 m.

S. microphyllum Gamble : A small tree ; W. Ghats, Travancore, 1200 1500 m.

S. myhendrae (Bedd. ex Brandis) Gamble : A moderate sized tree ; W. Ghats, Mysore, Travancore & Tirunelveli, 900-1200 m. Rare & Threatened.

S. occidentalis (Bourd.) Gandhi : A small tree ; W. Ghats, Periyar river, Idduki dist., Kerala. Rare & Threatened.

S. palghatense Gamble : A large tree ; Southern W. Ghats, hills of Malabar, 1500 m. Rare & Threatened.

S. rama-varmae (Bourd.) Chithra : A moderate sized tree ; Southern W. Ghats, Travancore & Tirunelveli, 1200 m. Rare.

S. stocksii (Duthie) Gamble : A large tree ; W. Ghats, Konkan (?) Kanara, Wynaad, 900 m. Rare & Threatened.

S. tamilnadensis Rathakr. & Chithra : Large tree ; W. Ghats, Nilgiris, Tirunelveli & Madurai, 1500 m.

S. travancoricum Gamble : A moderate/large sized tree ; Southern W. Ghats, Travancore, low level. Rare & Threatened.

S. zeylanicum (L.) DC. var. **ellipticum** Henry, Chandrabose & Nair : An erect shrub ; Southern W. Ghats, Tirunelveli.

MELASTOMATACEAE

This is a fairly large family comprising of *ca* 240 genera and 3000 species distributed in the tropical and subtropical regions and to a very small degree in the temperate parts. The members are mostly centred in South America where they form one of the major floristic components, besides being the characteristic elements of the Brazilian flora.

The family is represented in India by *ca.* 12 genera and 81 species. As many as 38 species and 4 varieties are endemic to Peninsular India. Thus, in relation to the Indian species of the family the degree of endemism in Peninsular India is as high as 50% which is a relatively high figure. The genera with the largest representation of endemic species are *Sonerila* (with 17 endemic species and 1 variety) followed by *Memecylon* (with 12 endemic species) and *Osbeckia* (with 7 endemic species and 3 varieties). *Sonerila* is essentially an Asiatic genus and it seems to have established itself well in Peninsular India. *Sonerila barnessi*, *S. elegans*, *S. nemakadensis*, *S. pulneyensis* & *S. wynaadensis* are rare plants of the region.

ENDEMIC TAXA :

Medinilla beddomei Clarke : An epiphytic fleshy shrub. ; W. Ghats, Coorg to Wynaad-southwards Coimbatore, Madurai & Tirunelveli, 600-1900 m.

M. malabarica Bedd. : Epiphytic sub-scandent shrub ; W. Ghats, Nilgiris & Anamalais (Coimbatore), 900-2300 m.

Memecylon depressum Benth. ex Triana : A shrub ; W. Coast & lower slopes of W. Ghats of Malabar—Travancore, Coimbatore, Madurai & Nilgiris, up to 350 m.

M. flavescens Gamble : A shrub ; W. Ghats, Nilgiris, 2300 m. Rare & Endangered.

M. gracile Bedd. : An undershrub ; W. Ghats, Travancore & Tirunelveli ; Kanyakumari, 300-900 m.

M. lawsonii Gamble : Erect shrub ; W. Ghats, Wynaad, Nilgiris. Rare & Endangered.

M. lushingtonii Gamble : Large shrub ; E. Ghats, Cuddapah, 1300 m. Deccan-Coimbatore, W. Ghats, Nilgiris, 1300-1800 m.

M. madgolense Gamble : A shrub ; E. Ghats, N. Circars, Vishakhapatnam hills, 900-1400 m. Rare & Threatened.

M. malabaricum (Clarke) Cogn. : Small tree ; Southern W. Ghats, Kanara, Nilgiris & Palni hills, Coimbatore to Kanyakumari, 1200-1800 m.

Memecylon molestum (Clarke) Cogn. : A tall tree with light blue flowers ; Southern W. Ghats, Coimbatore & Nilgiris, above 1800 m.

M. subcordatum Cogn. : A shrub ; Peninsular India-locality not known.

M. subramanii Henry : An erect shrub ; Southern W. Ghats, Tirunelveli hills. Rare.

M. talbotianum Brandis : A tall tree ; W. Ghats, Coorg/Nilgiris, W. Coast, S. Kanara.

M. terminale Dalz. : Slender shrub ; W. Ghats, Kanara, 600 m.

Osbeckia aspera (L.) Blume var. **travancorica** (Bedd. ex Gamble) Hansen : An undershrub ; Southern W. Ghats, Travancore, Coimbatore & Nilgiris, low altitudes. Rare & Threatened.

O. courtallensis Gamble : Small shrub ; W. Ghats, Tirunelveli.

O. gracilis Bedd. ; Erect slender plant ; W. Ghats, Kanara to Nilgiris, Anamalais, Palni & Tirunelveli, 1300-2100 m.

O. lawsonii Gamble ; Erect undershrub ; Southern W. Ghats, Travancore, 600 m. Rare & Threatened.

O. leschenaultiana DC. ; A shrub ; W. Ghats, Nilgiri & Palni hills, 1800-2100 m.

O. lineolata Gamble var. **anamalayana** Giri & Nayar : Woody undershrub ; Southern W. Ghats, Kottayam, Cochin, Devicolam & Anamalais.

O. minor Triana : Small shrub ; W. Coast/Ghats, Travancore.

O. reticulata Bedd. ; A large shrub ; Southern W. Ghats, Anamalai & Palni hills, 1800-2300 m.

O. stellata Buch.-Ham. ex Ker-Gawl. var. **hispidissima** (Wt.) Hansen ; Hispid undershrub ; E. Ghats, Ganjam, Visakhapatnam dist., 1500-1600 m.

O. wynaadensis Clarke : Slender undershrub ; Southern W. Ghats, Wynaad, Coimbatore & Madurai, 1300 m.

Sonerila barnesii Fisch. ; A herb ; Southern W. Ghats, Travancore. Rare & Threatened.

S. clarkei Cogn. ; Small woody herb ; W. Ghats, Tirunelveli & Kanyakumari, 600 m.

S.onerila devicolamensis Nayar : Sub-erect herb ; Southern W. Ghats, Devicolam 2000 m., Kanyakumari.

S. elegans Wt. : Erect herb ; Southern W. Ghats, Nilgiris, Coimbatore, 1800 m. Rare & Threatened.

S. grandiflora Wt. & Arn. : Fleshy undershrub ; Southern W. Ghats, Nilgiris, Anamalais (Coimbatore) & Palni hills (Madurai), 1800 m.

S. nemakadensis C.E.C. Fisch. : Glabrous herb ; Southern W. Ghats, Travancore, 2000 m. Rare & Threatened.

S. pulneyensis Gamble : Straggling herb : Southern W. Ghats, Madurai, Palni hills. Rare & Endangered.

S. rheedii Wt. & Arn. : Small herb ; Southern W. Ghats, Coorg-Malabar, Wynaad & Nilgiri, 900 m.

S. rotundifolia Bedd. : Small herb ; Southern W. Ghats, Malabar hills-Nilgiris, Anamalais, 1300-1800 m.

S. sadasivanii Nayar : An erect herb with winged stem ; Southern W. Ghats, Travancore & Tirunelveli.

S. scapigera Dalz. : Stemless glabrous plant ; W. Ghats, Konkan, (Mahabaleshwar), hills of Karnataka.

S. speciosa Zenk. : Fleshy herb ; W. Ghats, Kanara-Karnataka & Niligiri, Tirunelveli, 1600-2300 m.

S. tinnevelliensis C.E.C. Fisch. : Erect undershrub ; Southern W. Ghats, Travancore, Tirunelveli, Madurai & Kanyakumari, 600-1300 m.

S. travancorica Bedd. : Perennial undershrub ; Southern W. Ghats, Travancore, Tirunelveli & Kanyakumari, 1100-1600 m.

S. versicolor Wt. var. **versicolor** : Annual undershrub ; Southern W. Ghats, Coimbatore, Nilgiris & Tirunelveli, 900-1800 m.

S. versicolor Wt. var. **axillaris** (Wt.) Gamble : A herb ; Southern W. Ghats, Nilgiris & Wynaad, 900 m.

S. wallichii Benn. : Stemless herb ; Southern W. Ghats, Malabar-Wynaad to Nilgiri & Anamalais (Coimbatore), 900 m.

S. wynaadensis Nayar : A herb ; Southern W. Ghats of Kerala-Wynaad.

RHIZOPHORACEAE

The Rhizophoraceae is a small family of *ca* 16 genera and 120 species distributed mostly in the tropics of the Old World. They flourish in tropical rain forests and mangroves. Some genera of this family form the principal components of coastal, brackish to saline swamp vegetation. Of the 4 genera occurring in the Americas *Cassipourea* accounts for more than half the species of the family.

The family is represented in India by 7 genera and 14 species, of which only one is endemic to Peninsular India. The endemic genus *Blepharistemma* is monotypic ; its species complement *B. membranifolia* is restricted to the evergreen forests of Southern W. Ghats.

ENDEMIC TAXA :

Blepharistemma membranifolia (Miq.) Ding Hou : Large tree ; W. Coast/W. Ghats, Coorg to Travancore, 750 m.

ARALIACEAE

The family Araliaceae comprises *ca* 55 genera and *ca* 700 species distributed chiefly in the tropics, with concentration in Indomalaysia and tropical America.

The present study shows that the family is represented in India by 60 species of which only 5 species and 1 variety are endemic to the Peninsular India, which brings the percentage of endemicity (in relation to the Indian species of the family) in this region to 8.33%. The genus *Aralia* has only one endemic species, while the genus *Schefflera* has 4 spp. and 1 var. endemic to Peninsular India. All the endemic taxa are confined to the Southern Western Ghats between elevations of 600 to 2000 m. *S. bourdillonii* is a rare and threatened species.

ENDEMIC TAXA :

Aralia malabarica Bedd. : Large shrub or small tree ; Southern W. Ghats, Wynaad, Travancore, Nilgiri, Coimbatore & Tirunelveli, 600-900 m.

Schefflera bourdillonii Gamble : Epiphytic shrub ; Southern W. Ghats, Travancore, 1250 m. Rare & Threatened.

S. capitata (Wt. & Arn.) Harms : Tree ; Southern W. Ghats, Wynaad, Nilgiris & Coimbatore, 900-1800 m.

S. chandrasekharanii Ramam. & Rajan : Small tree ; Southern W. Ghats, Kerala, Idukki dist., 2000m

Schefflera rostrata (Wt.) Harms var. **rostrata** : Large tree ; Southern W. Ghats, Nilgiris, Coimbatore, 1200 m.

S. rostrata (Wt.) Harms var. **micrantha** (Clarke) Mahesh. : Tree ; Southern W. Ghats, Nilgiris & Tirunelveli, 900 m.

UMBELLIFERAE

(*nom. altern.* Apiaceae)

The Carrot family is a relatively large one comprising *ca* 275 genera and 2850 species which are cosmopolitan, but predominant in the North temperate zone. The greatest concentrations of the family are found in the Mediterranean, Central Asia and Western North America. They are normally found at higher elevations, particularly in the tropics.

The family is represented in India by *ca* 54 genera and 202 species of which 17 species and 2 varieties are endemic to Peninsular India. The genus *Heracleum* is represented in India by *ca* 20 species of which 5 species and 2 varieties are endemic to Peninsular India. *Pimpinella* is represented in India by 30 species of which 5 are endemic to Peninsular India. *Pimpinella ttrupatiensis* is an endemic herb with a perennial tuberous root and has a very restricted distribution. *Heracleum aquilegifolium*, *H. hookerianum*, *H. rigens* var. *elongatum*, *Peucedanum anamallayense*, and *Pimpinella pulneyensis* are rare and threatened. The genus *Vanasushava* is monotypic.

ENDEMIC TAXA :

Bupleurum andhricum Nayar & Ban. : A herb ; E. Ghats, N. Circars, Koraput, Ganjam, Kalahandi & Visakhapatnam hills.

B. distichophyllum Wt. & Arn. : Slender erect herb ; Southern W. Ghats, Coimbatore, Madurai, Nilgiris & Tirunelveli, above 2200 m.

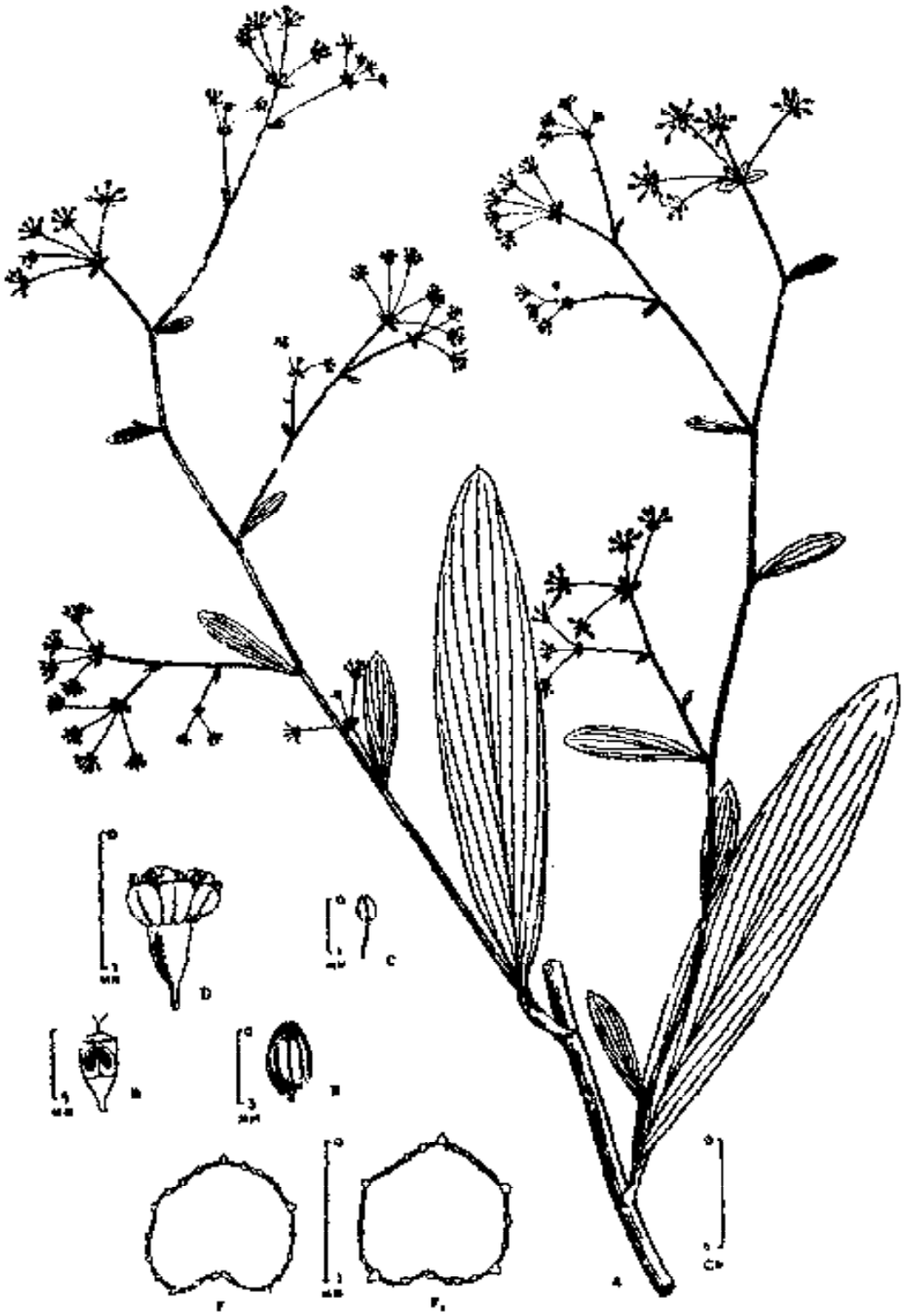
B. plantaginifolium Wt. ; An erect shrub : Southern W. Ghats, Nilgiris, above 1800 m. Rare.

Heracleum aquilegifolium Clarke : An erect herb ; W. Ghats, Konkan, Anamalais (Coimbatore). Rare & Threatened.

H. candolleanum (Wt. & Arn.) Gamble : Large leafy herb ; W. Ghats, Chikmagalur, Mysore, Nilgiris-Anamalai-Palni hills, Kanyakumari, Madurai, 1800 m.

H. courtallense Gamble : Tall leafy herb ; Southern W. Ghats, Courtallum, Tirunelveli, Nilgiri & Madurai.

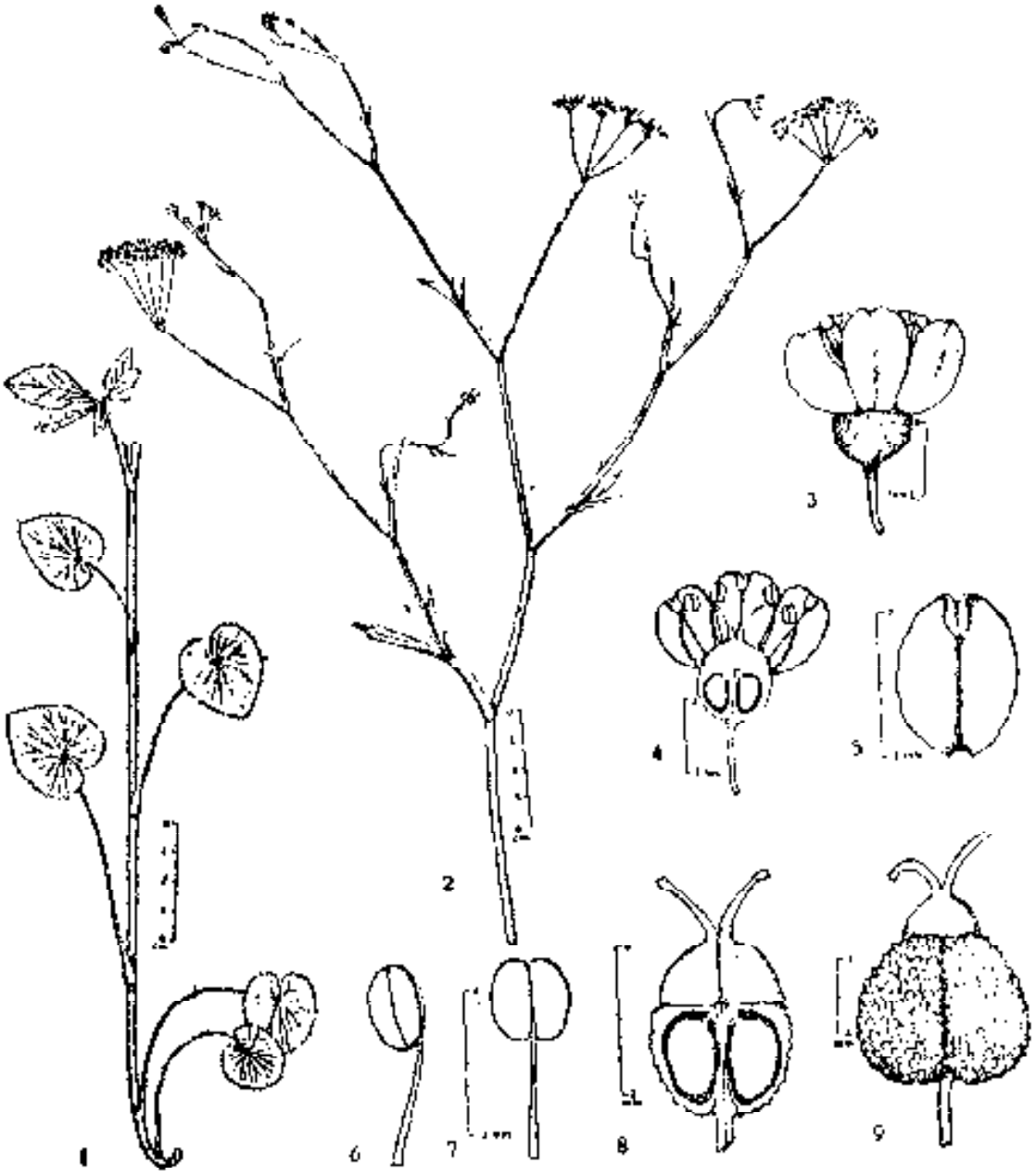
H. hookerianum Wt. & Arn. : An erect herb ; Southern W. Ghats, Nilgiris, 2100 m. Rare.



Bupleurum andhricum Nayar & Ban.

A. Branch. B. Flower. C. Stamen. D. L.S. of the ovary. E. Fruit, F-F_1. T.S. of a mericarp.

Courtesy : Bull. Bot. Surv. India



Pimpinella tirpuatiensis Bal. & Suhr.

Fig. 1. habit-basal portion ; Fig. 2. habit-upper portion ; Fig. 3. flower; Fig. 4. L.s. of flower ; Fig. 5 petal ; showing inflexed apex ; Figs. 6-7. two views of anther ; Fig. 8. L.s. of ovary with stylopadium ; Fig. 9. fruit.

Courtesy Bull. Bot. Surv. India

Heracleum rigens Wall. ex DC. var. **elongatum** Gamble : Slender erect herb ; Southern W. Ghats, Madurai (Palni hills). Rare.

H. **rigens** Wall. ex DC. var. **multiradiatum** Gamble : Large erect herb ; Southern W. Ghats, Madurai (Palni hills) & Nilgiris, at low elevations.

H. sprengelianum Wt. & Arn. : A large leafy herb ; W. Ghats, Belgaum, Coimbatore, Nilgiris, above 1800 m., Madurai & Ramanathapuram.

Hydrocotyle conferta Wt. : Prostrate herb ; Southern W. Ghats, Coimbatore, Nilgiris & Palni hills, Madurai & Tirunelveli.

Peucedanum anamallayense Clarke : Tall herb ; Southern W. Ghats, Anamalais, Coimbatore & Madurai. Rare.

Pimpinella candolleana Wt. & Arn. : Tall pubescent herb ; W. Ghats-not common in north, Mysore(?), Nilgiri & Palni hills, Coimbatore, Tirunelveli ; Dharmapuri of E. Ghats, Salem, above 1800 m.

P. katrajensis Rolla & Hemadri : A herb ; Maharashtra.

P. pulneyensis Gamble : Tall herb ; Southern W. Ghats, Palni hills Madurai), 1800-2100 m. Rare.

P. rollae Billore & Hemadri : A herb ; Maharashtra.

P. tirupatiensis Balakr. & Subr. : A herb ; E. Ghats, Tirupati hills.

Polyzygus tuberosus Dalz. : A herb with tuberous root ; W. Ghats, Konkan, Karnataka (Bangalore, Mysore, N. Kanara, S. Kanara).

Vanasushava pedata (Wt.) Mukh. & Constance : A trailing herb ; Southern W. Ghats, Belgaum(?), Nilgiris (Sivagiri) & Palni hills (Madurai). Rare.

GENTIANACEAE

This cosmopolitan family comprises *ca* 80 genera and 900 species occurring in almost any kind of vegetation ranging from the arctic and alpine conditions, to temperate and tropical climatic conditions. A few are also halophytic and saprophytic in nature.

The family is represented in India by 15 genera and 147 species of which 16 species (with 5 varieties), i.e. *ca* 10% are strictly endemic to Peninsular India. The genus *Exacum* is represented in India by *ca* 13 species of which 7 species and 2 varieties are endemic to Peninsular India. The genus *Swertia* which is represented in India by 34 species, has 5 species and 1 variety which are endemic to W. Ghats of

Peninsular India. *Exacum anamallayanum*, *Exacum courtallense* var. *laxiflorum* and *Swertia beddomei* are rare and threatened plants. Most of the endemic species are confined to the W. Ghats occurring up to elevations as high as 2100 m.

ENDEMIC TAXA :

Canscora concanensis Clarke : Annual herb ; Konkan. Rare & Threatened.

C. **pauciflora** Dalz. : Erect slender herb ; W. Ghats/Coast, Konkan, Kanara to Travancore.

C. **perfoliata** Lamk. : An erect herb ; W. Ghats, Konkan, Kanara hills of Karnataka, Anamalais & Travancore hills, 1100 m.

Exacum anamallayanum Bedd. : A shrubby perennial herb ; Southern W. Ghats, Anamalai & Palni hills, 1800-2100 m. Rare & Threatened.

E. **atropurpureum** Bedd. var. **atropurpureum** : An erect herb : Southern W. Ghats, Tirunelveli & Travancore hills ; Quilon in Kerala, 900-1600 m.

E. **atropureum** Bedd. var. **palghatense** Gamble : Erect herb ; Southern W. Ghats, Palghat hills, 1800 m., Anamalais, 1600 m.

E. **courtallense** Arn. var. **courtallense** : An erect herb ; Southern W. Ghats in Tirunelveli.

E. **courtallense** Arn. var. **laxiflorum** Gamble : An erect herb ; Southern W. Ghats, Travancore hills. Rare.

E. **lawii** Clarke : Erect slender herb ; W. Ghats, Mahableshwar, Belgaum, Konkan, Kanara (Bababudan hills of Karnataka) & Malabar.

E. **perrottetii** Gris. : An erect herb ; W. Ghats. South of Konkan, Nilgiris at 1800 m. Deccan-hills of Karnataka. E. Ghats. N. Circars, Mahendragiri, 1200-1600 m. Shevaroys, Salem, 1400 m.

E. **travancoricum** Bedd. : An erect herb ; Southern W. Ghats, Travancore hills, 1500 m., Agastamalais.

E. **wightianum** Arn. : An erect herb ; Southern W. Ghats, Nilgiri, Palni & Travancore hills, 1600-2100 m.

Halenia perrottetii Gris. : An erect herb : Southern W. Ghats, Nilgiri & Palni hills, above 1800 m.

Swertia beddomei Clarke : An erect herb ; W. Ghats, S. Kanara to Travancore, Nilgiris, 1900 m. Rare & Threatened.

S. **corymbosa** Wt. var. **corymbosa** : An erect herb ; W. Ghats, hills of Karnataka, Coimbatore, Nilgiris & Malabar, 1600 m.

S. **corymbosa** Wt. var. **grisebachiana** Clarke : Erect herb ; W. Ghats ; Anamalais & Palni hills, 1800 m.

S. **corymbosa** Wt. var. **lawii** Clarke : Herb ; W. Ghats, Belgaum, Kanara.

Swertia lawii Burk. : A tall herb ; W. Ghats, hills of Karnataka, 1200 m.

S. minor (Griseb.) Knobl. : Small erect herb ; W. Ghats, Konkan (?) to Nilgiris, 1800 m.

S. trichotoma Wall. : A tall leafy herb : Southern W. Ghats, Nilgiris, 2100 m.

APOCYNACEAE

The family comprises *ca* 180 genera and 1500 species, most of which are distributed in the tropics though some do occur in temperate regions as well.

The present study shows that there are *ca* 97 species representing the family in India. Of these 13 species, are endemic to the Peninsular Indian region. *Rauvolfia beddomei* and *Wrightia dolichocarpa* are rare and threatened plants of this family.

ENDEMIC TAXA :

Beaumontia jerdoniana Wt. : Large climbing shrub ; W. Ghats, Konkan southwards.

Carissa inermis Vahl : Climbing shrub ; Northern E. Ghats & throughout W. Ghats.

C. paucinervia A. DC. : Diffuse bushy shrub ; Deccan, Karnataka, Salem, Coimbatore, Nilgiris, 1200-1800 m.

C. gangetica Stapf ex Gamble : Thorny shrub ; Northern E. Ghats, Ganjam (Gangetic plains ?), 1500 m.

C. **salicina** Lam. : Thorny shrub ; Deccan, Coimbatore.

Ellertonia rheedii Wt. : Climbing shrub; Throughout W. Ghats, 900 m.

Ervatamia heyneana (Wall.) Cooke : Small tree ; W. Ghats, Konkan southwards, 900 m.

Rauvolfia beddomei Hook. f. ; Large glabrous shrub ; Southern W. Ghats of Kerala & Tamil Nadu. Rare & Threatened.

R. micrantha Hook. f. ; Slender shrub ; Southern W. Ghats, Malabar & Travancore.

Strophanthus wightianus Wall. ex Wt. : Climbing shrub ; Southern W. Ghats/Coast, Travancore (Quilon).

Tabernaemontana gamblei Subramanyam & Henry : Shrub ; Southern W. Ghats, Anamalai & Tirunelveli, 800-1200 m.

Wrightia dolichocarpa Bahadur & Bennet : Shrub ; Goa. Rare & Threatened.

W. indica Ngau : Shrub/Tree ; Southern Peninsular India, up to 900 m.

ASCLEPIADACEAE

The family comprises 130 genera and 2000 species which are spread chiefly in the tropical and subtropical regions of the world.

In India, it is represented by *ca* 39 genera and 209 species which are concentrated mainly in the Peninsular Indian region and the Himalayan foothills. There are 62 species endemic to Peninsular India, which brings the percentage of endemicity (in relation to Indian species of the family) to about 30%.

The African genus *Caralluma*, which has its greatest development in Africa and Madagascar, is represented in India by about 15 species of which 7 are endemic to Peninsular India. The genus *Ceropegia* is represented in India by 44 species and has a fairly good degree of concentration in Peninsular India, where as many as 27 species are endemic. *Frerea* and *Seshagirica* are two monotypic endemic genera. *Frerea indica*, endemic to the W. Ghats has now very few surviving pockets in Maharashtra W. Ghats and unless protective measures are taken, this beautiful asclepiad may soon become extinct.

ENDEMIC TAXA :

Brachystelma bourneae Gamble ; Tall slender herb ; Southern W. Ghats, Palni hills, at lower altitudes. Rare & Threatened.

B. brevitubulatum (Bedd.) Gamble ; Slender twining herb ; Deccan, on rocky hills, 330 m.

B ciliatum Arekal & Ramakrishna : Geophytic herbs with ovoid-discoid leaves ; Deccan, Karnataka, Kolar dist., 920 m.

B. elenaduensis M.B.S. Char. : Perennial with rhizome ; Deccan, Karnataka, Tumkur dist., 800 m.

B. glabrum Hook. f. ; Short slender herb ; E. Ghats, Cuddapah hills.

B. kolarensis Arekal & Ramakrishna : A herb ; Deccan Karnataka, Kolar dist.

Brachystelma maculatum Hook. f. : Tall slender herb ; W. Ghats, Karnataka, Mysore dist.

B. rangacharii Gamble : Tall slender herb ; Deccan, Tamil Nadu.

B. volubile Hook. f. : Slender twining herb ; W. Ghats, Karnataka, Hassan dist.; E. Ghats, Cuddapah hills, 660 m.

Caralluma diffusa (Wt.) N.E. Br. : Procumbent fleshy herb ; Deccan, dry districts of Tamil Nadu. Rare & Threatened.

C. indica N.E. Br. ; Small fleshy herb ; E. Ghats, Circars, Nellore & S. Arcot.

C. lasiantha N.E. Br.: Fleshy herb ; E. Ghats, Chittoor of A.P. Gooty ?

C. nilagiriana Kumari & Subbarao : Fleshy glabrous perennial herb ; Southern W. Ghats, Nilgiris, 900 m.

C. pauciflora N.E. Br. : Diffuse fleshy herb ; Southern W. Ghats, Tirunelveli & Travancore hills.

C. procumbens Gr. & Mayur. : Trailing herbs ; Southern W. Ghats, Travancore.

C. stalagmifera C.E.C.Fisch. : Erect fleshy herb ; E. Ghats, Visakapatnam, Chingleput dist. (Poddukotai state). Also in Karnataka, Hassan dist (?).

Ceropegia attenuata Hook. ; Tall tuberous herb ; W. Ghats of Maharashtra, Matwan ; Goa ; Karnataka, N. Kanara.

C. barnesii Bruce & Chatterjee : Twinning herb ; Southern W. Ghats, Karnataka, S. Kanara & Tamil Nadu, Nilgiris. Rare & Threatened.

C. beddomei Hook. f. : Slender hairy twiner ; Southern W. Ghats, Travancore hills, 750 m. Rare & Threatened.

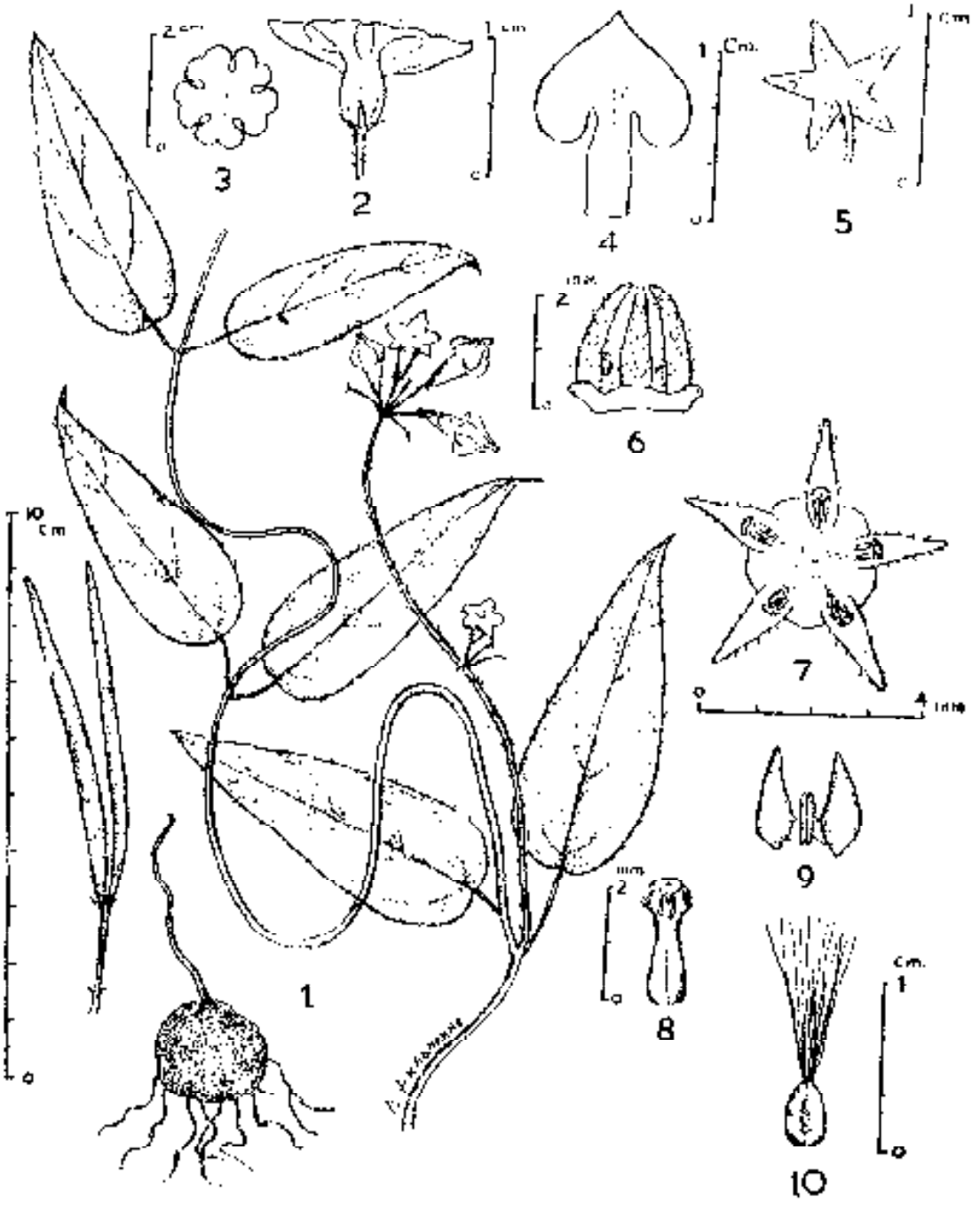
C. metziana Miq. : Slender climber ; W. Ghats, Nilgiris & Anamalais, 750-900 m. Rare & Threatened.

C. ciliata Wt. : Slender hispid twiner ; Southern W. Ghats, Travancore, Nilgiris, Palni, Anamalai, Tirunelveli hills, 1000-2200 m.

C. ensifolia Bedd. : Twiner with subglobose tubers ; Southern W. Ghats, Travancore, Anamalais.

C. evansii McCann ; Herb with tuberous root ; W. Ghats, Maharashtra, Pune dist., Khandala. Rare & Endangered.

C. fantastica Sedgw. ; Twinner with tuberous root ; W. Ghats, Goa, Karnataka (N. Kanara, Sulgeri). Rare & Endangered.



Ceropegia huberi Ansari

1. Whole plant (with tuber & follicle). 2. A flower (oblique view). 3. Floral head (top view). 4. A corolla lobe and a part of the tube below. 5. Dorsal view of the calyx with pedicel. 6. Lateral view of the entire corona. 7. Inner view of the dissected corona. 8. Gynostegium 9. Pollinia with corpusculum. 10. A seed with coma.

Courtesy : Bull. Bot. Surv. India

Ceropegia fimbrifera Bedd. : Erect herbs ; W. Ghats, Karnataka, Tamil Nadu (Anamalais).

C. huberi Ansari : Perennial twining herb ; W. Ghats of Maharashtra, Ratnagiri dist.

C. intermedia Wt. : Glabrous twiners ; Southern W. Ghats of Kerala & Tamil Nadu.

C. jainii Ansari & Kulk. : Erect dwarf, tuberous herb ; Maharashtra, Ratnagiri dist.

C. lawii Hook. f. : Tall erect tuberous herb ; Northern W. Ghats, Konkan.

C. maccannii Ansari : Erect tuberous herb ; Maharashtra, Poona dist.

C. mahabalei Hemadri & Ansari : Erect perennial herb with large flowers ; W. Ghats, Sahyadri Range, Maharashtra.

C. media (Huber) Ansari : Slender tuberous herbs ; W. Ghats, Maharashtra, Pune dist.

C. noorjahaniae Ansari : Erect perennial herb ; Maharashtra, W. Ghats, Panchgani, Satara dist.

C. oculata Hook. : Tuberous twiner ; Northern W. Ghats of Maharashtra.

C. odorata Nimmo ex Hook. f. : Slender twiner ; W. Ghats, Konkan, Gujarat.

C. omissa Huber : Glabrous twiner ; Southern W. Ghats, Tamil Nadu, Tirunelveli.

C. panchganiensis Blatter & McCann : Tall tuberous herb ; Maharashtra, Panchgani, Satara dist, Rare.

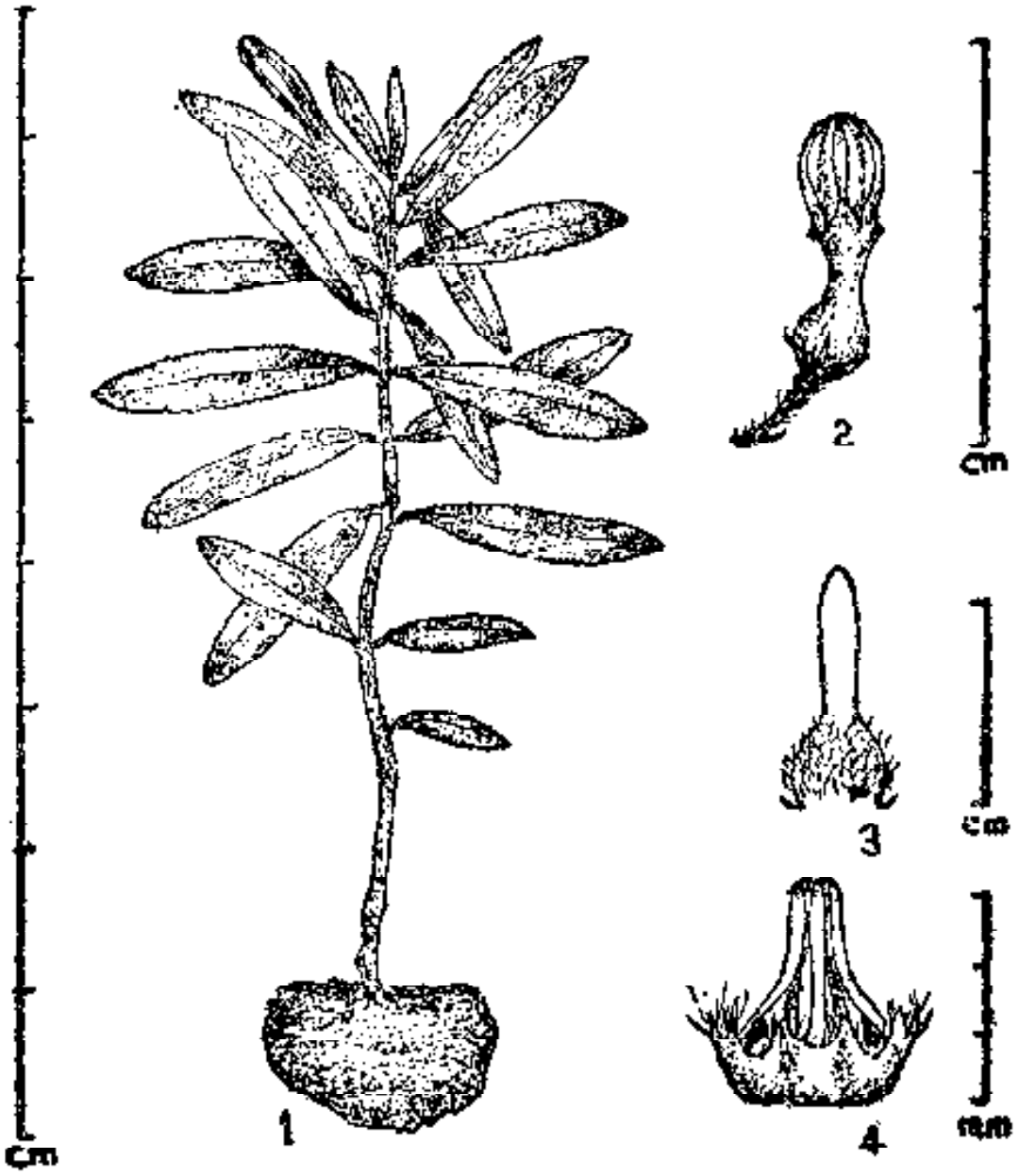
C. pusilla Wt. & Arn. : Minute herb ; W. Ghats, Mysore, Travancore, Nilgiris & Anamalais, 2100 m.

C. rollae Hemadri : Erect herb ; Maharashtra, Poona dist., 1300 m.

C. sahyadrica Ansari & Kulk. : Erect perennial herb ; W. Ghats, Sahyadri range, Ratnagiri dist.

C. santapaui Wadhwa & Ansari : Twining herb ; N.W. Ghats of Maharashtra, Satara dist., Mahableshwar, 1160 m.

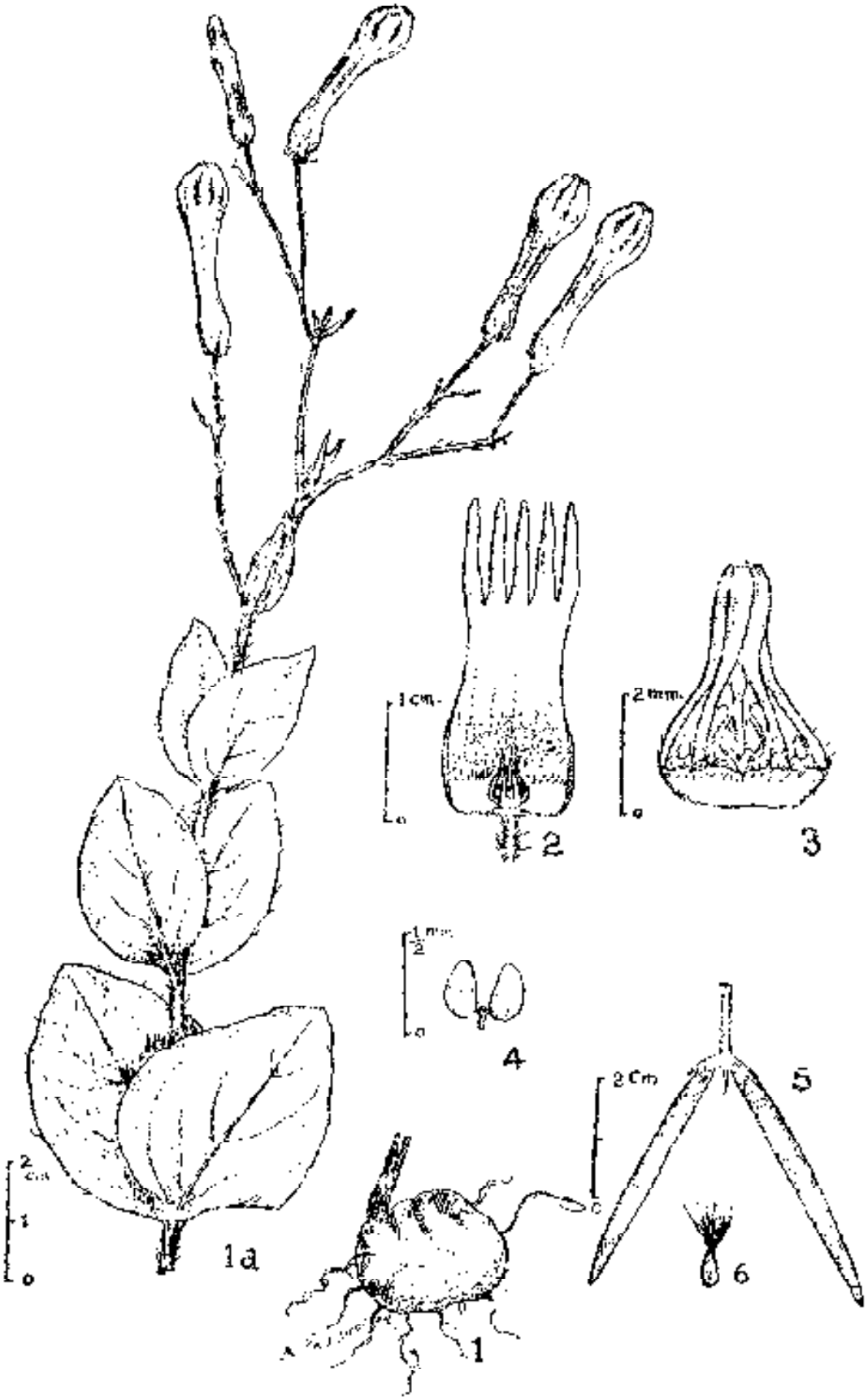
C. spiralis Wt. : Erect or slightly twining herb ; E. Ghats, Andhra Pradesh, Cuddapah & Southwards, 900 m. Karnataka (Hassan), Southern W. Ghats, Kerala & Tamil Nadu.



Ceropegia jainii Ans. & Kulk.

1. A whole plant. 2. A flower. 3. Ventral view of a fully opened corolla lobe showing hairs at the base. 4. A corona.

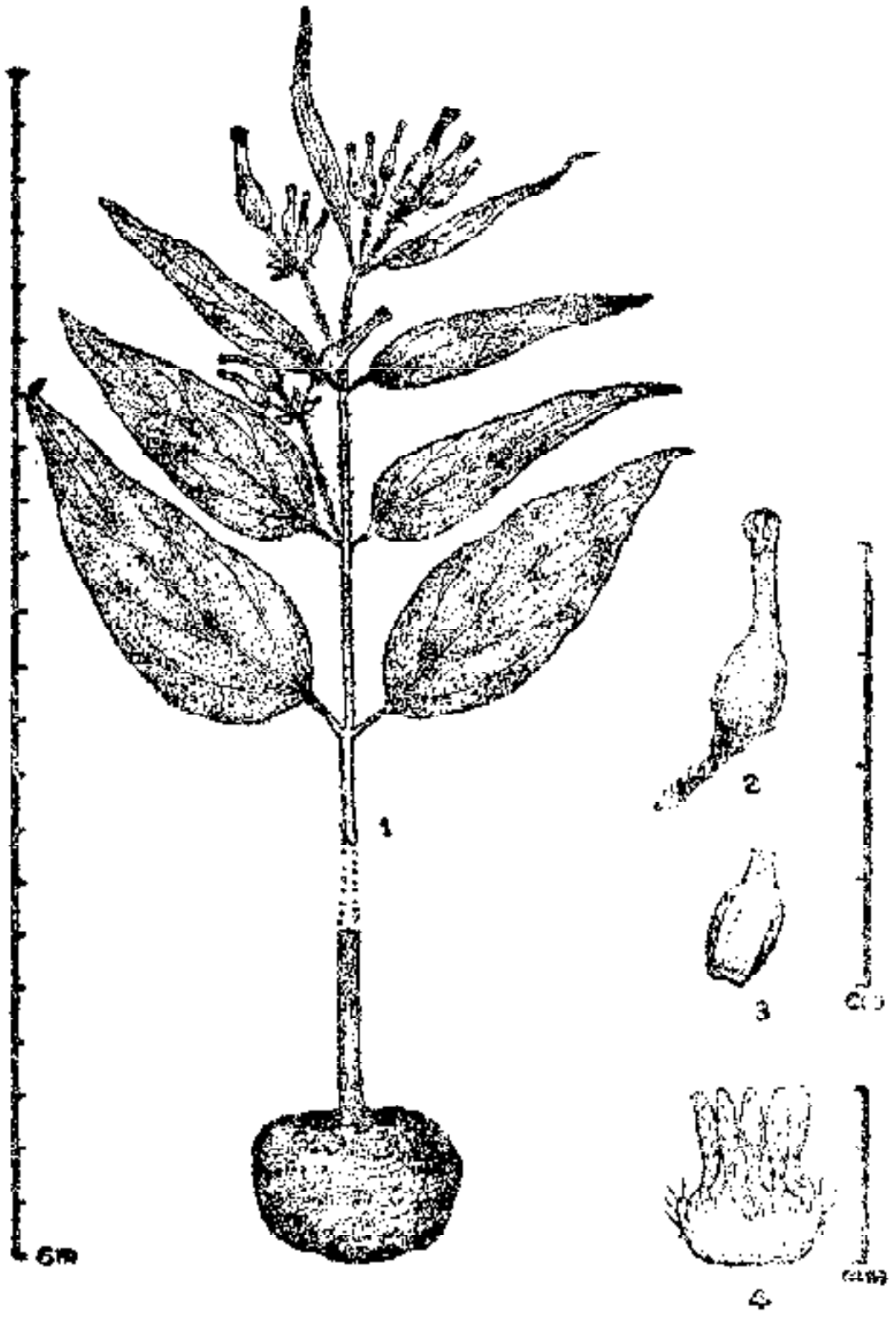
Courtesy : Bull. Bot. Surv. India



Ceropegia rollae Hemadri

1. Tuber. 1a. Flowering stem. 2. Flower dissected. 3. Gynostegium with outer and inner corona. 4. Pollenia. 5. Follicles 6. Seed.

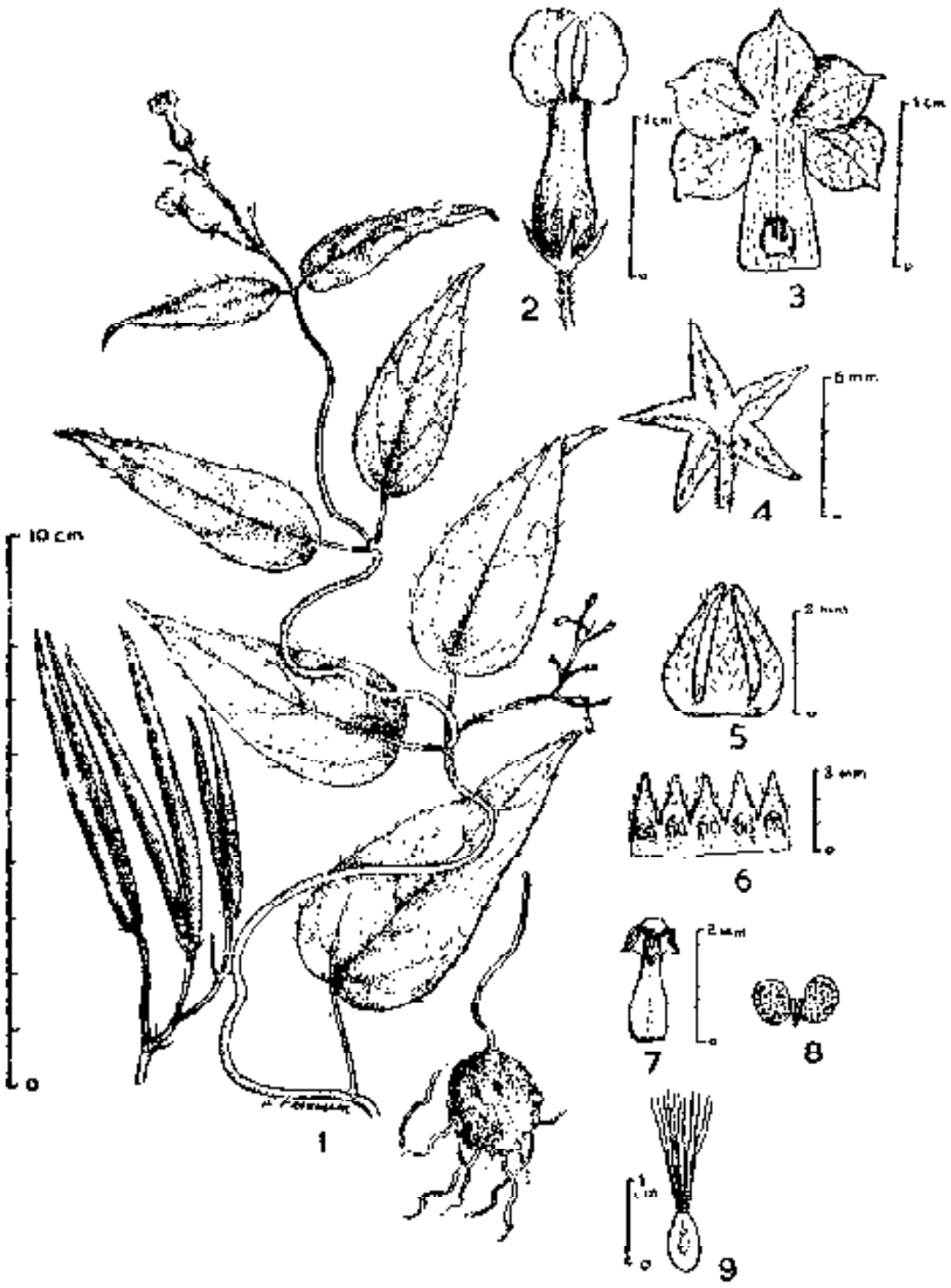
Courtesy : Bull. Bot. Surv. India



Ceropegia maccannii Ansari

1. A whole plant with a tuber. 2. A flower. 3. A dissected part of the inflated base showing a ring of hairs inside at base. 4. A corona.

Courtesy : Bull. Bot. Surv. India



Ceropegia santapaui Wadhwa & Ansari

1. Whole plant. 2. A flower. 3. Dissected flower showing corolla lobes and part of tube with corona at base. 4. Dorsal view of calyx and pedicel. 5. Outer lateral view of corona. 6. Inner view of dissected corona. 7. Gynostegium. 8. Pollinia. 9. A seed with coma.

Courtesy : Bull. Bot. Surv. India

Ceropegia vincaefolia Hook. : Tuberous twiner ; W. Ghats, Mahableshwar, Khandala.

Cynanchum alatum Wt. & Arn : Erect or twining herb/shrub ; W. Ghats, Chikmagalur, N. Kanara.

Frerea indica Dalz : Trailing/succulent herb ; Northern W. Ghats of Central Maharashtra. Rare & Threatened.

Gymnema montanum Hook. f. : Creeper ; Southern W. Ghats, Nilgiris & Anamalais, 1400 2500 m.

Hoya kanyakumariana Henry & Swamin. : Pendulous epiphytic herb ; Tamil Nadu, Kanyakumari, 600 m.

H. retusa Dalz. : Pendulous slender epiphyte ; W. Ghats, Konkan & Hassan (?), N. Kanara, Shimoga & S. Kanara (?).

Marsdenia brunoniana Wt. & Arn. : Twining shrub ; E. Coast, Coromandel, Tamil Nadu.

M. raziana Yog. & Subr. : Climbing shrub ; W. Ghats (Yelnir forest) Karnataka, Chikmagalur dist., 1200 m.

M. tirunelvelica Henry : Shrub ; Southern W. Ghats of Tirunelveli.

Oianthus beddomei Hook. f. : Twining undershrub ; Southern W. Ghats, Kerala hills, Wynaad, bordering Karnataka. Rare & Threatened.

O. deccanensis Talb. : Twining undershrub ; Northern W. Ghats of Mharashtra.

O. disciflorus Hook. f. : Twining undershrub ; Central W. Ghats, N. Karnataka, N. Kanara, also in Andhra Pradesh (Nallamalais).

O. urceolatus (Dalz.) Benth. : Twining undershrub ; Southern Maharashtra & Belgaum dist. (?) of Karnataka.

Sarcostemma intermedium Decne : Jointed shrub ; Deccan, Poona, Konkan, Karnataka, Chikmagalur, Dharwar (?), Hassan (?), Tamil Nadu, Coimbatore to Tirunelveli.

Seshagirica sahyadrica Ansari & Hemadri : Climbing undershrub ; W. Ghats in Maharashtra.

Toxocarpus beddomei Gamble : Slender climber ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

T. palghatensis Gamble : Slender climber ; Southern W. Ghats, Malabar, 1100 m. Rare & Threatened.

T. roxburghii Wt. & Arn. : Slenderclimber ; Northern E. Ghats, Circars.

Tylophora capparidifolia Wt. & Arn. : Twining undershrub ; Southern W. Ghats, Karnataka, Nilgiris to Tirunelveli.

T. subramanii Henry : Climbing undershrub ; Southern W. Ghats Tirunelveli, 1000 m.

PERIPLOCAEAE

The family comprises *ca* 45 50 genera and 200 species distributed in the tropical and warm temperate regions of the Old World. The family is concentrated in tropical Africa.

The family is represented in India by 9 genera and 16 species, of which 5 are endemic to Peninsular India. Four of these endemic species are complements of the monotypic genera, *Baeolepis*, *Decalepis*, *Janakia* and *Utleria*. The high degree of monotypic genera in this family occurring in more or less similar ecological conditions is interesting and points to active speciation. The aromatic roots of *Decalepis hamiltonii* finds popular use as a spice and condiment.

ENDEMIC TAXA :

Baeolepis nervosa (Wt. & Arn.) Decne ex Moq. : Wiry climber ; Southern W. Ghats, Nilgiris, 1500 2300 m.

Decalepis hamiltonii Wt. & Arn. : Climbing shrub ; "Peninsular India".

Janakia arayalpathra Joseph & Chandrasekaran : Leafy perennial undershrub ; Southern W. Ghats, Trivandrum, western side of Agasthiyar hills.

Streptocaulon kleinii Wt. & Arn. : Climber ; Southern Peninsular India. Rare & Threatened.

Utleria salicifolia Bedd. ex Hook. f. : Shrub ; Southern W. Ghats, Anamalai hills, 900 1600 m. Rare & Threatened.

STRYCHNACEAE

The family comprises of *ca* 4 genera and 250 species which occur in the tropical and subtropical regions. (The members are often treated under the tribe *Strychneae* of the family Loganiaceae)

The family is represented in India by 2 genera and 24 species of which 3 species and 1 variety are endemic to Peninsular India. All these endemic species belong to the tropical genus *Strychnos* which is represented in India by *ca* 22 species.

ENDEMIC TAXA :

Strychnos aenea A. W. Hill : Large climbing shrub ; W. Ghats, Hills of Anamalai & Travancore, 670 1470 m.

S. **bicirrhosa** Lesch. : Climbing shrub ; Tamil Nadu, Tanjore.

S. **dalzelli** Clarke var. **dalzelli** : Climbing shrub ; W. Ghats, Konkan, N. Kanara, Chikmagalur, Coorg, & Hassan dist.

S. dalzelli Clarke var. **lanceolaris** A.W. Hill : Climbing shrub ; Southern W. Ghats, Coorg & Wynaad.

SOLANACEAE

The Potato family comprises *ca* 90 genera and more than 2000 species distributed in both tropical and temperate regions of the world. Its chief centres of development are Central and South America and also Australia. Since the greatest concentration of Solanaceae members is seen in South America many workers consider it as the centre of origin of this family.

The family is represented in India by *ca* 15 genera and 95 species of which only 3 species are known to be endemic to the Peninsular Indian region. All the 3 endemic species belong to the widespread genus *Solanum* which is represented in the world by *ca* 1500 species and in India by *ca* 40 species.

ENDEMIC Taxa :

Solanum purpureilineatum Sabnis & Bhatt. : Erect/decumbent herb ; Gujarat, Baroda dist., Sabarkantha dist.

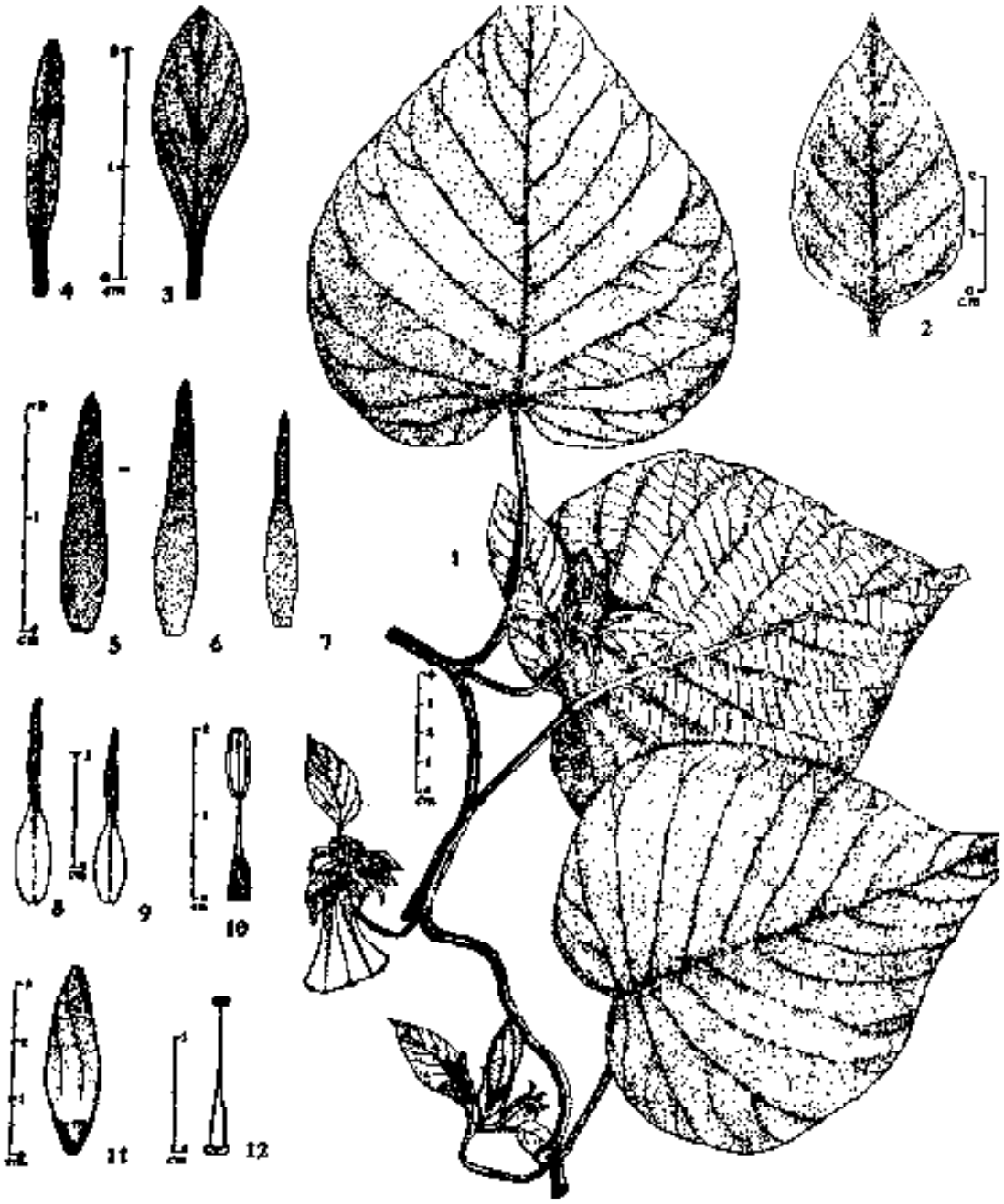
S. **vagum** Heyne ex Nees : A glabrescent shrub ; Southern W. Ghats, Tirunelveli, 1200-1800 m.

S. **wightii** Nees : Erect herbaceous plant ; Southern W. Ghats, Nilgiris & Coimbatore hills, 1200-1800 m.

CONVOLVULACEAE

This cosmopolitan family constitutes of about 10 genera and 1800 species distributed all over the tropical and temperate regions of the world in a variety of habitats.

In India the Convolvulaceae are represented by 20 genera and about 161 species, of which 14 species and 1 variety are endemic to Peninsular India. The genus *Argyreia* which is represented in India by *ca* 40 species has 8 species (and a variety) endemic to Peninsular India, thus showing some degree of endemism. *Convolvulus flavus* is rare in the southern W. Ghats.



Argyreia arakuensis Balakr.

1. portion of plant (from Holotype); Fig. 2. outermost foliaceous bract; Fig.3-4. inner bracts; Figs. 5-7. outer sepals; Figs.8-9. inner sepals; Fig. 10. stamen; Fig.11. flowerbud with sepals removed; Fig.12. gynoecium with disc, style and stigma.

Courtesy : Bull. Bot. Surv. India

ENDEMIC TAXA :

Argyreia arakuensis Balakr. : Climbing shrub ; E. Ghats, Araku valley, Visakhapatnam dist.

A. boseana Sant. & Patel : Shrub ; W. Ghats, Bombay.

A. coonoorensis Smith & Ramas. : Large climber ; W. Ghats, Coonoor, Nilgiris, 1800 m.

Argyreia cuneata Ker.-Gawl : Silky shrub ; W. Ghats, hills near Poona, Deccan hills, 100-1500 m.

A. fulgens Choisy : Silky silvery shrub ; W. Ghats, Anamalais, Travancore hills & Tirunelveli, 900 m.

A. lawii Clarke : Slender twiner ; W. Ghats, Konkan, Malabar & Bababudan hills of Karnataka.

A. osyrensis (Roth) Choisy var. **aggregata** (Roxb.) K.K.N. Nair : Climbing shrub ; W. Ghats, up to Travancore, Deccan & Northern Tamilnadu.

A. pilosa Wt. & Arn. : Large hirsute twiner ; W. Ghats, Konkan, Kanara, Bababudan hills of Karnataka; hills of Bellary dist., Orissa, 1000 m.

A. sericea Dalz. : Large silky twiner ; W. Ghats, Konkan & Malabar, Nilgiris to Tirunelveli hills.

Convolvulus flavus Willd. : Climber ; W. Ghats, Palni hills, Nilgiris, Coimbatore hills, 900-1800 m. Rare & Threatened.

Ipomoea salsettensis Sant. & Patel : Herb/shrub ; Maharashtra, Salsette island and Mumbra.

Lepistemon lefocalyx Stapf : A villous climber : W. Ghats, Travancore, Wynaad.

Neuropeltis malabarica Oost. : Scandent shrub ; W. Ghats, hills of Karnataka & Malabar (N. Kanara).

Operculina tansaensis Sant. & Patel : Large herbaceous climber ; Northern W. Ghats, Konkan, Tansa Lake environs.

Porana malabarica Clarke : Extensively ramified climber ; W. Ghats, Konkan, Kanara, Malabar-Nilgiris, Palni, Anamalais & Travancore hills, 1800 m.

BORAGINACEAE

The family is a large one, comprising *ca* 100 genera and 2000 species, occurring widely in the tropical and temperate regions, with a greater concentration in the Mediterranean.

The present study shows that there are 36 genera and 138 species in India, of which 13 species are endemic to the Peninsular India. Of the 16 Indian representatives of the genus *Cordia*, 4 species are endemic to Peninsular India. *Cordia octandra* is a rare plant and *C. domestica* is restricted to the Eastern Ghats.

ENDEMIC TAXA :

Adelocaryum coelestinum (Lindl.) Brand. : Herb/Shrub ; Maharashtra (Mahabaleshwar), Karnataka (Castle rock).

Cordia diffusa Jacob : Shrubby spreading plant ; Deccan, Coimbatore dist., 900 m.

C. domestica Roth : Shrub and small tree ; Chingelput of E. Ghats.

C. evolutior Gamble : Small tree ; Deccan in Karnataka, dry northern districts of Tamil Nadu S. Arcot.

C. octandra DC. : Small tree : W. Ghats, Travancore, 300 m. Rare & Threatened.

Ehretia wightiana Wall. : Shrub ; W. Ghats, Tirunelveli. Rare & Threatened.

Heliotropium cornutum Johnst. : A herb ; N. W. Ghats of Maharashtra and N. Kanara.

H. keralense Sivarajan & Manilal : Herb/undershrub ; Kerala.

H. rottleri Lehm. : Stiff undershrub ; Deccan, about Coimbatore, 340 m.

Paracaryum malabaricum Clarke : Stout erect tomentose herb ; W. Ghats, Kanara. Rare & Threatened.

Tournefortia beyneana Wall. : Subscandent shrub ; W. Ghats, Nilgiris & Anamalais, 900 m.

T. reticosa Wt. : Subscandent shrub ; W. Ghats, Coorg, Wynaad & Travancore at 900-1250 m.

T. wightii Clarke : Subscandent shrub ; Southern W. Ghats, Anamalais, 1250 m.

VERBENACEAE

The family comprises of *ca* 75 genera and 3000 species, which are predominantly tropical and subtropical in distribution. A few members are native to the temperate regions.

In India the family is represented by *ca* 17 genera and 198 species, of which 6 species are endemic to Peninsular India. The genus *Premna*, which is distributed in the tropics and subtropics of Asia and Africa, is represented by 25 species of which 4 species are endemic to Peninsular India. *Premna paucinervia* is a rare and threatened plant.

ENDEMIC TAXA :

Lippia unica Ram. : Perennial undershrub ; Tamil Nadu, Coimbatore dist.

Premna glaberrima Wt. : A shrub ; Southern W. Ghats, Tirunelveli.

P. pancinervia Gamble : A gigantic epiphytic climber ; Southern W. Ghats, Anamalai, 900 m. Rare & Threatened.

P. villosa Clarke : A large climber ; Southern W. Ghats, Wynaad : Deccan, Bellary, 600-900 m.

P. wightiana Schauer : Small tree/large shrub ; Southern W. Ghats, Tirunelveli, Travancore, Palni hills, low elevation.

LABIATAE

(*nom. altern.* Lamiaceae)

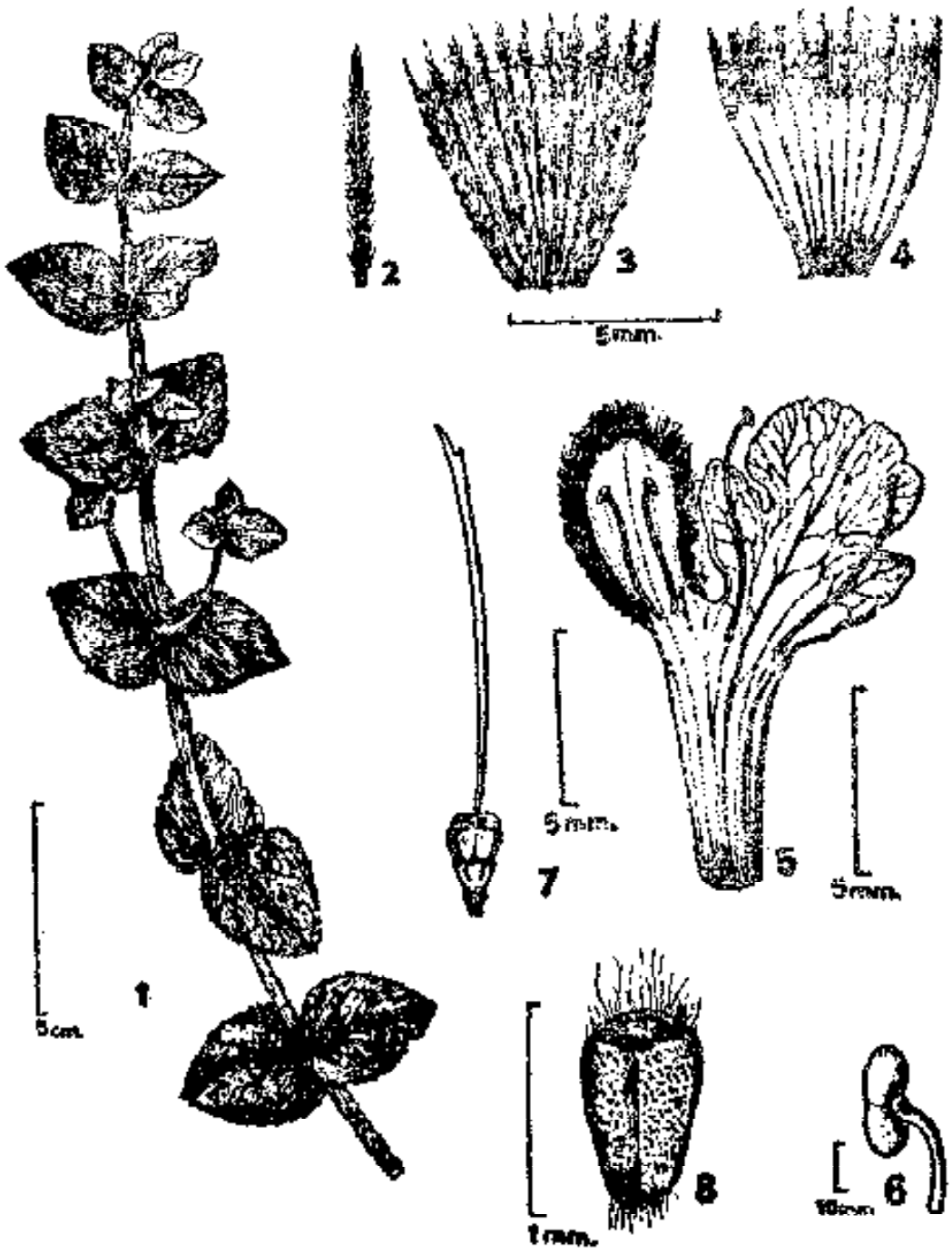
This is a large family comprising *ca* 180 genera and 3500 species, which are cosmoplitan in distribution, with their greatest development in the mediterranean. The members grow under various habitat conditions at different altitudes and show a high degree of adaptability with their occurrence ranging from the Arctic to the Himalayas. The chief centres of development of the family are : Southeast Asia (e.g. *Prasioideae* : *Stenogyne*, *Gomphostemma*) to Hawaii and Australasia (*Prostantheroideae* : *Prostanthera*) throughout Africa and in the New World from North to South (e.g. *Cutapherioideae* : *Catopheria*). A few large groups (eg. *Ajugoideae* : *Ajuga*, *Teucrium* and *Scutellarioideae* : *Scutellaria* ; *Lamioideae* : *Stachys*, *Salvia*) are cosmopolitan.

The family Lamiaceae is represented in India by *ca* 64 genera and 340 species of which (60 species and 5 varieties), i.e. approx. 18 percent are strictly enedmic to Peninsular India. These endemic taxa are spread over 14 genera of which *Anisochilus*, *Eusteralis*, *Leucas*, *Plectranthus* and *Pogostemon* have a large representation of endemic taxa. As many as 13 of these endemic plants are rare in their habitats.

ENDEMIC TAXA :

Acrocephalus palniensis Mukh. : A herb ; Southern W. Ghats, Palni hills. Rare & Threatened.

Anisochilus argenteus Gamble : Stout undershrub ; Southern W. Ghats, Palni hills.



Leucas mukerjiana Subbarao & Kumari

1. Part of the plant. 2. Bract. 3. Calyx tube split open—outer view. 4. Calyx tube split open—inner view. 5. Corolla split open. 6. Stamen. 7. Gynoecium. 8. Nutet.

Courtesy : Bull. Bot. Surv. India

Anisochilus dysophylloides Benth. var. **dysophylloides** : Thick undershrub ; Southern W. Ghats, Anamalais, Nilgiris, 1800 m.

A. dysophylloides Benth. var. **purpureus** Gamble : Undershrub ; Sourthern W. Ghats, Nilgiris.

Anisochilos plantagineus Hook. f. : Dwarf undershrub ; W. Ghats, Bababudan hills of Karnataka.

A. robustus Hook. f. : Tall stout shrub ; Southern W. Ghats. Tirunelveli, Courtallum, 1800 m.

A. scaber Benth. : Herb with woody stems ; Southern W. Ghats, Courtallum, Tirunelveli & Travancore.

A. sericeus Benth : Stout undershrub ; Southern W. Ghats, Courtallum, Palni & Tirunelveli. Rare & Threatened.

A. suffruticosus Wt. : Woody undershrub ; Southern W. Ghats, Konkan (?), Deccan, Hyderabad and Golconda dist., hills of Karnataka, 600 900 m.

A. verticillatus Hook. f. : Erect herb ; W. Ghats, Konkan (?), hills of Karnataka, 600 900 m ; Deccan, Hyderabad & Golconda dist.

A. wightii Hook. f. : Erect herb ; W. Ghats, Anamalais. Rare & Threatened.

Anisomeles heyneana Benth. : Tall erect herb ; W. Ghats, Konkan (Mahabaleshwar), Nilgiris, Deccan.

Coleus caninus (Roth) Vatke : Perennial fleshy herb ; W. Ghats, Konkan & Coimbatore dist. ; Salem of E. Ghats.

C. vettiveroides Jacob : Succulent herb ; Southern Peninsular India in most districts — Madurai, Tanjore, Coimbatore & Chingelpet dist.

Dysophylla rugosa Hook. f. : An erect herb ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

Eusteralis deccanensis Panigrahi ; Herb ; Deccan, South of Belgaum, W. Coast, S. Kanara to Travancore.

E. erecta (Dalz.) Panigrahi : Tall herb ; W. Ghats, Konkan, Malabar ; E. Ghats, Ganjam dist.

E. griffithii (Hook. f.) Panigrahi : Aquatic herb ; E. Ghats, Ganjam dist.

E. stocksii (Hook. f.) Panigrahi : Herb ; W. Ghats, Konkan.

E. tomentosa (Dalz.) Panigrahi : Herb ; W. Ghats, Konkan, Malabar.

Geniosporum prostratum Benth. var. **longiracemosum** Ramam. & Seb. : Branched herb ; Southern W. Ghats, Tirunelveli dist.

Gomphostemma eriocarpon Benth. ; Slender erect herb ; Southern W. Ghats, Anamalais, Travancore & Tirunelveli hills, 600 m.

G. heyneanum Wall. : Tall shrubby herb ; W. Ghats, Kanara to Wynaad, 900 m, Anamalais, Travancore & Tirunelveli hills, 900 m.

Lavandula gibsonii Grah. ; Tall undershrub ; W. Ghats, Poona, Mahabaleshwar, Konkan, Nilgiris.

Leucas angustissima Sedgw. : Erect herb ; W. Ghats, Kanara, Gersoppa, Sidhapur.

L. diffusa Benth. : Small diffuse herb ; E. Ghats/Coast Godavari, Shevaroys.

L. helianthemifolia Desf. : Small shrub ; Southern W. Ghats, Anamalais, Palni hills, Nilgiris, 1550-2200 m.

L. hirta Spreng. var. **hirta** : A sub-shrubby herb ; E. Ghats, Horsleykonda, 1400 m ; Deccan hilly distr. ; W. Ghats, Kanara to Tirunelveli.

L. hirta Spreng. var. **beddomei** Hook. f. : A herb ; W. Ghats, Kanara.

L. lamifolia Desf. : Large straggling herb ; Southern W. Ghats, Nilgiris, 1800 m.

L. lanaefolia Desf. : A shrub ; Southern W. Ghats, Nilgiris & Palni hills, 1800 2550 m.

L. mukerjiana Subbarao & Kumari : Villous herb ; E. Ghats, N. Circars, Visakhapatnam dist.

L. nepetaefolia Benth. : Shrubby plant : Deccan, Hyderabad dist., Guntur dist.

L. prostrata Gamble : A low herb ; Southern W. Ghats, Nilgiris, Anamalais & Shevaroys of E. Ghats, 1550 2400 m.

L. pubescens Benth. : Erect herb ; Southern W. Ghats, Nigiris, 1550 m. Deccan (?). Rare & Threatened.

L. rosmarinifolia Benth. ; Small shrub ; Southern W. Ghats, Nilgiris, above 1800 m.

L. ternifolia Desf. : An undershrub ; W. Ghats, Anamalais, Palni & Travancore hills, above 1800 m.

L. vestita Benth. var. **vestita** : Tall soft herb. ; W. Ghats, Kanara, Wynaad, Palni, Tirunelveli & Travancore hills, at low altitudes.

L. vestita Benth. var. **devicolamensis** Shetty & Vivek. : Bushy undershrub ; Kerala, Devicolam, Kottayam dist.

L. wightiana Benth : Small erect herb ; Northern Tamil Nadu & Cape Comorin, Travancore. Rare & Threatened.

Orthosiphon comosus Wt. : A handsome shrub ; Southern W. Ghats, Tirunelveli & Coimbatore hills, 600 900 m.

O. diffosus Benth.: A diffuse undershrub ; E. Ghats, Cuddapah & Arcot dists. ; Southern W. Ghats, Nilgiris & Palni hills.

O. viscosus Benth. : An erect herb ; E. Ghats, Arcot dist., W. Ghats, throughout at low altitude.

Plectranthus bishopianus Gamble ; Large erect undershrub ; W. Ghats, Palni hills, 2200 m. Rare & Threatened.

Plectranthus bourneae Gamble : Succulent undershrub ; Southern W. Ghats, Palni hills, Nilgiris, 2000-2400m. Rare & Threatened.

P. fruticosus Hook. f. : Succulent undershrub ; Southern W. Ghats, Nilgiris & Palni hills, 2200 m.

P. nilghericus Benth. : Tall herb with rootstock ; Southern W. Ghats, Anamalais, north of Wynaad, 1450-2200 m.

P. parvifolius Talb. : Villous herb ; W. Ghats, Kanara, Bababudan hills, 1800 m.

P. rivularis Wt. : A tall herb ; Southern W. Ghats, Nilgiris & Anamalais, Atraimalais, 900-1250 m.

P. stocksii Hook. f. : Slender deccumbent herb ; W. Ghats, Konkan hills of Karnataka.

P. urticifolius Hook. f. : A succulent herb ; Southern W. Ghats, Courtallum, Tirunelveli, 1350 m.

P. wightii Benth : A tall herb ; Southern W. Ghats, Nilgiris, Anamalais, Palni hills, up to 2450 m, E. Ghats, Salem Shevaroy.

Pogostemon atropurpureus Benth. : An erect shrub ; Southern W. Ghats, Nilgiris, 1800 m. Rare & Threatened.

P. gardneri Hook. f. : Soft branching herb ; Southern W. Ghats, hills of Wynaad, Travancore, Nilgiris, 1550 m. Rare & Threatened.

P. mollis Benth. : Low woody undershrub ; Southern W. Ghats, Nilgiris, Palni hills & Tirunelveli hills, 1800 m, E. Ghats, Salem Shevaroys.

P. nilagiricus Gamble : A soft herb ; Southern W. Ghats, Nilgiris.

P. paludosus Benth. : Slender erect herb ; Southern W. Ghats, Nilgiris, 1800-2250 m. Rare & Threatened.

P. purpurescens Dalz. : An erect herb ; W. Coast & Ghats, Konkan, Kanara.

P. rotundatus Benth. : A herb ; Deccan.

P. speciosus Benth. : A shrub ; Southern W. Ghats, Nilgiris & Anamalais, 1800-2400 m.

P. travancoricus Bedd. var. **travancoricus** : A sub-shrubby plant ; Southern W. Ghats, Hills of Travancore, 1100 m. Rare & Threatened.

P. travancoricus Bedd. var. **devicolomensis** Shetty & Vivek. : Tall, purplish undershrub ; W. Ghats of Kerala, Devicolam.

P. vestitus Benth : A woolly undershrub ; W. Ghats, Palghat ; Deccan.

Pogostemon wightii Benth. : An erect herb ; Southern W. Ghats, Nilgiris, Palni & Anamalai hills, 2200 m.

Scutellaria colebrookiana Benth. : Straggling herb ; Southern W. Ghats, Palni hills & Tirunelveli hills, at low altitudes.

Teucrium plectranthoides Gamble : Slender erect herb ; Southern W. Ghats, Tirunelveli. Rare & Threatened.

T. wightii Hook. f. : A thick stout herb ; Southern W. Ghats, Nilgiris, 2400-2700 m.

OLEACEAE

The Olive family comprises *ca* 29 genera and 600 species which are cosmopolitan in distribution but mainly centred in temperate and tropical Southeast Asia and Australasia. The distribution pattern of the family is rather diverse, yet it has many groups with restricted distribution, e.g. *Abeliophyllum* (Korea), *Amarolea* (Eastern North America), *Noronhia* (Madagascar, Mauritius,Comoron islands) and *Notelaea*(Eastern Australia), etc. The genera having wider distribution are *Fraxinus* (Eurasia, North America), *Jasminum* (Eurasia, Africa, Australia, Oceania and tropical America) and *Ligustrum* (Europe to Northern Iran, Asia, Indomalaysia and New Hebrides).

In India the family is represented by *ca* 3 genera and 33 species of which 9 species and 4 varieties, i.e. approx. 27% are endemic to Peninsular India. The genus *Jasminum* which is represented in India by 40 species has 5 species and a variety endemic to Peninsular India. *J. wightii* is a rare plant. Of the 16 species representing the genus *Ligustrum* in India, 3 species and 2 varieties are endemic to Peninsular India. *Ligustrum decaisnei* var. *beddomei* is rare/threatened.

ENDEMIC TAXA :

Jasminium calophyllum Wall. ex DC. : A slender climber ; Southern W. Ghats, Nilgiris, Anamalai & Tirunelveli, 1200 m.

J. cordifolium Wall. : A climbing shrub ; Southern W. Ghats, Coimbatore, Nilgiris & Tirunelveli, 1500 m.

J. flexile Vahl var. **travancorense** Gamble : A climbing shrub ; Southern W. Ghats, Travancore.

J. malabaricum Wt. : A climbing shrub ; W. Ghats, Konkan, Southwards Karnataka to Nilgiris, 1200 m.

Jasminium trichotomum Heyne ex Roth : Stiff climbing shrub ; Deccan, Coimbatore hills, 600 m. Tanjore & adjoining area.

J. wightii Clarke : A wiry climber ; Coimbatore hills. Rare & Threatened.

Ligustrum decaisnei Clarke var. **decaisnei** : A shrub ; Southern W. Ghats, hills of Coimbatore, Madurai, Nilgiris & Tirunelveli, 1500 m.

L. decaisnei Clarke var. **beddomei** Clarke : A shrub ; W. Ghats, Coorg. Rare & Threatened.

L. decaisnei Clarke var. **microphylla** Clarke : A shrub ; W. Ghats, Tirunelveli.

L. perrotteti A.DC. var. **obovatum** Gamble : A large shrub ; W. Ghats, Babababudan hills of Karnataka, Palni, Anamalai & Tirunelveli & Nilgiri hills, 1800-2100 m.

L. travancorium Gamble : A small tree ; S.W. Ghats, Tirunelveli & Travancore, 1350 m.

Linociera courtallensis Bourd. : A medium sized tree ; S.W. Ghats, Tirunelveli & Travancore, 900-1500 m.

L. wightii Clarke : A small tree ; Southern W. Ghats, Travancore & Tirunelveli, at low elevations.

SCROPHULARIACEAE

This is a cosmopolitan family of *ca* 220 genera and 3000 species. Some large genera like *Linaria*, *Mimulus*, *Pedicularis*, *Penstemon* and *Verbascum* are chiefly north temperate while others like *Calceolaria* and *Herbe* occur southwards in South America and Australasia.

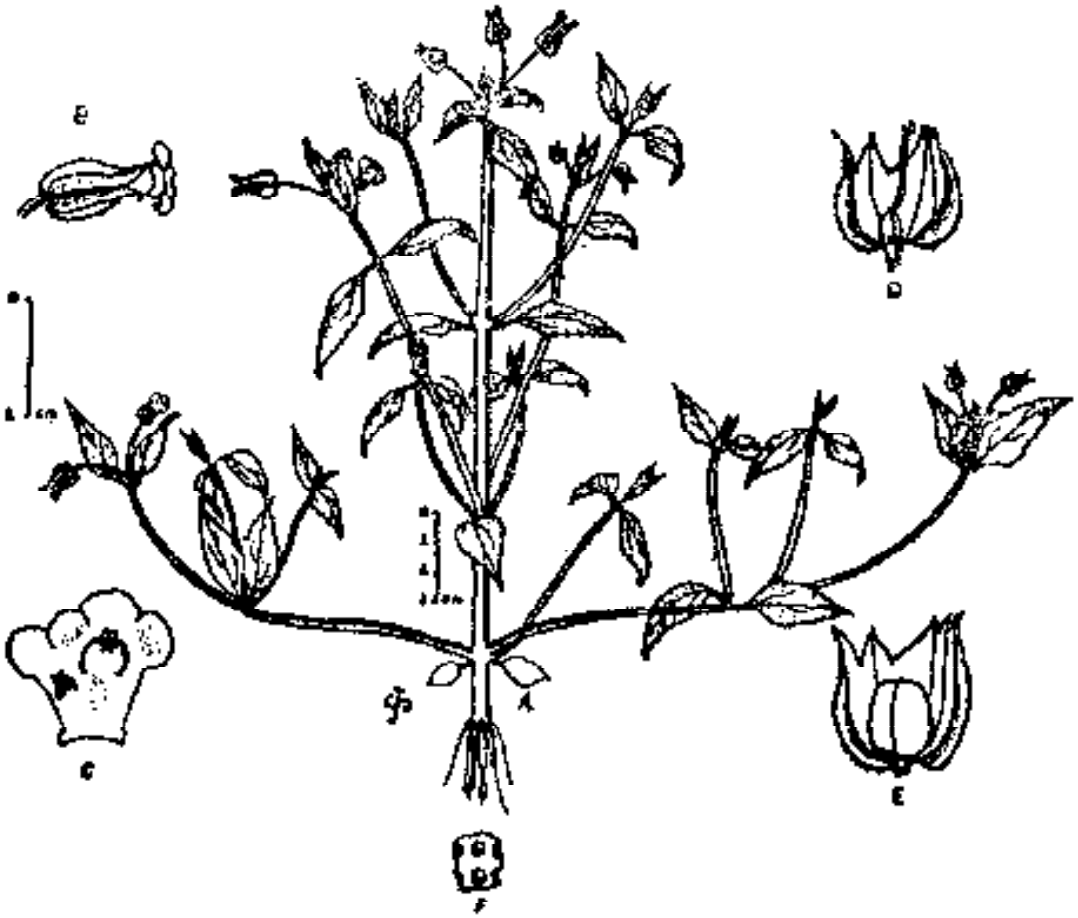
The family is represented in India by *ca* 57 genera and 353 species of which 11 species are endemic to Peninsular India. The tropical genus *Torenia* represented in India by 12 species has 4 species endemic to Peninsular India.

ENDEMIC TAXA :

Adenosma malabaricum Hook. f. : An erect herb ; Southern W. Ghats, Malabar.

Ilysanthes minima Benth. : A minute herb ; E. Ghats, Chingeleput ; W. Ghats, Tirunelveli.

Limnophila glandulifera Philcox : Aquatic herb ; Southern W. Ghats of Kerala & Tamil Nadu.



Torenia indica Saldanha

A. Entire plant. B. Flower. C. Dissected corolla with stamens. D. Gynoecium with dissected calyx. E. Capsule with dissected calyx. F. Seed (higly magnified).

Courtesy : Bull. Bot. Surv. India

Lindernia manifaliana Sivarajan : Annual herb ; Malabar coast, Calicut, N. Kanara (?)

Micrargeria wightii Benth. : Erect scabrid herb ; Deccan plains, Karnataka (Hassan, Mysore, Tumkur) & Coimbatore, Palni ; W. Ghats, Tirunelveli.

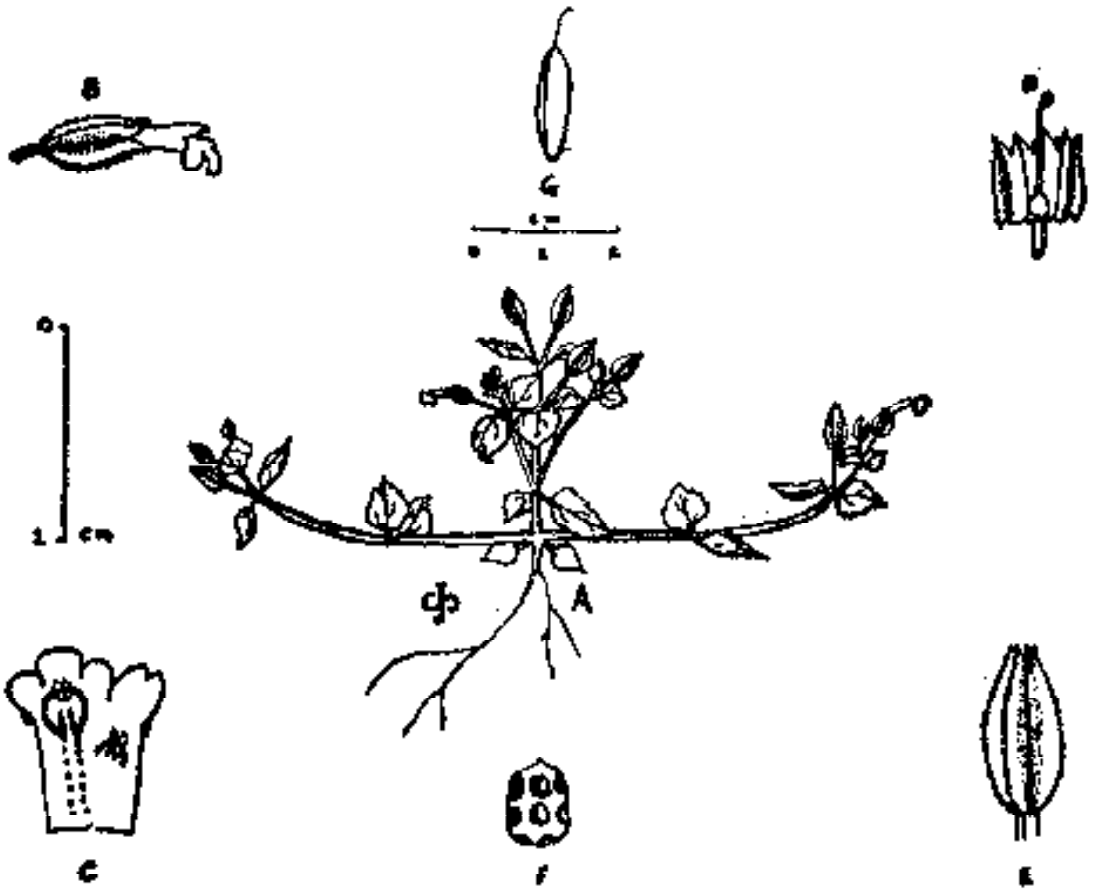
Pedicularis perrottetii Benth. : Semi parasitic herb ; Southern W. Ghats, Nilgiris & Anamalais, above 2100 m.

Rhamphicarpa longiflora Benth. : Erect herb ; W. Ghats,/Coast, Konkan, Matheran,Mahabaleshwar, Belgaum, N. Kanara to Chikmagalur, Shimoga & S. Kanara.

Torenia courtallensis Gamble : A trailing herb ; Southern W. Ghats, Travancore, Anamalais, Tirunelveli & Madurai hills, 1200 m.

T. hirsuta Benth. : Stout diffuse herb; W. Ghats-throughout (?), Nilgiris common, 900-1800 m.

T. indica Saldanha : Annual herb ; Maharashtra (Bombay, Colaba, Ratnagiri & Thana), Karnataka (Shimoga).



Torenia lindernioides Saldanha

A. Entire plant. B. Flower. C. Dissected corolla with stamens, D. Gynoecium with dissected calyx. E. Fruiting calyx enclosing capsule. F. Seed (highly magnified). G. Capsule. *Courtesy : Bull. Bot. Surv. India*

Torenia lindernioides Saldanha : Annual herb ; W. Ghats of Karnataka, Kozhikode, N. Kanara, Shimoga & Hassan.

OROBANCHACEAE

The family of total parasitic herbs comprises *ca* 13 genera and 180 species distributed mainly in north temperate Eurasia. A few species occur in the tropics and America.

The family is represented in India by *ca* 9 genera and 54 species, of which 5 species are endemic to Peninsular India. The genus *Campbellia* is monotypic : *C. cytinoides* is a fleshy parasitic herb occurring in Nilgiri and Palni hills. The genus *Christisonia* with 17 species distributed in S.W. China, S.E. Asia and Indomalaysia, is represented in India by *ca* 10 species of which 4 species are endemic to Peninsular India. *C. saulierei* with a very narrow restricted distribution is rare and threatened.

ENDEMIC TAXA :

Campbellia cytinoides Wt. : Parasitic herb ; Southern W. Ghats, Nilgiri & Palni hills.

Christisonia flammea Sedge : Parasitic herb ; W. Ghats, N. Kanara, Gersoppa falls.

C. keralensis Erady : Erect parasitic herb ; W. Ghats of Kerala, Nelliyampathi hills, 500 m.

C. saulierei Dunn : Slender erect herb ; Southern W. Ghats, Palni hills. Rare & Threatened.

C. tubulosa Hook. f. : A parasitic herb ; W. Ghats, Kanara (Karnataka), Travancore, Wynaad, Nilgiri, Anamalai, Palni, Tirunelveli, 900-1200 m.

GESNERIACEAE

This is a large family comprising *ca* 120 genera and 2000 species most of which are pantropical but a few also occur in the temperate regions. Their general distribution is from Mexico to Chile of the Americas, Southern, Eastern and Western Africa, Madagascar, Southeast Asia, Polynesia, Australasia, China, Japan and Southern Europe.

The Indian representatives of the family are spread over 20 genera and 114 species. 13 species, i.e. approx. 12% of the Indian gesneriads, are endemic to Peninsular India. Except for *Aeschynanthus perrottetii* which occurs throughout the W. Ghats on trees and rocks in moist forests, all the endemic gesneriads are confined to the Southern W. Ghats. The genus *Didymocarpus* which is represented in India by 40 species has 12 species which are strictly endemic to Peninsular India. *Didymocarpus fischeri* and *D. meeboldii* are rare and threatened species. *Jerdonia* is a monotypic endemic genus : its species component *J. indica* is a perennial scapigerous herb with thick rootstock, occurring in the damp evergreen forests of Nilgiris and Anamalais at an altitude of about 1000 m.

ENDEMIC TAXA :

Aeschynanthus perrottetii A. DC. : Epiphytic undershrub ; W. Ghats, Konkan, Kanara, throughout in all dists. at 1200-2100 m.

A. planiculmis (Clarke) Gamble : Epiphytic undershrub ; Southern W. Ghats, Tirunelveli hills, above 1200 m.

Didymocarpus fischeri Gamble : Large handsome herb ; Southern W. Ghats, Anamalais, 500 m. Rare & Threatened.

Didymocarpus gambleanus C.E.C. Fisch. : Scapigerous herb ; Southern W. Ghats, Tirunelveli & Madurai hills.

D. inconspicuus Burtt : Large scapigerous herb ; Southern W. Ghats, Coorg, Travancore, Nilgiri, Anamalai, Tirunelveli, Madurai & Palni hills, Deccan-Nellore-Veligonda hills, Coimbatore, 1300 m.

D. lyrata Wt. : Soft villous herb ; Southern W. Ghats, Tirunelveli hills.

D. macrostachya Barnes : Perennial scapigerous herb ; Southern W. Ghats, Travancore.

D. meeboldii Sm. & Ramas. : Scapigerous herb ; Southern W. Ghats, Madurai & Travancore hills, 900 m. Rare & Threatened.

D. missionis Wall. : Delicate scapigerous herb ; Southern W. Ghats, hills of Travancore, 600 m.

D. ovalifolia Wt. : A herb ; Southern W. Ghats, Tirunelveli hills, 900 m.

D. repens Bedd. : Creeping herb ; Southern W. Ghats, Tirunelveli & Travancore hills, 300-900 m.

D. wightii (Clarke) Gamble : Small herb ; Southern W. Ghats, Tirunelveli hills.

Epithema carnosum Benth. var. **hispida** Clarke : Herb ; W. Ghats, S. Maharashtra to Nilgiris and Tirunelveli, at low altitudes.

Jerdonia indica Wt. : A scapigerous herb ; Southern W. Ghats, Nilgiris, Anamalai & Coimbatore hills, 1000 m.

ACANTHACEAE

The family constitutes *ca* 250 genera and 2500 species which are distributed mostly in the tropical regions of the world, as also in the Mediterranean. They have chiefly four centres of distribution : Indomalaysia (*Strobilanthes* and *Andrographideae*) ; Africa (*Barleria*), Brazil (*Ruellia*) and Central America (*Aphelandrea* and *Odontonema*).

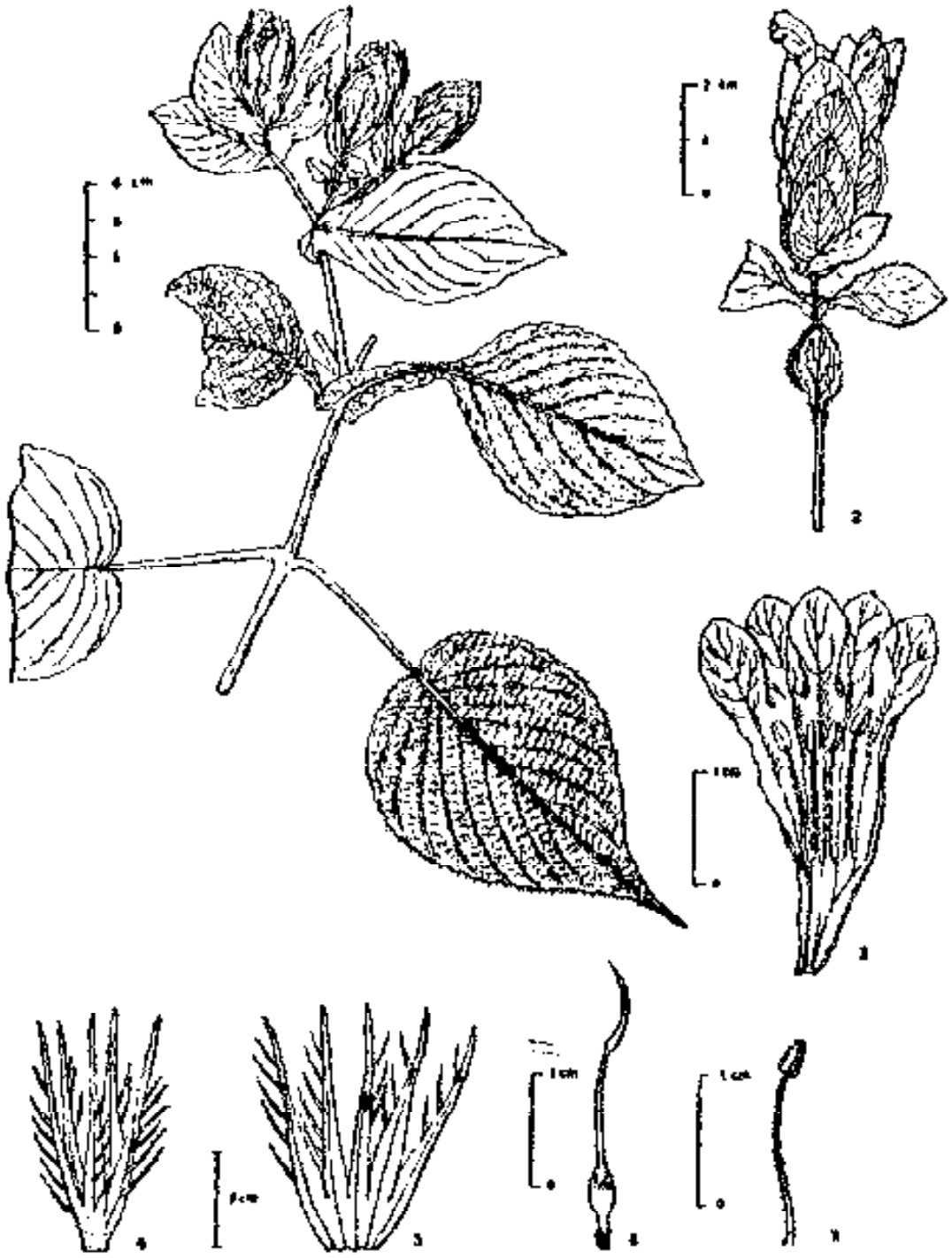
In India the family is represented by 70 genera and 344 species. In all 155 taxa constituting 144 spp. and 11 vars. are endemic to Peninsular India. Thus, in Peninsular India the percentage of endemism in context to the Indian distribution of species is 42%.

The endemic species of the Acanthaceae are spread over 42 genera of which 6 are monotypic.

The genera with the highest representation of endemic species are *Nilgirianthus* (with 20 endemic spp.), *Andrographis* (with 18 endemic spp.) followed by *Justicia* (with 7 endemic spp.).

ENDEMIC TAXA :

Acanthopale jogensis Gilli : Shrub ; Restricted to Shimoga dist., Kanara in the W. Ghats of Karnataka.



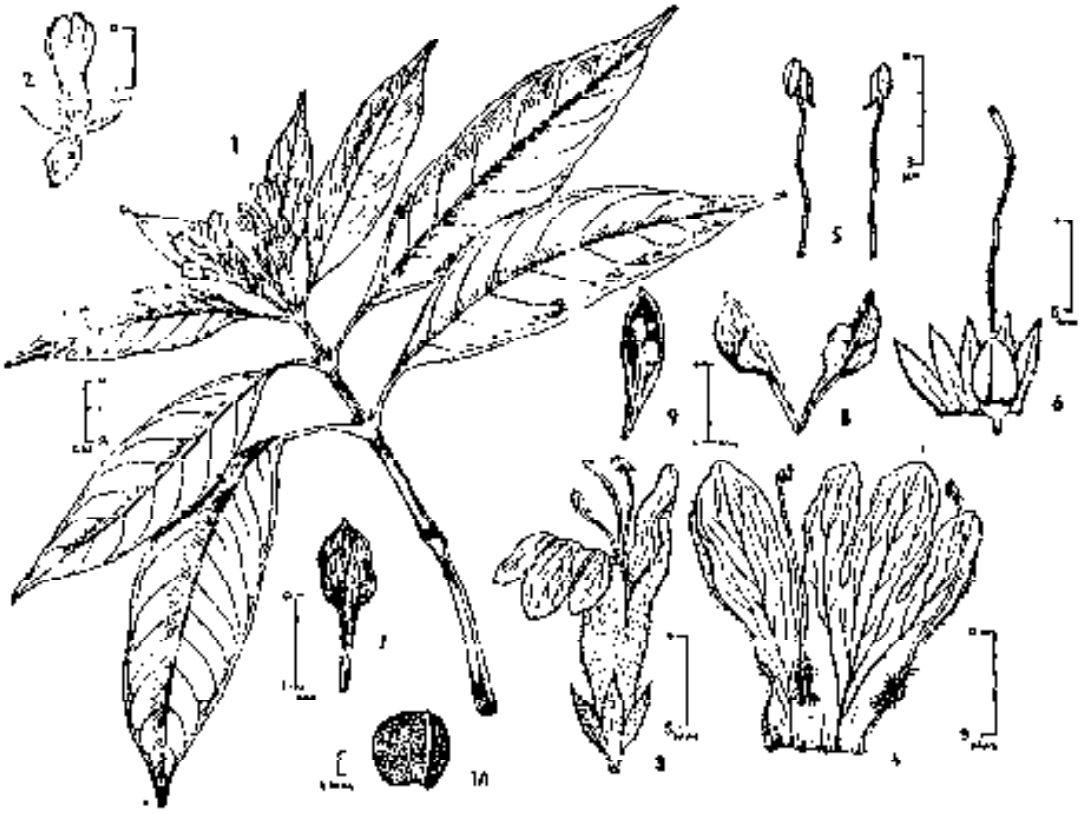
Kanjarum palghatense Ramam.

1. Portion of a branch. 2. Inflorescence. 3. Corolla split open showing stamens. 4. Calyx. 5. Calyx, split open. 6. Pistil. 7. Stamen.

Courtesy : Bull. Bot. Surv. India

Adhatoda beddomei Clarke : Large shrub ; Travancore hills of Southern W. Ghats & S. Arcot, Rare & Threatened.

Andrographis affinis (T. And.) Nees : Slender undershrub ; Nilgiris and Palni hills of W. Ghats, 1500 m.



Adathoda beddomei Clarke

1. Portion of a branch. 2. Bud bracteoles. 3. Entire flower. 4. Corolla, split open showing stamens. 5. Stamens. 6. Calyx, split open to show Gynoecium. 7. Fruit. 8. Capsule, showing dehiscence. 9. Inner portion of the capsule, showing seeds. 10. Seed.

Andrographis nallamalayana Ellis

1. Habit sketch. 2. Flower. 3. Corolla split open to show the position and nature of filaments. 4. Anther with a portion of filament. 5. L.S. of flower with corolla removed. 6. Fruit. 7. An opened fruit, S—seed.

Courtesy : Bull. Bot. Surv. India

Andrographis beddomei Clarke : Glabrous undershrub ; E. Ghats, Cuddapah & Nallamalai hills, up to 600 m. Rare & Threatened.

A. elongata T. And. : Annual herb with divaricate branches ; Tirunelveli hills & S. Travancore hills, at low altitudes.

A. explicata Gamble : Erect herb ; W. Ghats, hills of Tirunelveli & Travancore hills, up to 1800 m.

A. glandulosa Nees : Small straggling undershrub ; Southern Karnataka & Cuddapah, up to 900 m.

A. lawsonii Gamble : Low undershrub ; Nilgiris, around 2490 m, in W. Ghats.

A. lineata Nees : Erect herb ; Hills of Cuddapah, Karnataka & N. Coimbatore to Nilgiris & Madurai, 1200-1600 m.

A. lobelioides Wt. : Procumbent herb ; Southern W. Ghats, Nilgiris, at 1800-2400 m.

A. nallamalayana Ellis : A decumbent herb ; Nallamalais in E. Ghats.

A. neesiana Wt. var. **neesiana** : An erect plant ; Anamalai, Palni & Tirunelveli hills, at 2000 m. in W. Ghats.

A. neesiana var. **rotundifolia** Sreem. : An erect plant ; Tamil Nadu.

A. ovata Benth. : Tall erect herb ; E. Ghats, Mahendragiri hills, Rampa hills, Anantapur of Karnataka, 600-1200 m.

A. producta (Clarke) Gamble : Erect herb ; Southern W. Ghats, 1800 m.

A. rothii Clarke : Straggling undershrub ; Southern W. Ghats Tirunelveli hills, lower ranges.

A. serpyllifolia Wt. : A trailing procumbent herb ; Deccan & dry districts of Tamil Nadu, 1200 m.

A. stellulata Clarke : Erect herb ; Southern W. Ghats, Nilgiri hills, 1800 m.

A. stenophylla Clarke : Glabrous undershrub ; Dry districts of South India.

A. viscosula Nees ; Woody undershrub ; Southern W. Ghats, hills of Travancore, Tirunelveli.

A. wightiana Arn. ex Nees : Slender herb ; Southern W. Ghats, Anamalai, Travancore & Tirunelveli hills, at 800 m.

Asystasia crispata Benth. : Herbaceous undershrub ; Nilgiri & Travancore, Palni hills, 700-2500 m.

Asystasia dalzelliana Sant. : Erect herb ; W.Ghats, from S. Canara, south-wards at low altitudes.

A. mysurensis (Roth.) T. And. : Erect herb ; Deccan Peninsula.

A. travancorica Bedd. : Large shrub ; Anamalai, Tirunelveli & Travancore hills at 1200 m. in W. Ghats.

Barleria acuminata Wt. : Low shrub ; Deccan, Karnataka & W. Ghats, up to 1600 m.

B. courtallica Nees : Erect shrub ; N. Circars, Rampa hills of E. Ghats, 650 m. W. Ghats, at low altitudes.

B. cuspidata Heyne ex Nees : Small prickly shrub ; Dry districts of Deccan, Karnataka, N. W. Ghats & N. E. Ghats.

B. gibsonioides Blatt. : Glabrous undershrub ; Maharashtra (not collected since original collection).

B. involucrata Nees var. **elata** Clarke : Shrub ; All districts of W. Ghats & Deccan, 900-1800 m.

B. longiflora Linn. f. : Whitish shrub ; Northern E. Ghats, Deccan, Karnataka.

B. morrisiana Bar. ex Fischer : Shrub ; Northern E. Ghats

B. paniculata Wall. : Shrub ; W. Ghats, Malabar, Cochin & Travancore, at low altitudes (rocky river banks).

B. pilosa Wall. : Small pilose undershrub ; W. Ghats, Tirunelveli hills, up to 450 m. S. Deccan.

B. prattensis Sant. : Shrub ; Maharashtra.

B. sepalosa Clarke : Shrub ; "Concan" No collection known since the original.

B. stocksii T. And. : Small undershrub ; Karnataka, Bababudan hills. Andhra Pradesh, Anantapur dist., at about 600 m.

B. tomentosa Roth : Low shrub ; Deccan, Karnataka, South of river Krishna & W. Ghats.

Blepharis aspetrima Nees : Diffuse erect or prostrate herb ; W. Ghats, hills of Karnataka, S. Kanara & Coorg.

Calacanthus grandiflorus (Dalz.) Radlk. : Gregarious shrub ; W. Ghats, hills of S. Kanara, 900 m.

Carvia callosa (Nees) Bremek. : Tall shrub ; W. Ghats of Maharashtra & Karnataka.

Dicliptera beddomei Clarke : Slender herb ; E. Ghats, Circars-Nallamalai, hills of Kurnool. Rare & Threatened.

Dicliptera cuneata Nees : Branching herb ; Deccan, Horseleykonda in Chittoor, 1350m.; hills of N. Coimbatore, Carnatic, Salem, Trichinapolly & Madurai to S. Travancore of W. Ghats, 1000 m.

D. ghatica Sant. : Herb ; N. W. Ghats, Bombay, Khandala.

D. parvibracteata Nees : Tall slender herb ; E. Ghats, N. Circars & Rampa hills, at about 600-700 m.

Didyplosandra andersonii (Bedd.) Bremek. : Large shrub ; W. Ghats, Anamalais at 1800 m. Rare & Threatened.

D. holumpattiana (Bedd.) Bremek. : Large shrub W. Ghats, Bollampatti hills of Coimbatore, at 1400-2200 m.

D. lurida (Wt.) Bremek. ; Large straggling gregarious shrub ; W. Ghats, Nilgiri & Travancore hills, 700-1800 m.

Dyschoriste dalzellii (T. And.) Kuntze. : Perennial herb—shrubby ; W. Ghats of Maharashtra (Konkan Poona).

D. vagans (Wt.) Kuntze. : Perennial herb, shrubby ; E. Ghats, N. Circars, Deccan & dry districts of Tamil Nadu up to 1000 m. Kambakam & other hills. Northern W. Ghats, Konkan.

Eranthemum capense Linn. var. **concanense** (Clarke) Sant. : Small shrub ; Karnataka at Kempkull, 300-600 m.

E. roseum (Vahl) R. Br. : Shrub ; W. Ghats, in S. Kanara.

Gantelbua urens (Heyne ex Roth.) Bremek. : Procumbent, hard hispid herb ; E. Ghats, Bellary & Kurnool, East to Guntur & Masulipatam.

Gymnostachyum canescens T. And. : Hairy shrub ; W. Ghats, S. Kanara & in Malabar, Nilgiris, Anamalais, Travancore & Tirunelveli, 1250 m.

G. febrifugum Benth. : Scapigerous herb ; W. Coast & W. Ghats, S. Kanara, Malabar & Travancore.

G. latifolium T. And. : Glabrous undershrub ; W. Ghats in S. Kanara, Coorg & Malabar, Karnataka, 1250 m.

G. polyanthum Wt. : Scapigerous herb ; W. Ghats in Coorg, Shimoga, Malabar.

Haplanthodes nilgherrensis (Wt.) Majumdar : Erect herb ; W. Ghats, hills of Karnataka, S. Kanara & Malabar, 1000 m.

H. plumosus (T. And.) Panigrahi : Erect herb ; Throughout W. Ghats.

H. tentaculatus (L.) Majumdar : Erect herb ; Maharashtra & Goa.

H. verticillatus (Roxb.) Majumdar : Erect herb ; Deccan, Bellary.

Hemigraphis latebrosa Nees var. **beddomei** Clarke. : Straggling undershrub. ; Deccan, Bellary.

Hemigraphis latebrosa Nees var. **beynoana** Bremek. : Straggling undershrub ; Peninsular India.

H. latebrosa Nees var. **incana** Gamble : Straggling undershrub ; E. Ghats, Horsley Konda in Chittoor.

Hygrophila pinnatifida (Dalz.) Sreem. : Herb ; W. Ghats, Konkan & Kanara, Deccan. Rare & Threatened.

Hypoestes lanata Dalz. : Undershrub ; Northern W. Ghats, Konkan.

Justicia neesii Ramam. : Erect herb ; E. Ghats, Bellary, Cuddapah & Chingeleput.

J. nilgherrensis (Nees) Wall. ex T. And. : Low herb ; Karnataka & S. Arcot, W. Ghats, Nilgiris above 1800 m.

J. salsoloides T. And. : Woody undershrub ; Karnataka. Rare & Threatened.

J. santapaui Bennet : Erect herb ; Throughout W. Ghats. Phonda Ghat in Deccan.

J. serpyllifolia Gamble : Prostrate or straggling herb : W. Coast, S. Kanara & Malabar of W. Ghats.

J. trinervia Vahl : Low procumbent herb ; W. Coast, S. Kanara, Konkan, Malabar & Karnataka.

J. wynaadensis (Nees) T. And. : Erect undershrub ; W. Ghats from S. Kanara & Coorg to Wynaad.

Kanjaram palghatense Ramam. : Undershrub ; Palghat hills of Southern W. Ghats.

Lepidagathis bandraemis Blatt. : Herb/undershrub ; Maharashtra.

L. barberi Gamble : Small shrub ; W. & S. Karnataka, Madurai & Tirunelveli.

L. diffusa Clarke : Straggling shrublet. ; Deccan, Karnataka, Bellary & Coimbatore.

L. mitis Dalz. : Stiff undershrub ; Deccan, dry districts of Karnataka ; E. Ghats, Nellore, Cuddapah & N. Arcot ; W. Ghats, Konkan, S. Kanara.

L. pungens Nees : Spinous shrub ; S. Karnataka & Tirunelveli of Tamil Nadu.

L. spinosa Wt. ex Nees : Prostrate spinous shrub ; Southern W. Ghats, Tirunelveli.

L. subarmata Gamble : Stiff undershrub ; E. Ghats, Cuddapah, Kurnool, up to Coimbatore in Deccan.

L. submittis Blatt. : Herb/undershrub ; Karnataka.

Leptacanthus amabilis (Clarke) Bremek. : Large sticky shrub ; Southern W. Ghats, Nilgiris.

L. rubicundus Nees : Slender shrub ; W. Ghats, Wynaad to Travancore & Tirunelveli hills, 600-900 m.

***Leptostachya wallichii** Nees : Erect herb ; Southern W. Ghats, Tirunelveli hills.

Mackenziea gracillis (Bedd.) Bremek. : Large shrub ; W. Ghats, Anamalais, Palni & Travancore hills, 1300-2000 m.

M. homotropa (Nees) Bremek. : Large shrub ; W. Ghats, Nilgiris above 2400 m.

M. integrifolia (Dalz.) Bremek. : Shrub ; W. Ghats, hills of S. Kanara & Coorg.

M. newii (Bedd. ex Clarke) Bremek. : Small shrub ; W. Ghats, Manjerabad of Karnataka.

M. violacea (Bedd.) Bremek. : Large shrub ; W. Ghats, Nilgiris, 1800-2 250 m.

Meyenia hawtayneana (Wall.) Nees : Climbing shrub ; Deccan & dry districts of Tamil Nadu, W. Ghats from S. Kanara to Nilgiris & Palni hills.

Neesiella longipedunculata Sreem. : Erect herb ; Maharashtra.

Neuracanthus sphaerostachyus (Nees) Dalz. : Shrub ; W. Ghats of Maharashtra & Karnataka (N. Kanara).

N. neesianus Clarke : Procumbent tomentose shrub ; Dry districts of Tamil Nadu.

Nilgirianthus asper (Wt.) Bremek. : Shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai & Travancore hills.

N. barbatus (Nees) Bremek. : Gregarious shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai & Travancore hills.

N. beddomei Bremek. : Shrub ; Southern W. Ghats, Nilgiri hills, Travancore & Tirunelveli hills.

N. campanulatus (Wt.) Bremek. : Undershrub ; Coorg hills in W. Ghats. Rare & Threatened.

N. ciliatus (Nees) Bremek. : Slender shrub ; W. Ghats in Karnataka to Travancore hills.

N. circarensis (Gamble) Bremek. : Shrub ; Hills of Visakapam in E. Ghats. Rare & Threatened.

N. decurrens (Nees) Bremek. : Herb ; W. Ghats in Karnataka, southwards to Travancore & Tirunelveli hills.

---

*Recent revision considered this taxon as a wide Species in S.E. Asia.

Nilgirianthus foliosus (Wt.) Bremek. : Gregarious shrub ; W. Ghats in Karnataka southwards to Travancore & Tirunelveli hills.

N. heyneanus (Nees) Bremek. : Small gregarious shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris, Anamalai, Travancore & Tirunelveli hills.

N. lupulinus (Nees) Bremek. : Shrub ; W. Ghats in Maharashtra, Karnataka, Nilgiris & Wynaad.

N. meeboldii (Craib) Bremek. : Small shrub ; W. Ghats in Karnataka.

N. membranaceus (Talb.) Bremek. : Stout gregarious herb ; W. Ghats in Karnataka.

N. neilgherrensis (Bedd.) Bremek. ; Large shrub ; W. Ghats in Karnataka, Nilgiris, Palni hills, Wynaad & Palghat hills in Kerala.

N. papillosus (T. And.) Bremek. : Large shrub ; Nilgiris of Southern W. Ghats.

N. perrottetianus (Nees) Bremek. : Large shrub ; Nilgiris, Anamalai & Travancore hills.

N. punctatus (Nees) Bremek. : Slender undershrub ; W. Ghats in Karnataka, Wynaad, Travancore & Tirunelveli hills.

N. reticulatus (Stapf) Bremek. : Small shrub ; W. Ghats in Maharashtra, Mahableshwar.

N. urceolaris (Gamble) Bremek. : Shrub ; Southern W. Ghats, Nilgiri, Palni & Travancore hills.

N. warrensis (Dalz.) Bremek. : Shrub ; W. Ghats in Maharashtra & Karnataka.

N. wightianus (Nees) Bremek. : Gregarious shrub ; Nilgiris of W. Ghats.

Phlebophyllum canaricum (Bedd.) Bremek. : Shrub ; W. Ghats in Southern Karnataka, Chikmagalur & Hassan dist. Rare & Threatened.

P. humile (Gamble) Bremek. : Small shrub ; Southern W. Ghats, Anamalai & Tirunelveli hills.

P. jeypurensis (Bedd.) Bremek. : Shrub ; E. Ghats, Visakhapatnam hills.

P. kunthianum Nees : A gregarious shrub ; Southern W. Ghats from Nilgiri southwards, above 1800 m.

P. lanatum (Nees) Bremek. : Shrub ; Southern W. Ghats, Nilgiris.

P. lawsonii (Gamble) Bremek. : Erect shrub ; Southern W. Ghats, Nilgiris, Wynaad & Travancore hills.

Phlebophyllum spicatum (Roth) Bremek. var. **spicatum** : Shrub ; Southern W. Ghats, south of Nilgiris.

P. spicatum var. amomum (Nees) Bremek. : Large shrub ; W. Ghats of Karnataka & dry Northern dist. of Tamil Nadu.

P. spicatum (Roth) Bremek. var. **hypoleucum** (Nees) Bremek. : Large shrub ; Southern E. Ghats, Chingleput hills.

P. versicolor (Wt.) Bremek. : Large shrub ; W. Ghats, 1300 m & Northern Circars of E. Ghats.

Plecaulis sessilis (Nees) Bremek. : Small undershrub ; Nilgiris of Southern W. Ghats, at 1800-2000 m.

P. sessiloides (Wt.) Bremek. : Small undershrub : hills of Karnataka, Nilgiris, at 1800-2250 m.

P. ritchici (Clarke) Bremek. : Shrub ; W. Ghats near Bombay.

Rhinacanthus nasutus (Linn.) Kurz var **montanus** (Clarke) Balakr. : Shrub ; Nilgiris of W. Ghats.

Rostellularia vahlii (Roth) Nees var. **rupicola** Ellis : Slender procumbent herb ; Nallamalais of E. Ghats.

Rungia laeta Clarke : Shrub ; Southern W. Ghats, Nilgiris, Anamalais, Malabar & hills of Coimbatore.

R. linifolia Nees : Slender herb ; W. Ghats, Konkan, North Kanara, of Karnataka. Rare & Threatened.

R. sisparensis T. And. : Shrub ; Southern W. Ghats, Nilgiris, Anamalais, hills of Coimbatore & Malabar, at 900-1400 m.

R. wightiana Nees : Erect undershrub ; Southern W. Ghats, 650-1350 m.

Santapaua madurensis Balakr. & Subram. : Herb ; Alagar hills in Tamil Nadu, 200 m.

Staurogyne perpusilla Henry & Balakr. : Herb/undershrub ; Madhya Pradesh.

Stenosiphonium confertum Nees : Erect shrub ; Deccan, most districts of S. India (hills of Krishna, Kurnool, Chingleput & Tirunelveli).

S. wightii Bremek. : Erect shrub ; Hills of Tirunelveli.

S. parviflorum T. And. : Erect shrub ; Deccan, up to Travancore.

S. cordifolium (Vahl) Alston : Erect shrub ; W. Ghats of Tamil Nadu & Kerala.

S. setosum T. And. : Erect shrub ; Deccan & leeward side of W. Ghats.

Strobilanthes dupenii Bedd. : Shrub ; Anamalais of Southern W. Ghats.

S. jogensis Gilli : Shrub ; W. Ghats of Karnataka, N. Kanara.

S. minor Talbot : Small shrub ; N. Kanara.

S. tristis T. And. : Erect shrub ; Southern W. Ghats, Anamalai, Tirunelveli & Nilgiris, below 1800 m.

S. urceolaris Gamble : Shrub. Southern W. Ghats, Nilgiris & Palni hills,

Supushpa serobiculata (Dalz. ex Clarke) Suryan, ; N. Kanara, Maharashtra.

Synnema anomalum (Blatt.) Sant ; Herb ; Maharashtra, Salsette islands.

Taeniandra micrantha (Wt.) Bremek. : Undershrub ; Southern W. Ghats from Nilgiri southwards.

Thelepaepale ixoicephala (Benth.) Bremek. : Small shrub ; W. Ghats in S. Kanara & Tamil Nadu.

T. mysorensis T. And. : Glabrous climber ; W. Ghats, S. Kanara, Karnataka to Travancore & Tirunelveli.

T. tomentosa Wall. : Slender climber ; Southern W. Ghats, Nilgiri hills at 2000 m., Coonoor & Madurai.

T. bicolor (Wt.) Lindau : Large climber ; Southern of W. Ghats, Nilgiris.

Xenacanthus heteromallus (T. And. ex Clarke) Bremek. : Large shrub ; Southern W. Ghats, Nilgiris, Palni hills, 1200 m.

X. pulneyensis (Clarke) Bremek. : Shrub ; Southern W. Ghats, above 1500 m ; Salem of E. Ghats.

X. zenkerianus (Nees) Bremek. : Large shrub ; Southern W. Ghats, 1800 m.

PEDALIACEAE

This small tropical family consists of *ca* 12 genera and 50 species distributed in South Africa, Madagascar and Indomalaysia.

The family is represented in India by *ca* 3 genera and 6 species of which 2 species and 1 variety belonging to the genus *Sesamum* are endemic to Peninsular India. *Sesamum* is a tropical genus of 30 species distributed in South Africa and Asia.

ENDEMIC TAXA :

Sesamum ekambaramii Naidu : Erect herb ; Tamil Nadu, Stuartpuram near Bapatla.

Sesamum laciniatum Klein ex Willd. : Stout herb ; E. Ghats, Cuddapah, Kurnool & Kambakam hills of Chingeleput ; W. Ghats, Karnataka.

S. orientale Linn. var. **malabaricum** Nan. : A herb ; Tamil Nadu, Kerala.

BIGNONIACEAE

The Bignoniaceae comprise *ca* 120 genera and 650 species, most of which occur in tropical regions while a few occur in the temperate regions of the world.

In India the family is represented by *ca* 12 genera and 65 species. Only 2 species, both belonging the genus *Dolichandrone*, are endemic to Peninsular India.

ENDEMIC TAXA :

Dolichandrone arcuata Clarke : Moderate-sized tree ; Deccan in Kurnool, Karnataka & Coimbatore, Ootacamund.

D. atrovirens Sprag. : Moderate-sized tree ; Peninsular India, districts of the Deccan up to Nellore, W. Ghats (Karnataka), Tirunelveli & Travancore, up to 900 m.

LENTIBULARIACEAE

This is a rather small family comprising *ca* 4 genera and 170 species with a cosmopolitan distribution. The family consists of insectivorous, often rootless and occasionally epiphytic herbs (bladderworts and butterworts). The tropical and temperate aquatic and terrestrial bladderworts are represented by about 120 species and the 46 temperate species of terrestrial butterworts are found in Eurasia and America (Heywood, 1978).

The family is represented in India by *ca* 2 genera and 32 species of which only 6 species, i.e. 19% are endemic to Peninsular India.

ENDEMIC TAXA :

Utricularia arcuata Wt. : Herbs ; W. Ghats, Konkan, Kanara (hills of Karnataka) to Travancore.

U. cecilii P. Taylor : Small annual terrestrial herb ; W. Ghats, S. Kanara (vicinity of Mangalore).

Utricularia lazulina P. Taylor : Small annual terrestrial herb ; W. Ghats, S. Kanara (around Mangalore & Kollur).

U. sampathii Subr. & Yog : Slender herb ; Karnataka, Bangalore.

U. smithiana Wt. : Slender herb ; W. Ghats, N. Kanara, Malabar-Coorg, Shimoga dist. & Palni hills.

U. squamosa Wt. : Slender erect herb ; W. Ghats, Malabar, Shimoga, Nilgiris, 1550 m.

CAMPANULACEAE

The family Campanulaceae has *ca* 60-70 genera and 2000 species distributed in temperate, subtropical and tropical mountains of the world.

In India the family is represented by 8 genera and 48 species of which 5 species are found to be endemic in the peninsular region.

This group is basically adapted to high altitudes and all the 5 endemics occur in the W. Ghats at an elevation of about 2000 m.

ENDEMIC TAXA :

Campanula alphonsii Wall. : Small wiry herb ; W. Ghats of Poona dist., Nilgiris, Anamalais & Palni hills, above 2000 m.

C. wightii Gamble : Soft herb ; Southern W. Ghats, Palni hills & Nilgiris, above 2000 m.

Cephalostigma flexuosum Hook. f. & Thoms. : Slender annual ; Malabar & Konkan of W. Ghats, Deccan, Bababudan hills of Karnataka-Coimbatore & Bellary. Rare & Threatened.

Lobelia beddomeana E. Winm. ; Herb ; Tamil Nadu.

L. courtallensis K. K. N. Nair : Herb ; Tamil Nadu, Courtallum.

RUBIACEAE

This is one of the largest families of flowering plants comprising *ca* 500 genera and 6000 species distributed to a large extent in the tropics. Some species (e.g. Rubieae : *Sherardia*, *Crucianella*, *Asperula*, *Galium* and *Rubia*) extend into the temperate region while a few species of *Galium* even extend to the Arctic.

The family is represented in India by *ca* 77 genera and 286 species of which as many as 124 species and 11 varieties, i.e. approx. 48%, are endemic to Peninsular India. The tropical Asian genus *Hedyotis* and the mostly Indomalaysian genus *Lasianthus* have the highest representation of endemic species (i.e. 15 & 16 endemic species respectively). *Ixora*, *Oldenlandia*, *Ophiorrhiza*, *Pavetta* and *Psychotria* are the other genera which have many endemic species in Peninsular India. Many of the endemic species are rare and threatened.

ENDEMIC TAXA :

Acranthera anamullica Bedd : Low herbaceous plant ; W. Ghats, Anamalai & Tirunelveli hills, 1200 1500 m.

A. grandiflora Bedd. : Herbaceous plant ; Southern W. Ghats, hills of Tirunelveli & Travancore, 900 1500 m.

Anotis longiflora Hutch. : Erect perennial herb ; Southern W. Ghats, Palni hills, 1800 2100 m.

Argostemma courtallense Arn. : Small delicate herb ; W. Ghats, Hassan, N. Kanara & southward to Travancore hills, up to 900 m.

Borreria eradii Ravi : Soft annual herb ; Kerala, Punalur.

B. malabarica Sivarajan & Manilal : Herb ; Kerala.

B. stricta (Linn. f.) K. Schum var. **rosea** Sivarajan & Manilal : Herb ; Kerala.

Coffea crassifolia Gamble : A stiff shrub ; Southern W. Ghats, Travancore and Anamalai, 1350 m. Rare & Threatened.

Hedyotis anamalayana (Gamble) Rolla Rao & Hemadri : Erect undershrub ; Southern W. Ghats, Anamalais. Rare & Threatened.

H. barberi (Gamble) Henry & Subram. : Erect shrub ; Southern W. Ghats, Tirunelveli, 1500 m. Rare & Threatened.

H. beddomei Hook *f.* : A stiff shrub ; Southern W. Ghats of Kerala, Palghat dist. 1950 m.

H. bourdillonii (Gamble) Rolla Rao & Hemadri : A small shrub ; Southern W. Ghats, Travancore, 600 1200 m. Rare & Threatened.

H. erecta Manilal & Sivarajan : Annual herb ; Kerala, Calicut. Idimushikkal.

H. eualata (Gamble) Henry & Subram. var. **eualata** : A week shrub ; Southern W. Ghats, Nilgiris, Anamalai & Tirunelveli hills, 1200 1500 m.

Hedyotis eualata (Gamble) Henry & Subram. **var. agastyamalayana** Henr & Subram. : A shrub ; Southern W. Ghats, Agastyamalais.

H. gamblei Henry & Subram : A shrub ; Tamil Nadu.

H. mabeshwarii (Sant. & Merch.) Rolla Rao & Hemadri : Erect tiny annual herb ; North W. Ghats, Thana, Ratnagiri, Satara & Poona dist.

H. prainiana (Talb.) Rolla Rao & Hemadri : A small diffuse herb ; Deccan, hills of Karnataka (Bababudan).

H. pruinosa Kuntze ; A shrub ; Southern W. Coast, Malabar & Tirunelveli.

H. ramarowii (Gamble) Rolla Rao & Hemadri : An undershrub ; Southern W. Ghats, Travancore, (Chimunjee & Ponmudi hills), 1200 m.

H. santapaui Shetty & Vivek : Tall undershrub ; Southern W. Ghats, Kerala, Kottayam dist. & Anamalais (Tamil Nadu).

H. shuteri (Hook. f.) Rolla Rao & Hemadri : Erect scabrous herb ; E. Coast of Tamil Nadu, near Madras. Rare & Threatened.

H. stocksii (Hook. f. & Thoms.) Rolla Rao & Hemadri : Slender annual ; Deccan, hills of Karnataka, Bababudan hills, 1800 m. Rare & Threatened.

H. travancorica Bedd. : Small undershrub ; Southern W. Ghats, Travancore & Tirunelveli hills, 900 1200 m.

H. villosostipulata (Gamble) Rolla Rao & Hemadri : A herb ; Southern W. Ghats, Travancore hills. Rare & Threatened.

H. wightii (Hook. f.) K.K.N. Nair : A stiff herb ; Deccan plateau.

H. wynaadensis (Gamble) Rolla Rao & Hemadri : A large shrub ; W. Ghats, Wynaad (Chambra Peak Forest), 1350 1800 m. Rare & Threatened.

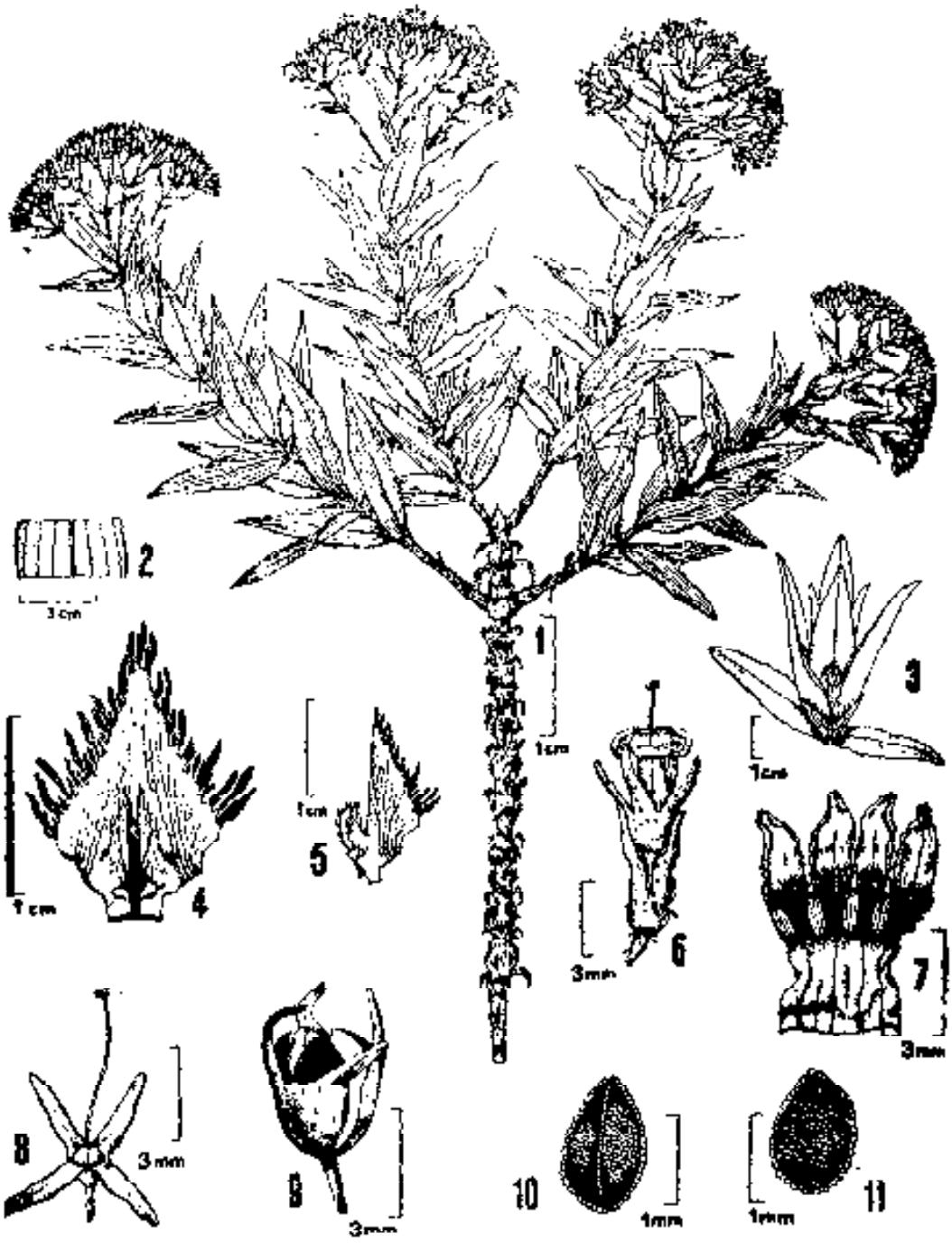
Hymenodictyon obovatum Wall. : A small tree ; W. Ghats, Konkan, Karnataka to Travancore, 1200 m.

Ixora brachiata Roxb. : A small tree ; W. Ghats, Konkan, Karnataka & South to Travancore at low altitudes.

I. elongata Heyne ; A shrub ; W. Ghats, Konkan Karnataka to Wynaad & Attapadi hills of Malabar, at 600 m.

I. johnsonii Hook. f. : A small tree/large shrub ; W. Coast, Cochin, Ernakulam dist., Travancore. Rare & Threatened.

I. malabarica (Dennst.) Mabber. : An erect shrub ; W. Ghats, Kanara to hills of Tirunelveli & Travancore.



Hedyotis santapaui Shetty & Vivek.

1. Branch showing flowers and capsules. 2. Lower surface of a portion of leaf showing raphides. 3. Terminal portion of a vegetative shoot showing stipules connate at base. 4. Dorsal view of stipules. 5. Side view of stipule showing stipular appendages. 6. Flower. 7. Corolla split open. 8. Calyx with gynoecium. 9. Capsule showing dehiscence. 10 & 11. Two views of seed. *Courtesy : Bull. Bot. Surv. India*

Ixora lawsonii Gamble : A small tree : W. Ghats, Wynaad (Mannanthody) & Coorg, 900 m. Rare & Threatened.

I. leucantha Heyne var. **leucantha** : A shrub ; W. Ghats, hills of Tirunelveli & Travancore.

I. leucantha Heyne var. **malabarica** Gamble : A shrub ; W. Coast, Hassan, S. Kanara to Travancore.

I. monticola Gamble : A shrub ; W. Ghats, Madurai dist, 1200 1650m.

I. notoniana Wall. : A small tree ; W. Ghats, hills of Karnataka, Nilgiris, Anamalais, Palni & hills of Travancore, 900 1800 m.

I. polyantha Wt. : A large shrub ; W. Ghats, W. Coast, Konkan, Kanara, Malabar, Travancore.

I. saulierei Gamble : A small tree ; W. Ghats, Palni hills. Rare & Threatened.

Knoxia heyneana DC. : An erect herb ; W. Ghats, Tirunelveli & Travancore hills, 1200 - 1500 m. Dindigul hills of Tamil Nadu (?).

K. linearis Gamble : Erect slender herb with woody rootstock ; W. Ghats, Tirunelveli, Mahendragiri hills. Rare & Threatened.

K. wightiana Wall. : A erect herb ; E. Ghats, Cuddapah, N. Arcot & Chingeleput ; W. Ghats, Karnataka, South of Shimoga, Nilgiris & Southwards, 1500 m.

Lasianthus acuminatus Wt. : Slender shrub ; Southern W. Ghats, Chikmagalur, Hassan, N. Kanara, Shimoga, Nilgiris, Palni hills, Tirunelveli & Travancore hills, 900 1800 m.

L. blumeanus Wt. : Glabrous shrub ; Southern W. Ghats, in Tirunelveli hills, 1150 m. Rare & Threatened.

L. capitulatus Wt. ; A large shrub ; W. Ghats, Mysore, hills of Coimbatore dist, Nilgiri & Palni hills. Rare & Threatened.

L. ciliatus Wt. ; A stout shrub ; Southern W. Ghats, Nilgiris, 1500- 1800 m. Rare & Threatened.

L. cinereus Gamble : Shrub with cinereus pubescence ; Southern W. Ghats, Tirunelveli hills.

L. coffeoides Fyson : Erect shrub ; Southern W. Ghats, Mysore Travancore & Palni hills, 1800 2100 m.

L. dichotomus Wt. : A nearly glabrous shrub ; Southern W. Ghats, Courtallum, Tirunelveli hills. Rare & Threatened.

Lasianthus jackianus Wt. : An evergreen shrub ; Southern W. Ghats, Nilgiris, Wynaad & hills of Coimbatore & Malabar, 900 1500 m.

L. oblongifolius Bedd. : An evergreen shrub ; Southern W. Ghats, hills of Tirunelveli (Papanasam), 900 1200 m. Rare & Threatened.

L. obovatus Bedd. : Shrub with small leaves ; W. Ghats, hills of Travancore (Atramalais), 1500 m. Rare & Threatened.

L. parvifolius Wt. : A glabrous shrub ; W. Ghats, Chikmagalur, Nilgiris, Anamalai, Palni & Tirunelveli hills, 1200 m

L. rostratus Wt. : A large shrub ; Southern W. Ghats, hills of Tirunelveli, Travancore & Madurai, 1200 1500 m.

L. sessilis Talb. : A stout shrub ; W. Ghats, N. Kanara, southwards to Gersoppa falls.

L. strigillosus Hook. f. : A shrub ; Southern W. Ghats, Tirunelveli hills.

L. truncatus Bedd. : A shrub ; E. Ghats, N. Circars, Mahendragiri hill, Ganjam & Visakhapatnam hills, 1150 1350 m. Rare & Threatened.

L. venulosus (Wt. & Arn.) Wt. : A large shrub ; W. Ghats, Konkan (?) Nilgiris & Palni hills, 1800 m.

Morinda reticulata Gamble : Climbing shrub ; Southern W. Ghats, Travancore, 600 m. Rare & Threatened.

Mussaenda laxa Hutch. : A climbing shrub ; W. Coast/W. Ghats, Konkan, Kanara to Karnataka Tirunelveli & Nilgiri hills, 1000 m.

M. tomentosa Wt. : A straggling shrub ; Southern E. Ghats, Gingee hills of S. Arcot, westwards to Tirunelveli hills of W. Ghats, 750 m.

Mycetia acuminata (Wt.) Kuntze : A soft small shrub ; Southern W. Ghats, Shimoga, S. Kanara, Hassan, Coorg, Nilgiris & southwards up to 900 m.

Neanotis carnosa (Dalz.) W.H. Lewis : A fleshy diffuse annual herb ; W. Coast, S. Kanara (Malwan). Rare & Threatened

N. concanensis Daniel & Vajravelu : Herb ; W. Ghats, Konkan, Mysore.

N. decipiens (Hook. f.) W. H. Lewis : Slender perennial ; W. Ghats, Konkan (?), Palni, Travancore, Tirunelveli hill.

N. foetida (Dalz.) W.H. Lewis : Slender wiry annual ; W. Ghats, Konkan, Kanara.

N. monosperma (Wall. ex Wt. & Arn.) W.H. Lewis var. **monosperma** : Slender herb ; Southern W. Ghats, Bababudan hills, hills of Karnataka, (Mysore), Nilgiris & Palni hills, 2100 m. Rare & Threatened.

Neanotis monosperma (Wall. ex Wt. & Arn.) W.H. Lewis var. **tirunelvelica** Henry & Chandr. : Slender herb ; Southern W. Ghats, Tirunelveli.

N. montholonii (Hook. f.) W.H. Lewis : An erect annual ; W. Ghats, Konkan, Kanara, Karnataka and Malabar. Rare & Threatened.

N. sahyadrica Billore & Mudaliar : Herb ; Maharashtra

N. rheedii (Wall. ex Wt. & Arn.) W.H. Lewis : Slender annual herb ; W. Coast, W. Ghats, Konkan, Kanara, Karnataka & southwards to Cochin & Anamalais. Rare & Threatened.

Ochreinauclea missionis (Wt. & Arn.) Ridsd. ; A small tree ; W. Ghats, Coast of Karnataka (N. Kanara), Kerala (Travancore) & Tamil Nadu, 450 m.

Octotropis travancorica Bedd. : A large shrub/small tree ; Southern W. Ghats, Wynaad & southwards to hills of Travancore & Tirunelveli, 900 1500 m.

Oldenlandia albo-nervia (Bedd.) Gamble ; Glabrous undershrub ; Southern W. Ghats, Travancore and Tirunelveli, 900-1200 m. Rare & Threatened.

O. articularis Gamble : A stiff shrub ; Southern W. Ghats, Nilgiris, Anamalai, Palni & Palghat hills above 1800 m.

O. buxifolia (Bedd.) Kuntze : A stiff shrub ; Southern W. Ghats, Anamalais, 2100 m.

O. hirsutissima Kuntze : A shrub ; Southern W. Ghats, Nilgiris, 2100m.

O. hygrophila Bremek. : Annual erect herb ; Kerala, Malampuzha near Palghat.

O. sisparensis (Gage) Gamble : An undershrub ; Southern W. Ghats, Nilgiris, 2100 m.

O. stylosa Kuntze : A large shrub ; Southern W. Ghats, hills of Karnataka, Nilgiris & Palni hills, 1500 m.

O. swertioides (Hook. f.) Kuntze : A low shrub ; Southern W. Ghats, Palni hills & southwards to hills of Travancore.

O. viscida (Bedd.) Kuntze : A large shrub ; Southern W. Ghats, Tirunelveli hills, 900 m.

Ophiorrhiza barberi Gamble : Slender erect undershrub ; Southern W. Ghats, Anamalai & Travancore hills, 900 m.

Ophiorrhiza barnesii C.E.C. Fisch. : Herb, undershrub ; Southern W. Ghats, Travancore (Idukki). Rare & Threatened.

O. brunonis Wt. & Arn. var. **brunonis** : Erect undershrub ; Southern W. Ghats, Nilgiris, above 1500 m.

O. brunonis Wt. & Arn. var. **johnsonii** Hook. f. : Undershrub ; Cochin hills.

O. chandrasekharanii Subba Rao & Kumari : A herb ; E. Ghats, Andhra Pradesh, Visakhapatnam dist., Vanckachinta.

O. caudata C.E.C. Fisch. : Herb, undershrub ; Southern W. Ghats, Travancore (Idukki), Kalaan high range. Rare & Threatened.

O. codyensis Gamble : Erect undershrub ; Southern W. Ghats, Coorg. Rare & Threatened.

O. eriantha Wt. : Erect undershrub ; Southern W. Ghats, Tirunelveli & Travancore.

O. grandiflora Wt. : An erect undershrub ; Southern W. Ghats, Tirunelveli hills.

O. hirsutula Wt. : An undershrub ; W. Ghats, S. Kanara, Coorg, hills of Karnataka to Nilgiri & Travancore hills, E. Ghats, Visakhapatnam hills, 1000 m.

O. incarnata C.E.C. Fisch. : Herb/undershrub ; Southern W. Ghats, Nilgiris. Rare & Threatened.

O. monnarensis C.E.C. Fisch : Herb/undershrub ; Southern W. Ghats, Travancore (Idukki), Cochin. Rare & Threatened.

O. pykarensis Gamble : Erect slender undershrub ; Southern W. Ghats, Nilgiris (Pykara falls). Rare & Threatened.

O. roxburghiana Wt. : An erect undershrub ; Southern W. Ghats, Palni hills. Rare & Threatened.

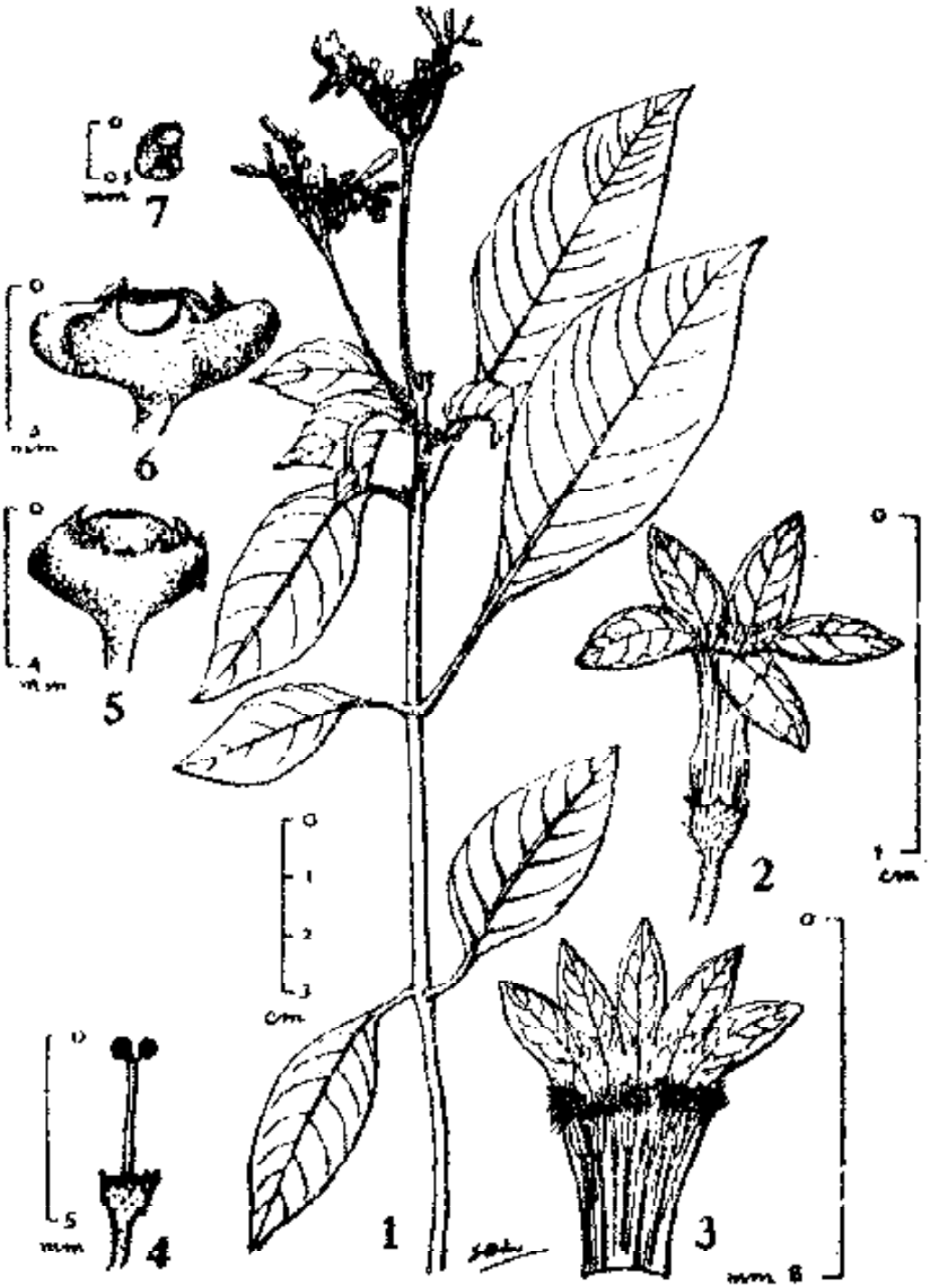
O. tirunelvelica Henry & Subr. : Herb/undershrub ; Tamil Nadu, Southern W. Ghats, Tirunelveli.

Pavetta breviflora DC. : A shrub ; Eastern Ghats, Mahendragiri hills in Ganjam, 1350 m. (?).

P. blanda Bremek. : A shrub ; Southern W. Ghats, hills of Karnataka, Travancore, Tirunelveli, 1800 m. & adjacent hills of Kerala.

P. brunonis Wall. : A tomentose shrub ; Southern W. Ghats, Nilgiris, 1500 - 1800 m.

P. concinna Bremek. : A glabrous shrub ; S. W. Ghats, Attraimalais, Tirunelveli.



Ophiorrhiza tirunelvelica Henry & Subr.

1. Flowering branch. 2. Flower. 3. Corolla split opened. 4. Gynoecium. 5. & 6. Fruits. 7. Seed.

Courtesy : Bull. Bot. Surv. India

Pavetta hohenackeri Bremek. : A glabrous shrub ; Southern W. Ghats, Nilgiris (Sispara). Rare & Threatened.

P. lacta Bremek. : A glabrous shrub ; Southern W. Ghats, Nilgiris & Palni hills.

P. nemoralis Bremek. : A glabrous unbranched shrub ; Southern W. Ghats, Kerala, Cochin. Rare & Threatened.

P. oblanceolata Bremek. : A glabrous shrub ; Southern W. Ghats, Palghat & Attraimalai hills.

P. praecox Bremek. : A shrub ; W. Ghats of Karnataka.

P. praeterita Bremek. : A shrub ; Courtallam, Quilon.

P. siphonantha Dalz. : A glabrous shrub ; Southern W. Ghats, Travancore, low level & Bangalore.

P. travancorica Bremek. : A shrub ; Southern W. Ghats, Travancore.

P. wightii Hook. f. : A shrub ; Southern W. Ghats, Nilgiris, 1200 1800 m.

Plectronia ficiformis (Hook. f.) Gamble : An evergreen tree ; Southern W. Ghats, Mysore, Palni & Tirunelveli hills. Rare & Threatened.

P. neilgherrensis (Wt.) Bedd. var. **neilgherrensis** : An evergreen shrub/tree (?); Southern W. Ghats, Nilgiris, Travancore & Tirunelveli hills, 1200 1800 m.

P. neilgherrensis (Wt.) Bedd. var. **chartacea** Gamble : A small tree ; W. Ghats, Nilgiris & Palni hills, 1500 2100 m.

P. pergracilis (Bourd.) Gamble : Tall tree ; W. Ghats, Travancore, low altitude. Rare & Threatened.

P. travancorica (Hook. f.) Bedd. : A tree ; Southern W. Ghats, Tirunelveli & Travancore.

Psychotria anamallayana Bedd. : A small tree ; Southern W. Ghats, Anamalai & Travancore hills, 900 1350 m.

P. barberi Gamble : A shrub; Southern W. Ghats, Anamalai & Travancore hills, 1350 m. Rare & Threatened.

P. canarensis Talb. : Small erect shrub ; W. Ghats, Kanara.

P. congesta Hook. f. var. **astephana** Hook. f. : Large shrub/small tree ; Southern W. Ghats. Nilgiri & Palni hills.

P. connata Wall. : Glabrous shrub ; Southern W. Ghats, Travancore & Tirunelveli, 1200 - 1800 m.

Psychotria dalzelli Hook. f. : Stout glabrous shrub ; W. Coast, Kanara, Malabar & Cochin.

P. flavida Talb. : A small shrub ; W. Coast/W. Ghats, Konkan, Kanara to Travancore.

P. globicephala Gamble : A shrub with globose flower head ; Southern W. Ghats, Tirunelveli, Rare & Threatened.

P. johnsonii Hook. f. : A glabrous shrub ; Southern W. Coast, Malabar, Cochin, W. Ghat, Nilgiri & hills of Coimbatore, 1500 m.

P. keralensis Deb & Gang. : Shrub ; Kerala, Cannanore dist., 800 m.

P. macrocarpa Hook. f. : A large shrub ; Southern W. Ghats, Tirunelveli & Travancore, 600 1200 m.

P. nudiflora Wt. & Arn. : Large glabrous shrub ; Southern W. Ghats, Courtallam, Travancore & Tirunelveli hills, 1200-1800 m.

P. octosulcata Talb. : An erect shrub ; W. Ghats, Konkan, Kanara hills of Coimbatore & Nilgiris, 700 m.

Randia candolleana Wt. & Arn. var. **candolleana** : A small tree ; W. Ghats, hills of Karnataka, Coimbatore ; Southern E. Ghats, hills of Chingleput & N. Arcot.

R. candolleana Wt. & Arn. var. **corymbosa** Gamble : Small tree ; E. Ghats, dry districts of Krishna, Kurnool, Cuddapah & Anantapur.

Saprosma corymbosum Bedd. : A shrub ; Southern W. Ghats, hills of Travancore & Tirunelveli, 750 1200 m.

S. fragrans Bedd. : A shrub ; Southern W. Ghats, Malabar hills, Nilgiris & Tirunelveli, 600 1200 m. Rare & Threatened.

S. glomeratum (Gardn.) Bedd. : A shrub ; W. Ghats, Konkan, Kanara to Travancore, 600 1200 m.

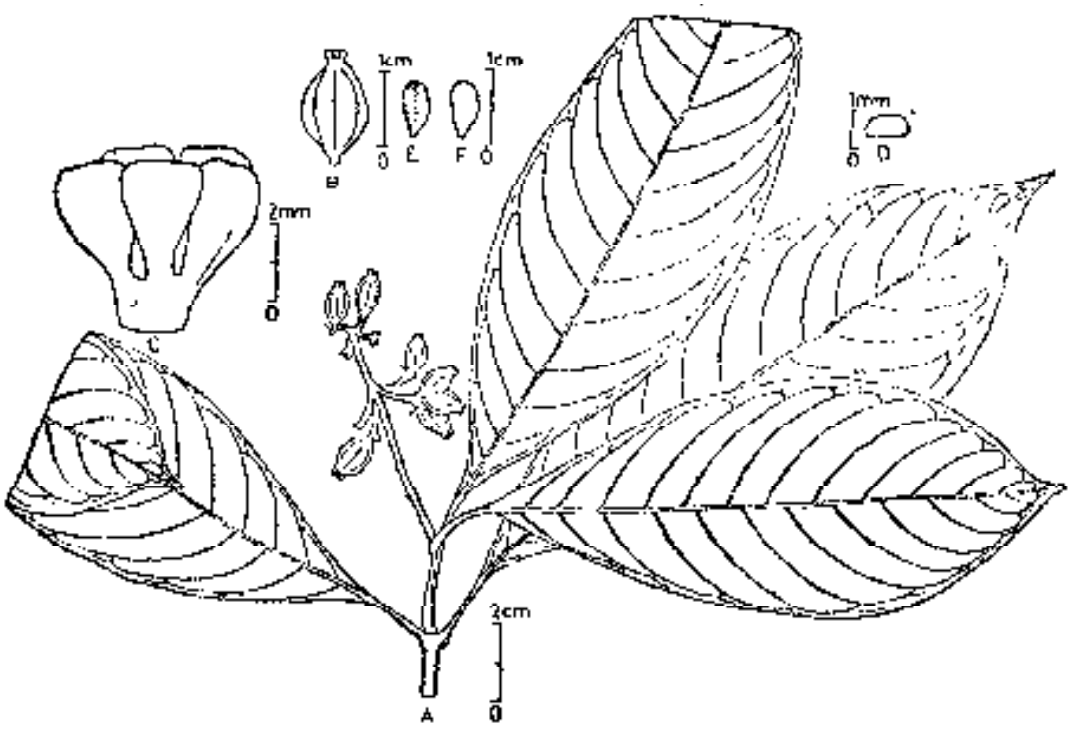
Stylocoryne canarica (Hook. f.) Gamble : A shrub ; W. Ghats, Kanara, Southwards to Tirunelveli & Travancore.

S. lucens (Hook. f.) Gamble : A bushy shrub ; Southern W. Ghats, Nilgiris, hills of Travancore & Tirunelveli, above 2100 m.

Tarenna nilagirica (Bedd.) Raju : A shrub ; Southern W. Ghats (Wynaad ?), Nilgiris to Travancore & Malabar hills, 900 m.

T. agumbensis Sunderar. : Woody shrubs ; Southern W. Ghats, Agumbe, Shimoga dist.

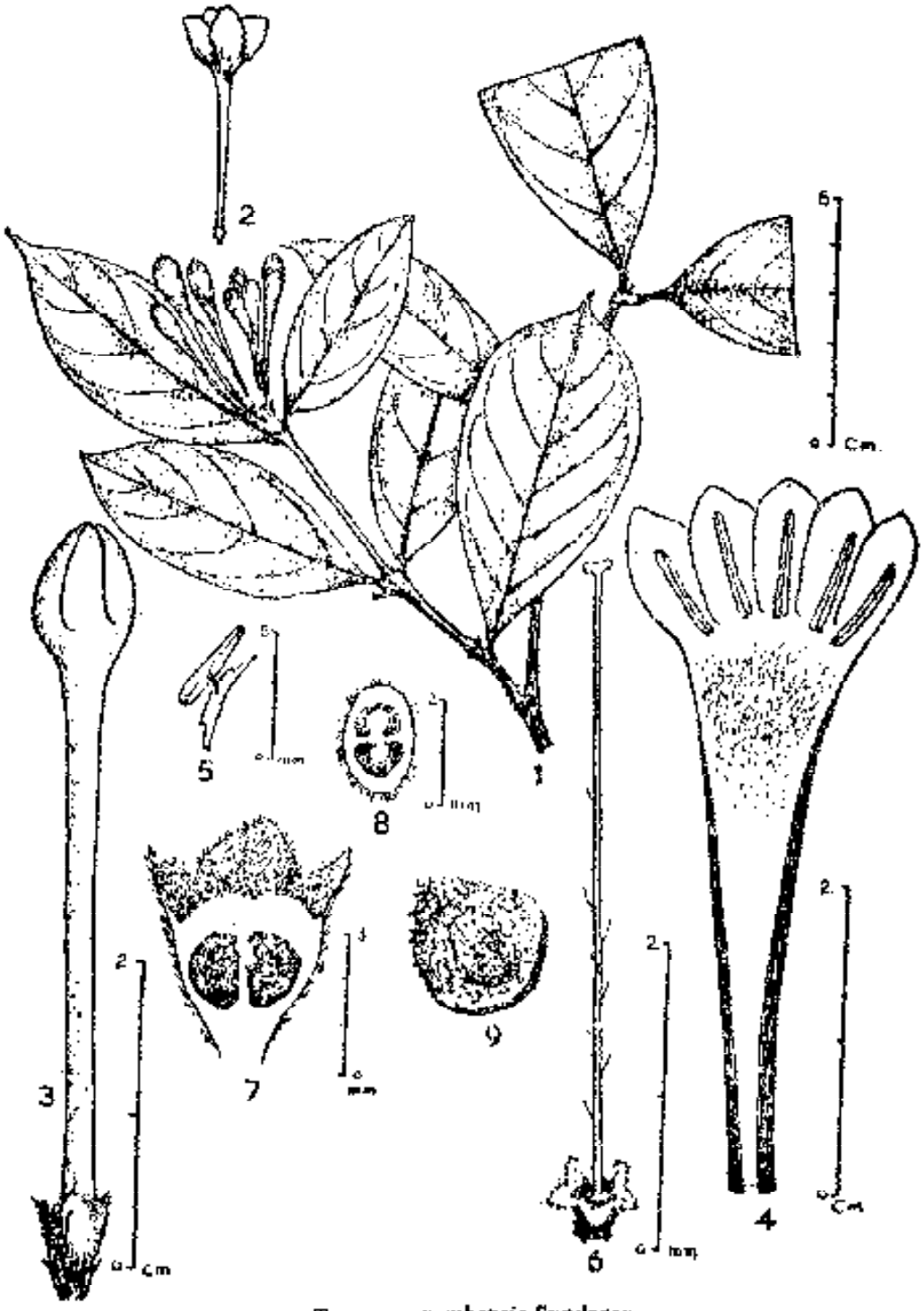
T. monosperma (Wt. & Arn.) Raju : Shrub/tree ; Southern W. Ghats, Travancore, & Tirunelveli.



Psychotria keralensis Deb & Gang.

A. Habit. B. Frult. C. Calyx. D. Disc. E. Seed (dorsal view). F. Seed (ventrul view).

Courtesy : Bull. Bot. Surv. India



Tarenna agumbensis Sundarar.

1. Flowering twig. 2. Fully open flower. 3. Enlarged & mature bud. 4. Corolla split open showing tube and lobes. 5. Stamen. 6. Style & stigma. 7. L.S. of ovary. 8. C. S. of ovary. 9. Ovule embedded amidst a cluster paraphyses like appendages. *Courtesy : Bull. Bot. Surv. India*

Tricalysia apiocarpa (Dalz.) Gamble : A small tree : W. Ghats, Konkan to southern hills of Coimbatore, Nilgiri, Anamalai & Travancore, 900-1200m.

T. sphaerocarpa (Hook. f.) Gamble : A small tree ; W. Ghats, Konkan, southwards to Tirunelveli.

Wendlandia angustifolia Wt. : A small tree ; Southern W. Ghats, Tirunelveli ; hills E. Ghats, Cuddapah hills. Rare & Threatened.

W. gamblei Cowan : Small glabrous tree ; E. Ghats, N. Circars, Ganjam & Visakhapatnam dist.

W. thyrsoidea (Roth) Steud. var. **lawii** (Hook. f.) Cowan. : A small tree; W. Ghats, Babubadan hills of Mysore. Rare & Threatened.

W. tinctoria DC. subsp. **cinnamomea** Cowan : A small tree ; Deccan, Hyderabad E. Ghats, Kurnool & Nellore dist.

OLACACEAE

This is a pantropical family of *ca* 25 genera and 250 species chiefly distributed in Africa and Asia and to a lesser extent in America. A few species also occur in Australia and the Pacific Islands.

In India the family is represented by *ca* 10 genera and 61 species of which 1 species and 1 variety are endemic to Peninsular India. The family's inclusion in the composition of Indian flora is indicative of a northeast Asian influence. The basically Indomalaysian genus *Anacolosa* is represented in India by 4 species, of which *A. densiflora* is a rare species endemic to the Southern W. Ghats. *Olax wightiana* var. *nigrescens* is also a rare endemic of Southern W. Ghats.

ENDEMIC TAXA :

Anacolosa densiflora Bedd. : Lofty tree : Southern W. Ghats, Anamalai (Coimbatore), Travancore hills, 750 m. Rare & Threatened.

Olax wightiana Wall. ex Wt. & Arn. var. **nigrescens** Gamble : A scandent shrub ; Southern W. Ghats, Tirunelveli & Anamalai (Coimbatore), Sivagiri hill. Rare.

SANTALACEAE

The Sandalwood family comprises *ca* 30 genera and 400 species distributed in the tropical and temperate regions. The members of the family consist of semiparasitic trees, shrubs or herbs showing a preference for dry habitat.

The family is represented in India by 7 genera and 10 species of which *Thesium wightianum* is endemic to Peninsular India. *Santalum album* popularly called the Sandal wood tree is indigenous but is cultivated in other places for its aromatic wood and oil.

ENDEMIC TAXA :

Thesium wightianum Wall. : Slender perennial herb ; Southern W. Ghats, Malabar, Nilgiri, Palni & Alapedi hills, above 900 m.

LORANTHACEAE

The Mistletoe family of parasitic nature comprises of *ca* 36 genera and 1300 species distributed in the wooded areas of the tropical and temperate regions of the world. Some groups tend to show localised or restricted distribution. In the eastern hemisphere the family has developed well in the Malaysian centre.

The family is represented in India by *ca* 11 genera and 45 species of which *ca* 24 percent, i.e. 11 species and 1 variety are endemic to Peninsular India. In India the family has greater concentrations in the North Eastern region and the Malabar coast in the south. *Helicanthes* is a monotypic genus and its single species complement (*H. elastica*) is a woody parasite with swollen joints. The genus *Tolypanthus* which comprises only 5 species is represented in India by 2 species of which *Tolypanthus lagenifer* is endemic to the W. Ghats.

ENDEMIC TAXA :

Dendrophthoe memecylifolia (Wt. & Arn.) Danser : Parasitic shrub ; Southern W. Ghats, Nilgiris, above 1550 m.

D. neelgherrensis (Wt. & Arn.) van Tieghem var. **clarkei** Hook f. : Parasitic shrub ; Southern W. Ghats, Nilgiris, 2100 m.

D. trigona (Wt. & Arn.) Danser : Parasitic shrub ; W. Ghats, Konkan to Coorg, Nilgiri & Palni hills, up to 900 m.

Elytranthe lepidophylla (Walp.) Danser : Slender parasitic shrub ; Southern W. Ghats, Courtallam, Tirunelveli hills, 1100 m.

Helicanthes elastica (Desr.) Danser : Parasitic shrub ; W. Ghats, Konkan to Travancore, low altitude ; Deccan in Karnataka ; E. Ghats-Chingleput & S. Arcot, 600 m.

Helixanthera intermedia (Wt.) Danser : Parasitic shrub ; Southern W. Ghats, Nilgiri, Palni & Travancore hills, 900-1800 m.

H. obtusata (Schult.) Danser : Parasitic shrub ; W. Ghats, all districts including Nilgiri & Palni hills, above 1550 m.

Helixanthera wallichiana (Schult.) Danser : Parasitic shrub ; W. Ghats, Konkan Kanara & southwards, up to 1200 m.

Loranthus recurvus Wall. : Parasitic shrub ; Southern W. Ghats, Nilgiris, above 1800 m.

L. sarcophyllus Wall. : Parasitic shrub ; Southern W. Ghats, Nilgiris & hills of Madurai.

Taxillus heyneanus (Schult.) Danser : Parasitic shrub ; E. Ghats, N. Circars, Visakhapatnam hills, Cuddapah, Kurnool-S. Arcot, extending westwards to W. Ghats, 600 m.

Tolypanthus lagenifer (Wt.) van Tieghem : Parasitic shrub ; W. Ghats. Konkan, Kanara, Malabar.

VISCACEAE

This family of semiparasitic shrubs comprises *ca* 11 genera and 450 species. The members are cosmopolitan in distribution with greater development in the tropical and subtropical regions.

Of the 14 Indian representatives of the genus *Viscum* only 2 species are endemic to Peninsular India.

ENDEMIC TAXA :

Viscum mysorense Gamble : Parasitic shrub ; Deccan Hassan, Mysore (Arsikere) in Karnataka, 600 m.

V. orbiculatum Wt. : Small bushy shrub ; Southern W. Ghats, Mysore, Nilgiris, 1550 m.

CELASTRACEAE

The spindle tree family comprising *ca* 55 genera and 850 species is widespread but more concentrated in tropical and subtropical areas.

The family is represented in India by 11 genera and 64 species, of which 13 species are endemic to Peninsular India. The genera with the highest representation of endemic species are *Euonymus* (with 5 endemic species) and *Microtropis* (with 5 endemic species). Most species of the family show Malaysian affinity except for species of *Euonymus* which is a temperate genus.

ENDEMIC TAXA :

Euonymus angulatus Wt. : Small tree ; Southern W. Ghats, Coorg, Nilgiris & hills of Coimbatore at about 1500 m. Rare.

Euonymus crenulatus Wall. ex Wt. & Arn. : Small glabrous tree ; Southern W. Ghats, Nilgiris, Palni hills, 2500 m.

E. indicus Heyne ex Roxb. : Small tree ; W. Ghats, south of Konkan, S. Kanara, Wynaad, Coorg & Nilgiris, about 900 m.

E. paniculatus Wt. ex Lawson : Tree/shrub ; Southern W. Ghats, Tirunelveli & Travancore. Rare.

E. serratifolius Bedd. ; Shrub/small tree ; W. Ghats Malabar, Nilgiris & Travancore hills, Wynaad, 900-1500 m. Rare & Threatened.

Glyptopetalum lawsonii Gamble : Large shrub/small tree ; Southern W. Ghats, Nilgiris, Coimbatore, at low altitudes.

Maytenus bailadilana (Swamy & Mooney) Raju & Biswas : Large shrub/small tree ; E. Ghats, Koraput-Kalahandi, extending westward to Bastar dist. of Madhya Pradesh.

M. heyneana (Roth) Raju & Babu : Shrub ; Southern W. Ghats, Travancore, Nilgiris & Palni hills.

Microtropis densiflora Wt. : Large straggling shrub/small tree ; W. Ghats, Nilgiris. Rare & Threatened.

M. latifolia Wt. : Small tree ; W. Ghats from Konkan & southwards to Malabar, Nilgiris, at 600 1800 m.

M. microcarpa Wt. : Erect shrub/small tree ; W. Ghats, Konkan, Nilgiris, Palni hills.

M. ovalifolia Wt. : Evergreen shrub or small tree ; W. Ghats, Nilgiris, Ootacamund & Courtallam.

M. stocksii Gamble ; Small tree ; W. Ghats, Konkan, Coorg, Nilgiris, Anamalais, Tirunelveli, at 1500 m.

AQUIFOLIACEAE

The Aquifoliaceae is a bi-generic family with *ca* 400 species in the world. They occur in both tropical and temperate regions.

The genus *Ilex* is represented in India by 22 species, of which two are endemic to Peninsular India. Thus the percentage of endemism in Peninsular India in relation to Indian species of the family is 9.09%. *Ilex gardneriana* is a rare and endangered endemic plant confined to the Nilgiris at an altitude of about 1800 metres.

ENDEMIC TAXA :

Ilex gardneriana Wt. ; Small tree or large shrubs ; Southern W. Ghats, Nilgiris, 1800 m. Rare & Endangered.

Ilex malabarica Bedd. : Large tree : W. Ghats, Konkan southwards to Nilgiri, Coimbatore & Madurai ; Salem of E. Ghats, 900 m.

ICACINACEAE

The family consisting of *ca* 58-60 genera and 400 species is distributed in the tropical rain forests of Malaysia, India, Africa, Central America, and to a very lesser degree in the subtropics.

In India this family is represented by *ca* 9 genera and 16 species of which 2 species are endemic to Peninsular India. Of the two Indian representatives of the genus *Apodytes*, *A. dimidiata* is endemic to South India.

The genus *Miquelia* is represented in India by *ca* 3 species of which *M. dentata* is endemic and apparently rare in the Anamalai hills (Coimbatore dist.) of Tamil Nadu.

ENDEMIC TAXA :

Apodytes dimidiata E. Meyer ex Arn. : A medium sized tree. ; Southern W. Ghats, Travancore, Nilgiris, Anamalais (Coimbatore), Madurai, Tirunelveli hills, up to 900 m. ; E. Ghats Chingleput & Salem.

Miquelia dentata Bedd. : A climbing shrub. ; Southern W. Ghats, Anamalai (Coimbatore). Rare.

EUPHORBIACEAE

This is one of the largest families comprising *ca* 300 genera and 5000 species. It is a cosmopolitan family, occurring throughout the world except the arctic region. Though Euphorbiaceae are predominantly tropical in distribution some species occur in temperate regions as well. Indo-Malaysia and the New World tropics are the main centres of development in the tropical region. The members of this family tend to have strong local concentrations and are mostly found in gregarious colonies.

In India the family is represented by *ca* 61 genera and 344 species of which 73 species and 3 varieties, i.e. 21% are endemic to Peninsular India. *Pseudoglochidion* is a monotypic endemic genus of the Southern W. Ghats. Of the 73 endemic species, 12 species are rare. The genera with the highest representation of endemic genera are *Glochidion* (with 8 endemic species and 8 varieties), *Drypetes* (with 8 endemic species), *Reidia* (with 7 endemic species), *Phyllanthus* (with 6 endemic species) and *Euphorbia* (with 3 endemic species).

ENDEMIC TAXA :

Aporusa bourdillonii Stapf. : Small tree ; Southern W. Ghats, Travancore, at low altitudes.

Baccaurea courtallensis Muell.-Arg. ; Evergreen tree ; W. Ghats, due south of Kanara, Anamalais-Travancore.

Blachia denudata Benth. : A shrub/small tree ; W. Ghats, Konkan, Kanara, Bababudan hills of Karnataka.

B. reflexa Benth. : A shrub ; Southern W. Ghats, Nilgiris, Coorg, Travancore, 300 m. Rare & Threatened.

Bridelia cinerascens Gehrm. : A small tree ; E. Ghats, hills of Cuddapah, Nellore & Chingleput.

B. crenulata Roxb. : A large tree ; W. Ghats, all hilly districts of Maharashtra and Karnataka, Coimbatore ; E. Ghats, Shevaroys of Salem.

Chamaesyce longistyla (Boiss.) Raju & Rao : Erect delicate herb ; Deccan-Ceded districts.

C. senguptae (Balakr. & Subr.) Raju & Rao : Tall herbaceous plant ; E. Ghats, Nallamalais & hills of Cuddapah dist., 800 m.

Claoxylon anomalum Hook. f. : A shrub ; Southern W. Ghats-Tirunelveli of Courtallam, Travancore, 1100 m.

Cleistanthus malabaricus Muell.-Arg. : A large shrub/small tree ; W. Ghats, Konkan, Kanara, southwards to Travancore, 300-900 m.

C. travancorensis Jabl. : A small tree ; Southern W. Ghats, Travancore, 800 m.

Croton lawianus Nimmo : A small tree ; W. Ghats, Kanara, Bababudan hills of Karnataka.

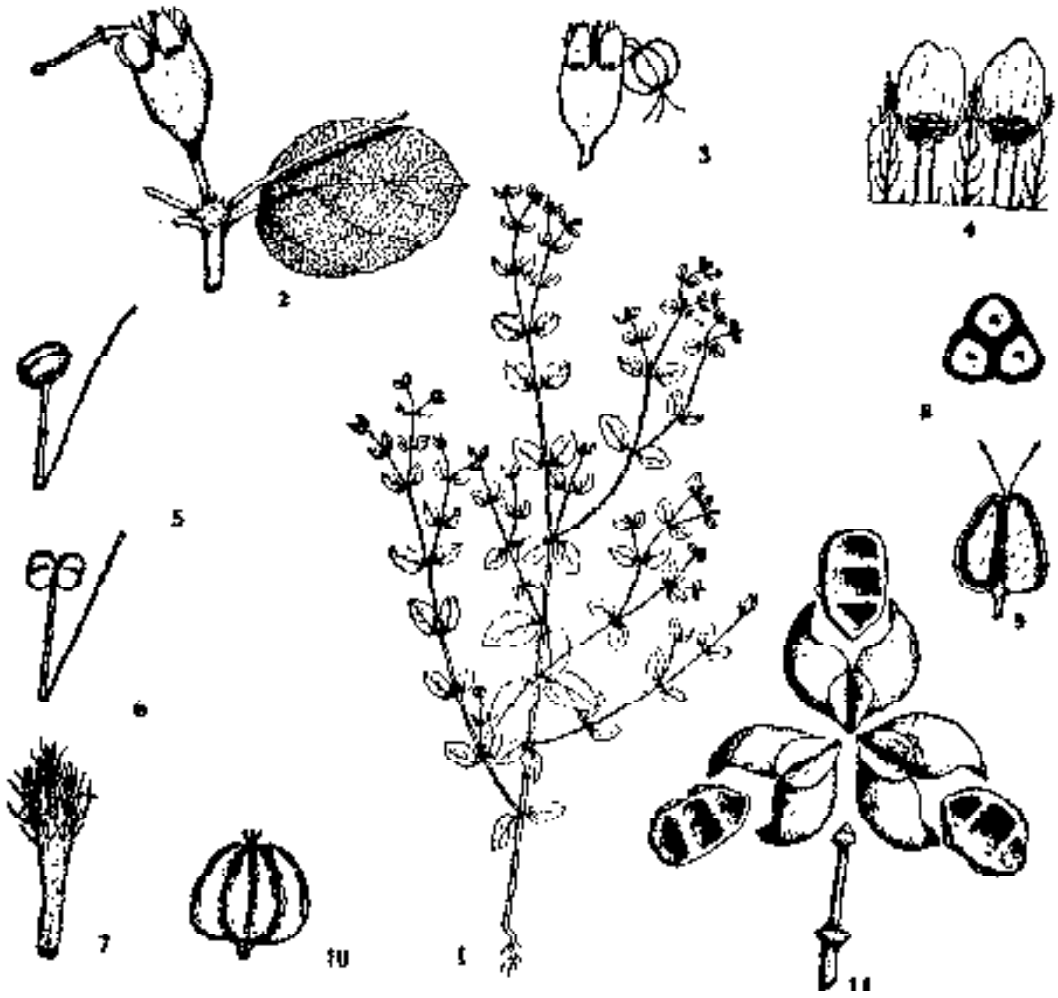
C. malabaricus Bedd. : A medium sized tree : W. Ghats, in all districts, 900-1300 m.

C. scabiosus Bedd. : A small tree ; E. Ghats, hills of Cuddapah & Kurnool dist., 300-1400 m. Rare & Threatened.

Dalechampia velutina Wt. : Twining undershrub ; Southern W. Ghats, Nilgiris, above 1600 m.

Dimorphocalyx lawianus Hook. f. : Small/medium sized tree ; W. Ghats, all districts, up to 1400 m.

Drypetes confertiflorus (Hook. f.) Pax & Hoffm. : A large tree ; W. Ghats, Kanara, Malabar, southwards to Travancore.



Chamaesyce senguptae (Balakr. & Subr.) Raju & Rao
(*Euphorbia senguptae* Balakr. & Subr.)

1. habit × .25 ; Fig. 2. a node showing leaf, stipule, branches and involucre × 5 ; Fig. 3. involucre showing limb of gland and fruit × 5 ; Fig. 4. a portion of involucral cup showing glands with entire limbs and involucral lobes between them × 7.5 ; Fig. 5-6. two views of male flower × 10 ; Fig. 7. peripheral bracteole × 10 ; Fig. 8. T.S. of ovary × 6 ; Fig. 9. L.S. of ovary × 6 ; Fig. 10. capsule × 2.5 ; Fig. 11. dehisced capsule with columella, valves and seeds × 4.

Courtesy : Bull. Bot. Surv. India

Drypetes elata (Bedd.) Pax & Hoffm. : A large tree ; W. Ghats, Anamalai, Wynaad & Tirunelveli.

D. malabarica (Bedd.) Airy Shaw : A medium sized tree ; Southern W. Ghats, Tirunelveli & Travancore hills, 1900-1600 m. Rare & Threaned.

D. oblongifolia (Bedd.) Airy Shaw : A tree ; W. Ghats, Coorg & Wynaad to Anamalais & hills of Tirunelveli & Travancore, 600-1200 m.

D. porteri (Gamble) Pax & Hoffm. A small evergreen tree ; Madurai dist., 600 m.

D. travancorica (Bourd.) S.K. Jain : Medium sized tree ; Southern W. Ghats, Travancore, 300 m.

D. venusta (Wt.) Pax & Hoffm. : Small tree ; W. Ghats, Kanara to Nilgiris & Tirunelveli, 1300 m.

D. wightii (Hook. f.) Pax & Hoffm. : Small/ moderate tree ; W. Ghats, Anamalais, Travancore, 900-1600 m.

Emblica fischeri Gamble : A small tree ; E. Ghats, Chingleput of Tamil Nadu, Nellore dist. of Andhra Pradesh ; W. Ghats, Coimbatore & Anamalais, 900 m.

Euphorbia corrigoloides Boiss. : Herb with stout rootstock ; S. Deccan, Northern districts of Tamil Nadu, usually near the coast ; Inland-Bellary.

E. mayuranathanii Croizat : Northern dry districts of Tamil Nadu.

E. notoptera Boiss. : Slender erect herb ; W. Coast, Konkan & Kanara in cultivated lands.

E. peltata Roxb. : Small erect herb ; Interior of Coromandel coast, northern dry districts of Tamil Nadu.

E. santapaui Henry : Glabrous shrub/tree ; Southern W. Ghats, Agastyamalais, Tirunelveli, 1650 m.

Excoecaria robusta Hook. f. : A shrub ; Southern W. Ghats, Coorg, Nilgiris, Anamalais, Travancore, Tirunelveli & Trichinapolly, 600-1600 m.

Glochidion arboreum Wt. : Small tree ; W. Ghats, Kanara, Tirunelveli & Nilgiris.

Glochidion bourdillonii Gamble : A small evergreen tree ; W. Ghats, evergreen forest, up to 1400 m. Rare & Threatened.

G. ellipticum Wt. var. **ellipticum** : Moderate sized tree ; W. Ghats, Kanara & all districts in evergreen forests, up to 1300 m.

G. ellipticum Wt. var. **ralphii** Gamble : Moderate sized tree ; Southern W. Ghats, Tirunelveli, 1100 m.

G. johnstonei Hook. f. : Small tree ; W. Coast & W. Ghats, Konkan, Kanara, Cochin, at 600 m.

G. malabaricum Bedd. : Small tree ; W. Ghats, Konkan, Kanara to Coorg, Nilgiris, Travancore, Palni hills (?).

G. neilgherrense Wt. : Medium sized tree ; Southern W. Ghats, Nilgiris, 1700-2300 m.

G. pauciflorum Gamble : Tree ; Southern W. Ghats, Nilgiris & Palni hills, 1600-2200 m. Rare & Threatened.

G. sisparense Gamble : Tree ; Southern W. Ghats, Nilgiris, 1600 m.

G. tomentosum Dalz. : Small tree ; W. Ghats, Konkan, Kanara, Coorg to Malabar-Travancore, 1300 m.

Jatropha maheshwarii Subr. & Nayar : Erect shrub ; Southern W. Coast, Cape Comorin & Tirunelveli.

J. tanjorensis Ellis & Saroja : Tall shrub ; E. Ghats, Tanjore, Ramnad dist, Trichinapolly.

J. villosa Wt. var. **ramnadensis** Ramam. : Erect shrub ; E. Ghats, Ramnad dist. of Tamil Nadu.

J. villosa Wt. var. **villosa** : Low shrub ; Deccan, Karnataka, Coimbatore.

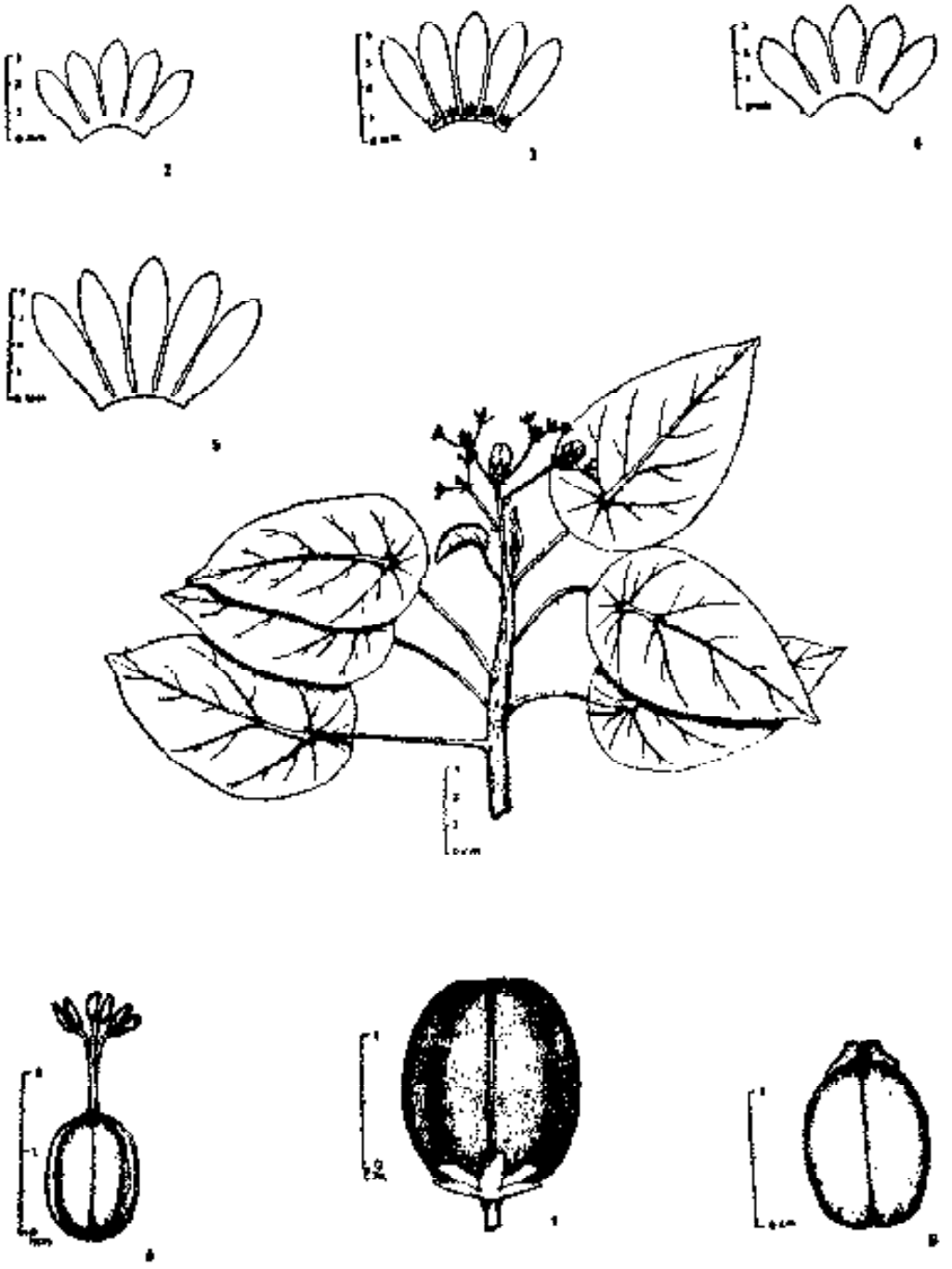
Koilodepas calycinum Bedd. : A small tree ; Southern W. Ghats, Tirunelveli, Sivagiri hills.

Lasiococca comberi Haines : Small tree ; E. Ghats, Visakhapatnam dist. Rare & Threatened.

Mallotus atrovirens Hook. f. : Shrub (?) ; W. Ghats, Cochin-Travancore, Anamalais, low altitudes.

M. aureo-punctatus Muell.-Arg. : Small tree ; W. Ghats, Konkan, Karnataka, Cochin, Travancore, Tirunelveli, 600 m.

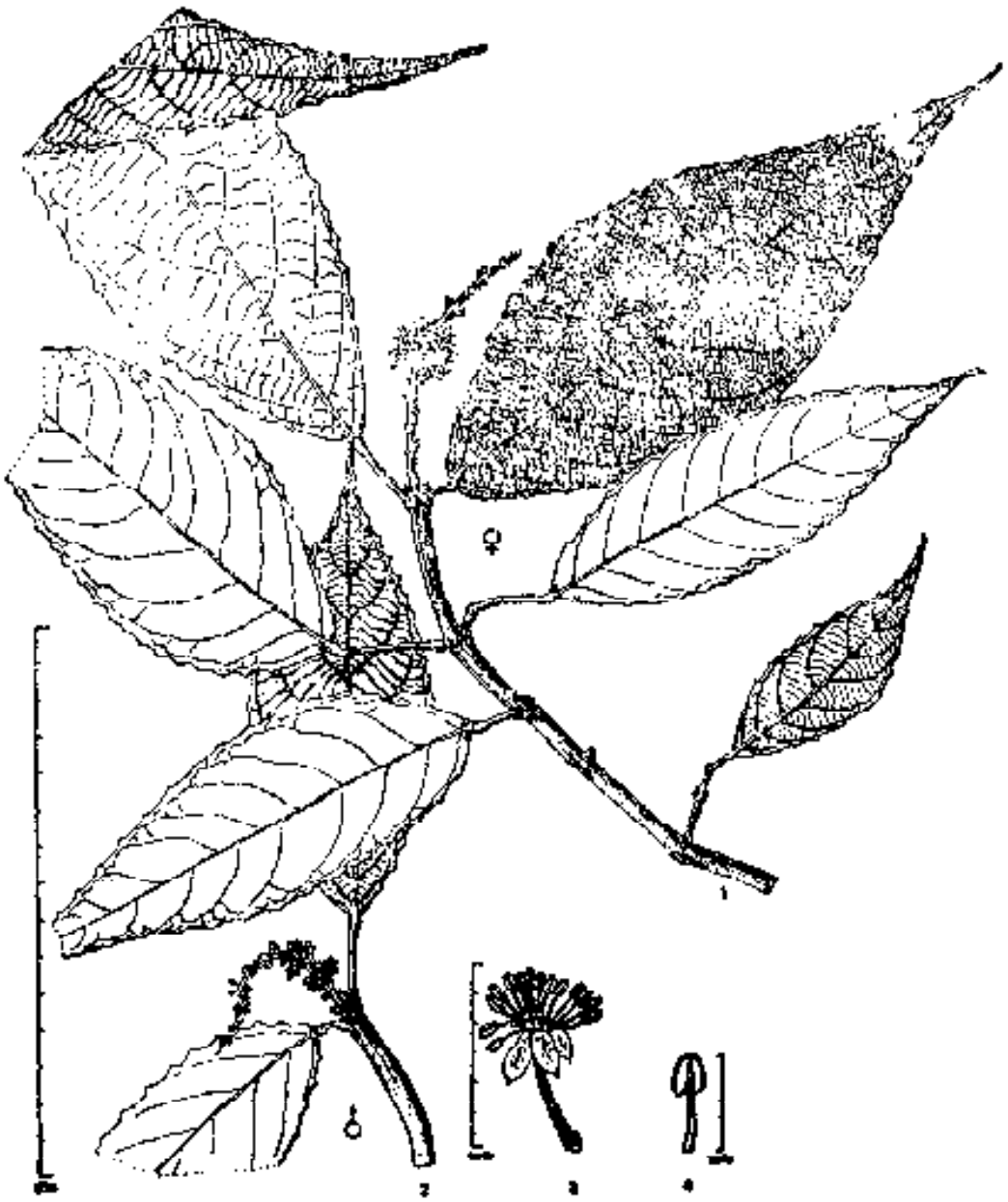
M. beddomei Hook. f. : A shrub ; W. Ghats, Wynaad, Anamalais, Travancore, Tirunelveli & Coimbatore hills, up to 1600 m.



Jatropha maheshwarii Subr. & Nayar

1. Twig. 2. Calyx-male flower. 3. Corolla-male flower. 4. Calyx-female flower. 5. Corolla-female flower. 6. Pistil. 7. Fruit. 8. Seed.

Courtesy : Bull. Bot. Surv. India



Mallotus subramanyamii Ellis

1. A fruiting branch showing a few leaves above and below (diagrammatic). 2. A male flowering branch. 3. A male flower. 4. A stamen.

Courtesy : Bull. Bot. Surv. India

Mallotus muricatus Bedd. : A tree ; E. Ghats, Chittoor dist. 1100 m. Tiruchirapally, Southern W. Ghats, Anamalais, Travancore & Tirunelveli.

M. stenanthus Muell.-Arg. : Small tree ; W. Ghats, Konkan, Kanara, southwards to Anamalais, Travancore & Tirunelveli.

M. **subramanyamii** Ellis : Tree ; Nilgiris.

Meineckia suberosa (Wt. ex Muell.-Arg.) K.K.N. Nair. : Slender under shrub , E. Ghats, hills of Visakhapatnam & Godavari dists., Deccan, Nellore dist., W. Ghats, Coimbatore & Palni hills.

Microcoeca beddomei Prain : Undershrub ; Southern W. Ghats, Anamalais, Travancore & Tirunelveli hills, 2000 m.

M. wightii Prain : Slender undershrub ; Southern W. Ghats, Travancore, Tirunelveli. Rare & Threatened.

Neopeltandra longipes Gamble : Undershrub ; Southern W. Ghats, Coimbatore, Anamalai, Tirunelveli hills, up to 1800 m.

Phyllanthus kozhikodianus Sivarajan & Manilal : Kerala.

P. macraei Muell. Arg. var. **hispidus** Gamble : Shrub; Southern W. Ghats, Palni hills, 2100-2200 m.

P. macraei Muell.-Arg. var. **macraei** : Shrub ; Southern W. Ghats, Sholas of Palni hills & Tirunelveli, 1550-2200 m.

P. missionis Hook. f. : Erect undershrub ; Southern W. Ghats, Coimbatore to Tirunelveli, low altitudes.

P. narayanaswamii Gamble : Undershrub ; E. Ghats, hills of Visakhapatnam & Godavari dist., 1400 m. Rare & Threatened.

P. talbotii Sedge : Erect shrub ; Karnataka, Jog falls & Supa.

Pseudoglochidion anamalayanum Gamble : Small tree ; Southern W. Ghats, Anamalais, 1300 m.

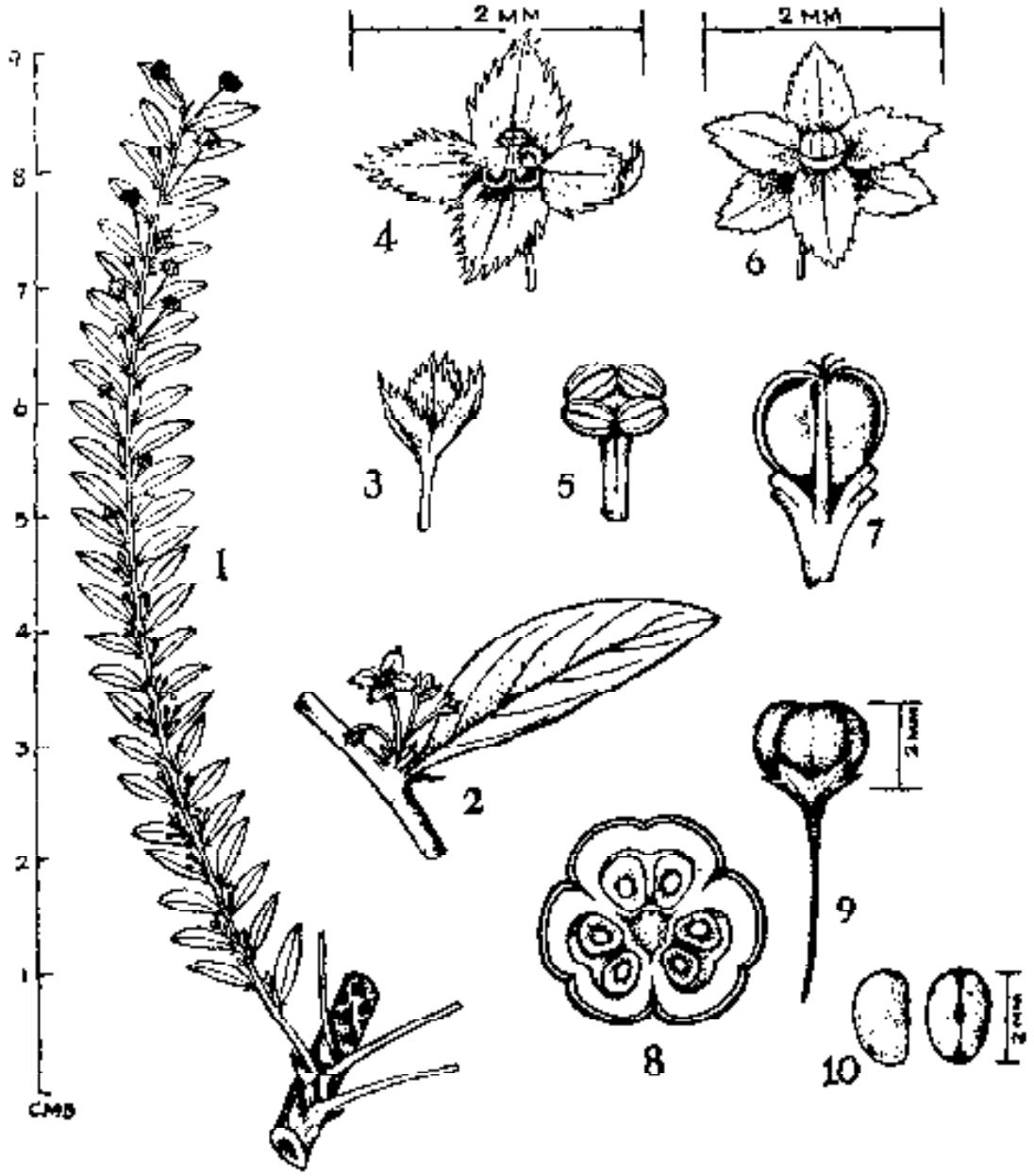
Reidia beddomei Gamble : Undershrub ; Southern W. Ghats, Tirunelveli & Travancore hills, 1300 m. Rare & Threatened.

R. fimbriata Wt. : Glabrous shrub ; Southern W. Ghats, Nilgiris, 1300 m.

R. gageana Gamble : Undershrub ; Southern W. Ghats, Tirunelveli & Travancore hills, 600 m. Rare & Threatened.

R. macrocalyx Gamble : Undershrub ; W. Ghats, Sivagiri hills, Tirunelveli, Babadudan hills of Karnataka.

R. megacarpa Gamble : Undershrub ; W. Ghats, Wynaad, 900 m. Rare & Threatened.



Redia singompattiana Sebastine & Henry

1. A portion of the stem showing a branchlet ; Fig. 2. A node showing leaf, stipule and male flowers rising from a tuft of imbricate bracts ; Figs 3-4. Two views of male flower ; Fig. 5. Staminal column showing 4 stamens united ; Fig. 6. Female flower ; Fig. 7. L.S. of ovary ; Fig. 9. Capsule ; Fig. 10. Two views of seed.

Courtesy : Bull. Bot. Surv. India

Reidia singampattiana Sebastine & Henry : Tall shrubby plant ; Southern W. Ghats, Tirunelveli dist.

R. stipulacea Gamble : Straggling shrub ; Southern W. Ghats, Anamalais, Palni hills. Rare & Threatened.

Symphyllia malloltiformis Muell.-Arg. : A tree ; E. Ghats, Cuddapah hills ; W. Ghats, Kanara, Coorg to Anamalais, Tirunelveli, Travancore, Nilgiri hills, 900-1100 m.

Tragia bicolor Miq. : Climbing herb ; W. Ghats, Nilgiris, Palni, 1550-1800 m.

T. gagei Haines : Herb ; E. Ghats, Circars.

Trewia polycarpa Benth. : Tree ; W. Ghats, Konkan, Malabar & Travancore, low altitudes, W. Coast.

Trigonostemon beddomei (Benth.) Balakr. : Small tree ; W. Ghats, Travancore & Tirunelveli.

RHAMNACEAE

The family comprises *ca* 58 genera and 900 species distributed almost all over the world.

In India the family is represented by *ca* 12 genera and 51 species of which 5 species are endemic to Peninsular India. *Ventilago goughii* is a rare and endangered plant of the southern W. Ghats.

ENDEMIC TAXA :

Colubrina travancorica Bedd. : Unarmed shrub ; Travancore, near the coast.

Ventilago bombaiensis Dalz. : Climbing shrub ;W. Ghats, Chikmagalur, Coorg, N. Kanara, Wynaad, 900 m.

V. gamblei Suesseng. : A climbing shrub ; South W. Ghats, Malabar-Tirunelveli & Coimbatore.

V. goughii Gamble : Climbing shrub ; Southern W. Ghats, Coorg, Nilgiris & Tirunelveli. Endangered.

Ziziphus horrida Roth : A thorny shrub ; E. Ghats, Kurnool dist., W. Ghats, Mysore & N. Kanara.

LEEACEAE

The family comprises a single genus constituting *ca* 70 species. The members are mainly Palaeotropical. (Some workers treat this under Vitaceae).

The genus *Leea* is represented in India by 20 species, of which only 1 species is endemic to Peninsular India.

ENDEMIC TAXA :

Leea talbotii King & Talbot : Undershrub ; W. Ghats N. Kanara

VITACEAE

(*nom. altern.* Vitidaceae)

This is a small family comprising *ca* 12 genera and 700 species distributed in the tropical and subtropical regions. *Vitis vinifera* is, however, widely cultivated in the temperate parts as well.

The family is represented in India by *ca* 8 genera and 42 species, of which 7 species are endemic to Peninsular India. *Ampelocissus* is a tropical genus with 10 Indian representatives, of which 2 species are endemic to Peninsular India. The genus *Tetrastigma*, which is distributed in Southeast Asia, Indomalaysia and Australia, is represented in India by 7 species of which 3 species are endemic to Peninsular India. *Ampelocissus arnottiana* and *Cayratia roxburghii* are rare and threatened plants.

ENDEMIC TAXA :

Ampelocissus araneosa (Dalz. & Gibs.) Planch : Slender climbing shrub ; W. Ghats, Konkan (?), Mysore, Nilgiris, Anamalais & Palni hills, Tirunelveli, Madurai, Tiruchirapalli ; Southern E. Ghats, Shevaroys, 1350 m.

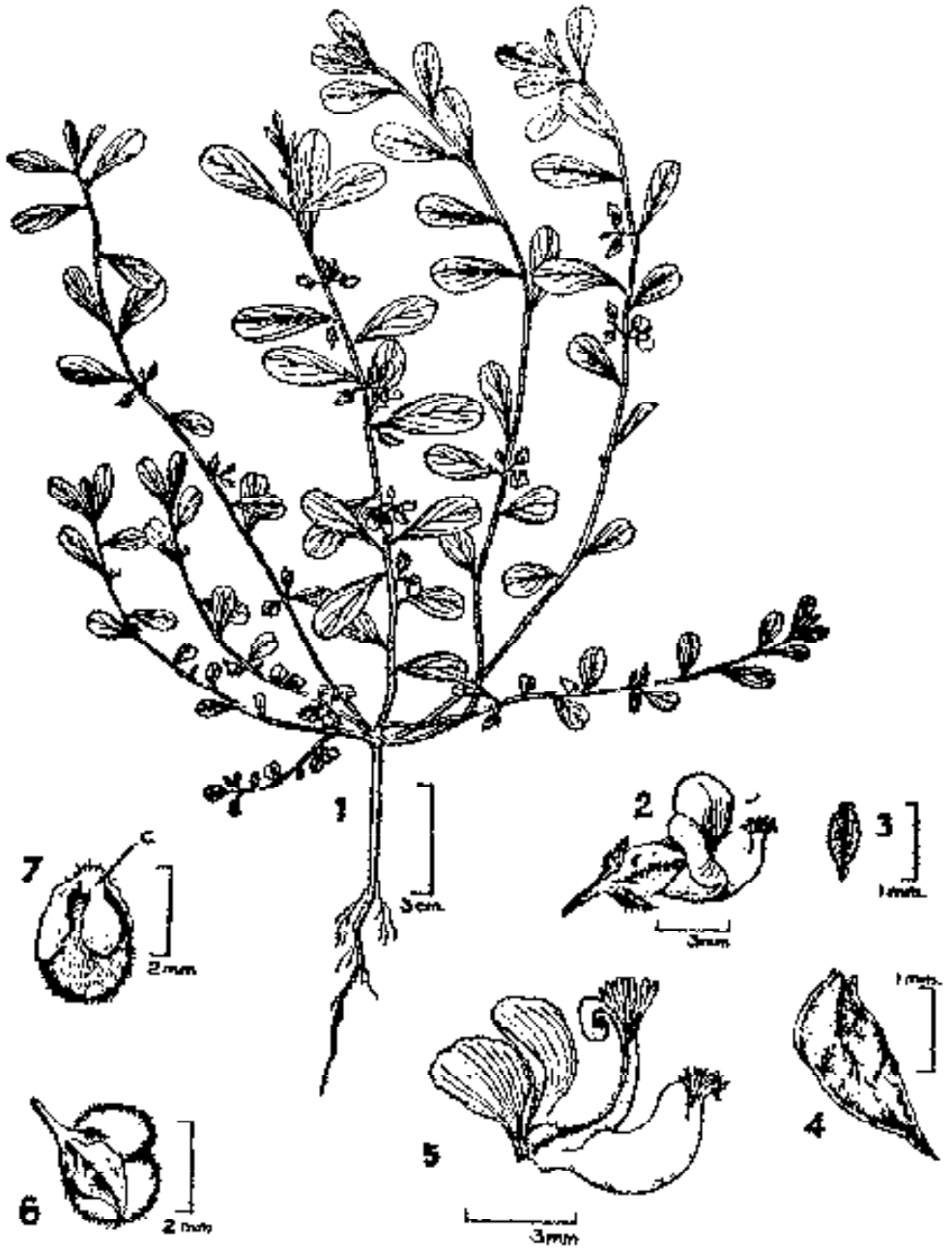
A. arnottiana Planch : Climbing shrub ; W. Coast/Ghats, Kanara, Wynaad Tirunelveli, Nilgiris, up to 900 m. Rare & Threatened.

Cayratia roxburghii (Wt. & Arn.) Gagnep : Glabrous climbing shrub ; Southern W. Ghats, Tirunelveli hills. Rare.

Cissus glauca Roxb. : Stout rambling shrub ; W. Ghats/Coast, south of Konkan to Nilgiri & Tirunelveli & E. Ghats, Salem, N. Arcot.

Tetrastigma canarense (Dalz.) Gamble : Climbing shrub ; W. Ghats, Kanara, Wynaad, Coimbatore, 900 m.

T. muricatum (Wt. & Arn.) Gamble : Climbing shrub ; W. Ghats, throughout Konkan-Travancore hills, 1800 m.



Polygala jacobii Chandr.

1. Habit sketch. 2. A single flower. 3. Outer sepal. 4. Inner sepal. 5. Flower with sepals removed and petals spread out to show androecium and gynoecium. 6. Fruit. 7. Seed. (*c*-caruncle).

Courtesy : Bull. Bot. Surv. India.

Tetrastigma sulcatum (Laws.) Gamble : Large climbing shrub ; Southern W. Ghats, Malabar, Nilgiris Anamalais Travancore hills, Coimbatore, 1350 m. Southern E. Ghats, Salem.

MALPIGHIACEAE

The family comprises *ca* 60 genera and 800 species which are tropical in distribution. Its centre of development is south America.

The family is rather poorly represented in India. The genus *Aspidopterys* which occurs from the Himalayas to S. China, W. Malaysia and Celebes, is represented in India by *ca* 9 species, of which only 2 species are endemic to Peninsular India. The endemic species *A. canarensis* is rare and threatened.

ENDEMIC TAXA :

Aspidopterys canarensis Dalz. : Climbing shrubs. ; Deccan W. Ghats, Kanara, Malabar to Tirunelveli. Rare & Threatened.

A. **hutchinsonii** Haines : Climbing shrubs ; E. Ghats of Orissa at Mayurbhanj, 900 m.

POLYGALACEAE

The family comprises *ca* 12 genera and 800 species. It is cosmopolitan in distribution excepting New Zealand, the Polynesian islands of the Pacific and the Arctic zone.

The cosmopolitan genus *Polygala* is represented in India by *ca* 20 species of which 3 species are endemic to Peninsular India.

ENDEMIC TAXA :

Polygala bulbothrix Dunn : Diffuse annual herb ; Southern W. Ghats, Coimbatore to Tirunelveli, Madurai, Ramanathapuram, Dharmapuri & E. Ghats, Salem.

P. jacobii Chandr. : Ascending/decumbent annual herb ; Tamil Nadu, Coimbatore, Tiruchirapalli ; South Arcot of E. Ghats.

P. wightiana (Wall.) Wt. & Arn. : Erect/ascending herb ; Coimbatore, Madurai, Ramanathapuram, Tirunelveli, Dharmapuri, Salem & Tiruchirapalli.

STAPHYLEACEAE

Staphyleaceae is a small family comprising *ca* 5 genera and 60 species which are distributed mostly in the north temperate and tropical regions of Asia and America. The genus *Tapiscia* is native to China while *Huertea* is native to Cuba, Hispaniola, Columbia and Peru. *Euscaphis* is east Asian, while *Turpinia* occurs in the tropical and temperate parts of Asia and America.

In India the family is represented by 2 genera and 5 species of which only 1 species, belonging to the genus *Turpinia*, is endemic to Peninsular India.

ENDEMIC TAXA :

Turpinia malabarica Gamble : A large tree ; W. Coast/W. Ghats, Travancore hills at low altitudes, Nilgiris, Anamalais & Madurai.

SAPINDACEAE

The Litchi family comprising *ca* 150 genera and 2000 species is cosmopolitan in tropical and temperate regions.

The family is represented in India by *ca* 19 genera and 45 species, of which 2 species and 2 varieties are endemic to Peninsular India. The widespread genus *Allophyllus* is represented in India by 8 species, of which 1 species and 2 varieties are endemic to Peninsular India. The genus *Otonephelium* is monotypic.

ENDEMIC TAXA :

Allophylus concanicus Radlk. var. **concanicus** : Large shrub/erect or climbing ; W. Ghats, Kanara, Malabar-Travancore, Nilgiri.

A. concanicus Radlk. var. **lanceolatus** Gamble : Erect/climbing shrub ; Southern W. Ghats, Nilgiris, Anamalais (Coimbatore dist.), Palni hills (Madurai) & Tirunelveli, up to 1200 m.

A. serrulatus Radlk. : Shrub/small tree ; Throughout W. Ghats (?) Common in Nilgiri & Palni hills (Madurai), Coimbatore, up to 1500 m, Salem of E. Ghats.

Otonephelium stipulaceum (Bedd.) Radlk. : A medium sized tree ; Southern W. Ghats, Hassan, Coorg, Malabar hills, Travancore & Anamalais (Coimbatore), Nilgiris, Tirunelveli, up to 900 m.

BURSERACEAE

This is a tropical family having *ca* 16 genera and 500 species, of which 5 genera and 21 species are represented in India.

The genus *Boswellia*, which has 20 species in the world is represented in India by only 3 species of which only one, i.e. *Boswellia ovalifoliolata* is endemic to the E. Ghats of Peninsular India.

ENDEMIC TAXA :

Boswellia ovalifoliolata Balakr. & Henry : Medium sized tree ; E. Ghats, Tirupati and Nallamalai hills, 300 m.

ANACARDIACEAE

The family constitutes *ca* 60 genera and *ca* 600 species, occurring mostly in the tropical regions of the world, but also extending to the temperate regions of the Mediterranean, America and Eastern Asia.

The family is represented in India by 18 genera and 61 species, of which 16 species are restricted to the Peninsular India. In relation to the Indian species of this family, the percentage of endemism in Peninsular India is 30%. The genus *Holigarna* has 5 species endemic to Western Ghats and *Nothopegia* has 4 species and 1 variety which are endemic.

ENDEMIC TAXA :

Buchanania barberi Gamble : Tree ; Southern W. Ghats, Travancore. Rare & Threatened.

B. lanceolata Wt. : Medium-sized tree ; Southern W. Ghats, Travancore, Kerala (Quilon), 600 m. Rare & Threatened.

Gluta travancorica Bedd. : Large tree ; Southern W. Ghats, South of Travancore & Tirunelveli, 1100 m. ; Kanyakumari.

Holigarna arnottiana Hook. f. : Lofty tree ; W. Ghats, throughout in forests of low altitude.

H. beddomei Hook. f. : Lofty tree ; Southern W. Ghats, Travancore, Nilgiris & Anamalais.

H. ferruginea March. : Large tree ; Southern W. Ghats, Kanara, Coorg, Travancore, Anamalais (Coimbatore).

H. grahamii (Wt.) Kurz : Large tree ; Throughout the W. Ghats, up to Tirunelveli. Rare

Holigarna nigra Bourd. : Large tree ; Southern W. Ghats, Travancore & Tirunelveli, 650-1250 m.

Nothopegia aureo-fulva Bedd. : Small tree ; Southern W. Ghats, Tirunelveli. Endangered.

N. beddomei Gamble var. **wynaadica** Ellis & Chandr. : Small tree ; Southern W. Ghats, Wynaad & Courtallam.

N. castanaefolia (Roth) Ding Hou : Small tree ; Goa.

N. heyneana (Hook. f.) Gamble : Small tree ; Southern W. Ghats, Anamalai & Tirunelveli ; Ganjam, Salem & S. Arcot of E. Ghats.

N. travancorica Bedd. ex Hook. f. : Small tree ; W. Ghats, S. Kanara to Malabar, Travancore, Tirunelveli & Nilgiri, 900 m.

Semecarpus auriculata Bedd. : Large tree ; W. Ghats, Travancore & Tirunelveli, 900 m.

S. travancorica Bedd. : Large tree ; Southern W. Ghats, Travancore, Coimbatore & Tirunelveli, 1200 m.

Spondias indica (Wt. & Arn.) Airy Shaw & Forman : Tree ; W. Ghats, from Coorg to the Anamalais, hills of Travancore & Tirunelveli, 800 m.

MELIACEAE

The Mahogany family comprising *ca* 50 genera and 550 species is distributed in the tropical and subtropical regions. This family of arborescent woody habit shrubs and trees often constitutes the understorey of tropical rain forest.

The family is represented in India by *ca.* 17 genera and 72 species of which 12 species, and 2 varieties, i.e. approx. 18% are endemic to Peninsular India. The genus with the highest representation of endemic taxa in Peninsular India is *Aglaia* (with 9 endemic taxa). *Aglaia barberi* and *A. maiae* are rare. The Indomalaysian genus *Dysoxylon* is represented in India by 10 species, of which 2 species are endemic to Peninsular India. The species, *D. beddomei* is rare.

ENDEMIC TAXA :

Aglaia barberi Gamble : A small tree ; W. Ghats, Travancore, Coimbatore dist. & Tirunelveli hills, 900 m. Rare & Threatened.

A. elaeagnoidea (Juss.) Benth. var. **courtallensis** (Gamble) K. K. N. Nair. : A tree ; W. Ghats in Tirunelveli hills.

Aglaia elaeagnoidea (Juss.) Benth. var. **bourdillonii** (Gamble) K.K.N. Nair : A tree ; W. Ghats, Travancore hills, Kanyakumari & Tirunelveli, above 1100 m. Rare.

A. indica (Hook. f.) Harms : A shrub ; W. Ghats, Malabar-Nilgiri, up to 900 m.

A. lawii (Wt.) Saldanha : Medium sized tree ; W. Ghats, Konkan, Kanara, Malabar-Tirunelveli, apparently scarce.

A. malue Bourd. : A tree ; W. Ghats, Travancore hills, 350 m. Rare & Threatened.

A. minutiflora Bedd. : Slender tree ; W. Ghats, Annamalai & Travancore hills, Coimbatore, Nilgiri, 450-900 m.

A. simplicifolia (Bedd.) Harms. : A small tree ; W. Ghats, Coorg to Travancore ; Tirunelveli & Madurai, 600-1300 m.

A. tamilnadensis Nair & Rajan : A large tree ; W. Ghats, Kanara to Travancore hills, Coimbatore, Tirunelveli & Tiruchirapalli, up to 1100 m, E. Ghats, Salem.

Amoora beddomei Kosterm. : A tree ; W. Ghats, Anamalais.

Dysoxylum beddomei Kosterm. : A large tree ; Southern W. Ghats, Travancore (Peermade-Cardamom hills), up to 1100 m. Rare & Threatened.

D. ficiforme (Wt.) Gamble : A large tree ; W. Ghats, Travancore hills, Coimbatore, 300-600 m.

D. malabaricum Bedd. ex Hiern. : A large tree ; W. Ghats, Kanara to Travancore, Anamalais & Nilgiris, up to 900 m.

Reinwardtiodendron anamallayanum (Bedd.) Saldanha : Medium sized tree ; W. Ghats, N. Kanara, Shimoga to Annamalais, Malabar hills—Travancore & Tirunelveli, 450-900 m.

RUTACEAE

The family comprises *ca* 150 genera and 900 species distributed in the tropical and temperate regions of the world. The main centres of development of the family are South Africa and Australia. The so called "Citrus-belt" spans the Mediterranean region, Southern United States of America, Mexico, South Africa and Australia, i.e. it runs across the whole globe.

In India the family is represented by *ca* 24 genera and 88 species, of which 4 species (along with 2 varieties) are endemic to Peninsular India.

Aegle and *Paramignya* are Indomalaysian genera, others being much wider in distribution. *Aegle marmelos* var. *mahurensis*, *Pamburus missionis*, *Evodia luna-ankenda* var. *tirunelvelica* and *Vepris bilocularis* are rare.

ENDEMIC TAXA :

Aegle marmelos (Linn.) Corr. var. **mahurensis** Zate : Moderate sized tree ; Maharashtra, Nanded, Mahur, Osmanabad dist. & Santhal Paraganas in Orissa. Rare.

Evodia luna-ankenda (Gaertn.) Merr. var. **tirunelvelica** Henry & Chandr. : A tree with small leaves ; Southern W. Ghats, Tirunelveli & Kanyakumari. Rare.

Melicope indica Wt. : A shrub ; Southern W. Ghats, Nilgiris, 1800-2400 m.

Pamburus missionis (Wt.) Swingle : Shrub/small tree ; E. Ghats, Cuddapah ; W. Ghats, N. Kanara, Travancore, Nilgiris & Anamalais. Rare & Threatened.

Paramignya beddomei Tanaka : A climbing shrub ; Southern W. Ghats, Coimbatore (Anamalais) & Tirunelveli.

Vepris bilocularis (Wt. & Arn.) Engl. : A large tree ; W. Ghats, Konkan, Coorg, Shimoga, Malabar, Anamalais & Travancore hills, up to 1200 m. Rare.

OXALIDACEAE

The family comprises *ca* 3 genera and 875 species distributed mainly in the tropical and subtropical parts of Asia, Africa and America. A few species are temperate.

The family is represented in India by *ca* 2 genera and 10 species. The tropical genus *Biophytum* is represented in India by *ca* 9 species, of which 3 species and 1 variety are endemic to the Southern W. Ghats of Peninsular India. The endemic species *Biophytum insignis*, *B. intermedium* var. *pulneyensis* and *B. longibracteatum* have restricted distribution and are also rare in their respective habitats.

ENDEMIC TAXA :

Biophytum insignis Gamble : Herb ; Southern W. Ghats, Tirunelveli, Rare.

B. intermedium Wt. var. **pulneyensis** Edgew. & Hook. f. : An annual herb ; Southern W. Ghats, Madurai, Palni hills. Rare.

Biophytum longibracteatum Tad. & Jac. : Herb ; Southern W. Ghats, Tirunelveli, Rare.

B. polyphyllum Munro : Herb ; Southern W. Ghats, Nilgiris, 1800 2100 m.

BALSMINIACEAE

The Balsams comprise *ca* 4 genera and 600 species which are distributed in the tropical and temperate regions of Eurasia, Africa and North America.

The family is represented in India by 2 genera *Hydrocera* and *Impatiens*. *Hydrocera* is a monotypic genus confined to Asia only. The genus *Impatiens* is essentially a tropical/temperate genus occurring in Africa, Madagascar, Eurasia and mountains of India and Sri Lanka. In India the genus *Impatiens* has two major centres of development with discontinuous distribution in the Himalaya and Southern W. Ghats, showing a relatively high degree of endemism. Of the 178 species occurring in India, 70 species are endemic to the Peninsular India in the Southern W. Ghats, where they are concentrated. Thus, as per the present study, the percentage of endemism in context to the Peninsular region of India is 43 % of the Indian Balsams while the percentage of endemism, in India as a whole is as high as 91 % (Chatterjee, 1940).

The *Impatiens* group is, in all probability, a very ancient one having arisen from a common genetic stock and developed separately and independently on parallel lines in different centres, viz. the Himalaya, Burma, South India and Sri Lanka. The South Indian *Impatiens* are closely allied to their Sri Lankan counterparts, reflecting their common geological ancestry. Though most of the species of *Impatiens* are palaeoendemics, some could have evolved recently through speciation. All these endemics are well established in their particular habitat, showing their adaptability and preference for particular specialised ecological conditions.

Endemic Taxa :

Impatiens agumbeana Bhask. & Razi, Shimoga, Karnataka.

Impatiens aliciae C. E. C. Fisch. : Herb ; Southern W. Ghats, Chikmagalur, Travancore, 600 1600 m.

I. anaimudica C. E. C. Fisch. : Herb ; Southern W. Ghats, Travancore 2500 m.

I. auriculata Wt. : Epiphytic herb ; Southern W. Ghats, Tirunelveli & Travancore, above 1600 m, Rare & Threatened.

I. barberi Hook. f. : Herb ; W. Ghats of Karnataka (Hassan, Mysore, Shimoga.).

Impatiens campanulata Wt. : Erect herb ; Southern W. Ghats, Palni hills, Nilgiris-Anamalais, 1800 2200 m.

I. chandraekharanii Chandrab. : Scapigerous herb ; Southern W. Ghats, Coimbatore dist., Akkamatai, Annamalai, 1700 m.

I. clavicornu Turcz. : Herb ; Southern W. Ghats, Nilgiris, 1800 2500 m.

I. cochinica Hook. f. : Small semi-shrubby species ; Southern W. Ghats in Cochin, 600 m.

I. coelotropis C. E.C. Fisch. ; Herb ; Southern W. Ghats, Travancore, 2000 2300 m.

I. concinna Hook. f. : Erect herb ; Southern W. Ghats, Malabar.

I. cordata Wt. : Small plant ; Southern W. Ghats, Travancore, Wynaad, Anamalais, Tirunelveli, Madurai & Kanyakumari, 900 1600 m.

I. crenata Bedd. : Scapigerous herb ; Southern W. Ghats, Anamalais, 1600 2500 m. Rare & Threatened.

I. dasysperma Wt. : Annual herb ; W. Ghats of Karnataka (Chikmagalur, Mysore, N. Kanara, Shimoga), Kerala & Tamil Nadu (Tirunelveli), 1000 m. Rare & Threatened.

I. debilis Turcz. : Annual herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

I. dendricola C.E.C. Fisch. : An epiphytic herb ; W.Ghats, Coorg, 1300 m.

I. denisonii Bedd. : Annual scapigerous tuberous herb ; Southern W. Ghats, Nilgiris, 900 - 1600 m.

I. disotis Hook. f. ; Erect herb ; Southern W. Ghats, Travancore, Tirunelveli, Coimbatore & Mahendragiri hills of Kanyakumari dist., 1300 m.

I. diversifolia Wall. ex Wt. & Arn. : Succulent herb ; W. Ghats, Hassan, S. Kanara southwards to Coimbatore & Nilgiris, up to 1800 m.

I. elegans Bedd. : Erect herb ; W. Ghats, Travancore hills & Anamalais, 800 1600 m. Rare & Threatend.

I. floribunda Wt. : Erect herb ; Southern W. Ghats, Travancore, Coimbatore, Tirunelveli & Kanyakumari ; Salem of E. Ghats, 1800 2200 m. Rare & Threatened.

I. fruticosa DC. : Large erect shrub ; W. Ghats, Mysore, Nilgiri, Palni hills, Travancore, Tirunelveli & Salem of E. Ghats, 1600 1800 m.

Impatiens gardneriana Wt. : Tall erect annual ; W. Ghats, Chikmagalur, Hassan, Shimoga, Nilgiris, S. Wynaad, 500 1700 m.

I. goughii Wt. : Slender annual herb ; W. Ghats, Mysore, Nilgiris, Anamalais, Palni & Travancore, 1600 2500 m.

I. herbicola Hook. f. : Annual herb ; Southern W. Ghats, Hassan, Travancore & Anamalais (Coimbatore), 1500 m. Rare & Threatened.

I. jerdoniae Wt. : Succulent epiphyte ; W. Ghats of Maharashtra, southwards to Coimbatore, Madurai & Nilgiri.

I. kleinii Wt. & Arn. : Slender herb ; W. Ghats, Konkan, southwards to Nilgiris, from sea level to 1800 m.

I. laticornis C.E.C. Fisch. : Epiphytic herb ; W. Ghats, Nilgiris, 2500 m.

I. lawii Hook. f. & Thoms. : Erect annual ; Chikmagalur, Malabar.

I. lawsonii Hook. f. : Scapigerous herb ; W. Ghats, Chikmagalur, Nilgiris. Rare & Threatened.

I. lenta Hook. f. : Annual herb ; Southern W. Ghats, Nilgiris, Nellaimbudi hills in Kerala. Rare & Threatened.

I. leptura Hook. f. : Short herb ; Southern W. Ghats, Travancore & Coimbatore, 1500 1700 m.

I. levingei Gamble ex Hook. f. : A herb ; Southern W. Ghats, Nilgiri 1800 m.

I. ligulata Bedd. : Herb ; Southern W. Ghats, Malabar, Cochin, Travancore & Anamalais (Coimbatore), 450 800 m.

I. lucida Heyne : Slender plant ; W. Ghats, Konkan to Travancore, 1400 m.

I. macrocarpa Hook. f. : Tall weak sub-shrubby species ; Southern W. Ghats, Travancore, 2000 m.

I. maculata Wt. : Tall slender herb ; Southern W. Ghats, Tirunelveli, Coimbatore & Madurai, 1200 2200 m.

I. modesta Wt. : Tall herb ; Southern W. Ghats, Nilgiris, Anamalai & Tirunelveli, 1800 m.

I. munnarensis Barnes : Weak erect herb ; Southern W. Ghats, Kerala Travancore, 1200 m.

I. monronii Wt. : Undershrub ; Southern W. Ghats, Nilgiris, 1700 2200 m.

Impatiens mysorensis Roth : Slender plant ; W. Ghats of Karnataka (Kolar).

I. nataliae Hook. f. : Herb ; W. Ghats of Karnataka, Shimoga dist, up to 900 m.

I. neo-barnesii C. E. C. Fisch. : Epiphyte ; Southern W. Ghats, Nilgiris, 2500 m. Rare & Threatened.

I. nilgirica C.E.C. Fisch. : A herb ; Southern W. Ghats, Nilgiris, 2500 m. Rare & Threatened.

I. omissa Hook. f. : Small slender plant ; Southern W. Ghats, Anamalais & Palni hills, 1800 2200 m.

I. orchioides Bedd. : Epiphyte ; Southern W. Ghats, Nilgiris, 2500 m.

I. pallidiflora Hook. f. : Straggling herb ; Southern W. Ghats, Travancore, incl. Devicolam in Idduki dist., Kerala, 2200 m.

I. pandata Barnes : Succulent scapigerous herb ; Southern W. Ghats, Travancore, 2100 m.

I. parasitica Bedd. : Succulent epiphyte ; Southern W. Ghats, Cochin & Travancore, Anamalais (Coimbatore), 1700 2400 m.

I. parvifolia Bedd. : Very small species ; Southern W. Ghats, Travancore, Anamalais (Coimbatore) & Madurai, 2200 2400 m.

I. pendula Heyne : Small erect plant ; W. Ghats of Karnataka, Chikmagalur, Bababudan hills.

I. phoenicea Bedd. : Erect suffruticose herb ; Southern W. Ghats, Palni hills & Tirunelveli, 1550 2200 m. Rare & Threatened.

I. platyadena C. E. C. Fisch. : Undershrub ; Southern W. Ghats, Travancore, 2200 2400 m.

I. pulcherrima Dalz. : Erect succulent plant ; W. Ghats in Karnataka (Mysore & N. Kanara).

I. rivuloicola Hook. f. : A herb ; Southern W. Ghats, Travancore, 1250 m.

I. rufescens Benth. ex Wt. & Arn. : Small plant ; Southern W. Ghats, Malabar Travancore, Nilgiris, 900 - 2200 m. Rare & Threatened.

I. rupicola Hook. f. : Erect herb ; W. Ghats, Belgaum, Shimoga & N. Kanara, 600 900 m.

I. scabriuscula Heyne ex Roth : Small species ; W. Ghats from Konkan to Wynaad, Nilgiris & Coimbatore, up to 1800 m.

Impatiens stocksii Hook. f. : Small stout balsam ; W. Ghats, Konkan, Chikmagalur, Coorg, Hassan, N. Kanara, 1100 m.

I. talbotii Hook. f. : Herb ; W. Ghats, Kanara, Agumbe area.

I. tangachee Bedd. : Short simple or forked herb ; Southern W. Ghats, Travancore, Madurai, Coimbatore, above 1400 m.

I. tomentosa Heyne : Small erect plant ; Southern W. Ghats, Travancore, Nilgiris to Madurai, Coimbatore & Tirunelveli, 1550 2500 m.

I. travancorica Bedd. : Small succulent herb ; Southern W. Ghats, Travancore, Tirunelveli & Kanyakumari, 1100 1550m. Rare & Threatened.

I. trichocarpa Hook. f. : Annual herb : W. Ghats, Bangalore, Hassan & Nilgiris. Rare.

I. uncinata Wt. : Small plant ; Southern W. Ghats, Tirunelveli.

I. verecunda Hook. f. ; Small herb ; Southern W. Ghats, Travancore, 1300 1600 m.

I. verticillata Wt. : Herb ; Southern W. Ghats, Cochin, Anamalais, Tirunelveli & Madurai, 1300 1600 m.

I. viridiflora Wt. : Fleshy epiphytic herb ; Southern W. Ghats, Tirunelveli at 1600 m. Rare & Threatened.

I. viscida Wt. : Slender plant ; Southern W. Ghats, Palni hills, Madurai dist. & Tirunelveli, 1550 - 2200 m. Rare & Threatened.

I. viscosa Bedd. : Herb ; Southern W. Ghats, Anamalais, Malabar, Cochin & Travancore, 900 1800 m. Rare & Threatened.

I. wightiana Bedd. ; Erect herb ; Southern W. Ghats, Anamalais (Coimbatore), 900 1100 m. Rare & Threatened.

CAPRIFOLIACEAE

The family comprises *ca* 12 genera and 450 species mostly distributed in northern hemisphere with a few exceptions like the species of *Viburnum* and *Sambucus* which occur also in S. America.

The family is represented in India by 5 genera and 65 species of which only 2 species are endemic to Peninsular India.

ENDEMIC TAXA :

Lonicera leschenaultii Wall. : Climbing shrub ; Western Ghats, above 1500 m. Hills of Deccan & Northern Tamil Nadu.

Viburnum hebanthum Wt. & Arn. : Small tree ; Southern W. Ghats, Nilgiris, 1800 2500 m.

VALERIANACEAE

The family comprises *ca* 13 genera and 400 species distributed primarily in the Northern Hemisphere. It occurs in Europe, Asia, Africa and America. The family is absent in Australia. In South America there is a diversity of genera, particularly in the montane zone. The Mediterranean region is another centre of diversity as it has two endemic genera, i.e. *Centranthus* and *Fedia*.

In India the family is represented by *ca* 4 genera and 17 species of which 3 species are endemic to Peninsular India. All the 3 endemic species belong to the genus *Valeriana* which is represented in India by 12 species. *Valeriana beddomei* is rare.

ENDEMIC TAXA :

Valeriana beddomei Clarke : A herb ; Southern W. Ghats, Anamalais & Palni hills, 2100 m. Rare & Threatened.

V. hookeriana Wt. & Arn. : Pubescent herb ; Southern W. Ghats, Coorg (?) Nilgiris & Palni hills (?), 1800 m.

V. leschenaultii DC. : A large herb ; Southern W. Ghats, Coorg, Nilgiris, 1800 m.

DIPSACACEAE

The Dipsacaceae is a family having *ca* 10 genera and 350 species largely distributed in the Mediterranean region and the Near East, extending to Northern Europe, Eastern Asia and Central to Southern Africa.

In India the family is represented by 2 genera and 5 species. Only one species (*Dipsacus leschenaultii*) is endemic to the Southern Western ghats of Peninsular India.

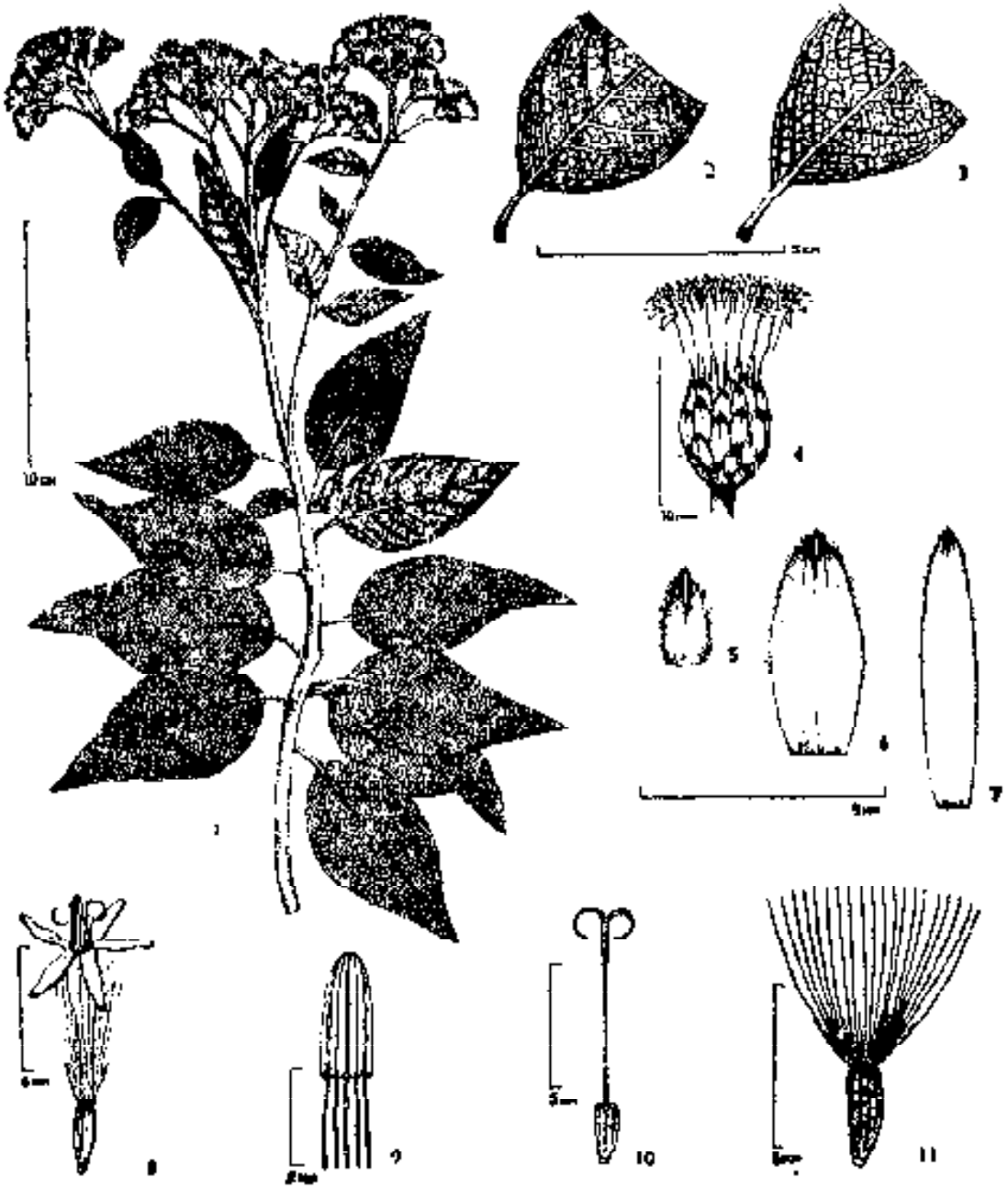
ENDEMIC TAXA :

Dipsacus leschenaultii Coult. : Tall herb with stout rootstock ; Southern W. Ghats, Nilgiris & Palni hills, above 1800 m.

ASTERACEAE

This is one of the largest families comprising ca 900 genera and 13,000 species which are cosmopolitan in distribution. The members of this family are well represented in the semi-arid parts of the tropical regions of the world, and are rather poorly represented in the tropical rain forests.

The family is represented in India by 138 genera and 723 species with high concentrations in both the Himalayan range as well as Peninsular



Vernonia unaimudica Shetty & Vivek.

1. Inflorescence and leaves. 2. Portion of leaf showing the tomentose undersurface. 3. Portion of leaf showing the midrib and nerves beneath pubescent. 4. Head. 5-7. Phyllaries. 8. Flower. 9. Stamens. 10. Gynoecium. 11. Cypsela with pappus.

Courtesy : Bull. Bot. Surv. India

India. 71 species and 2 varieties, i.e. approximately 10% are endemic to the Peninsular India. The compositae members of Peninsular India are closely allied/related to the African species. The temperate genera also have a fairly good degree of representation in Peninsular India.

The genera with the highest representation of species are ; *Anaphalis* (with 12 endemic spp.), *Senecio* (with 13 endemic spp.) and *Vernonia* (with 24 endemic spp.). The endemic monotypic genera of Peninsular India are *Adenoon*, *Camprachaenium* and *Nanothamnus*.

ENDEMIC TAXA :

Adenoon indicum Dalz. : Erect rigid scabrous herb ; Throughout W. Ghats.

Anaphalis aristata DC. : Viscid herb with woody rootstock ; Southern W. Ghats, Nilgiris & Palni hills, 1800 m.

A. barnesii C.E.C. Fisch. : Herb ; Southern W. Ghats, Travancore. Rare & Threatened.

A. beddomei Hook. f. : Low undershrub ; Southern W. Ghats, Palni hills, 2200 m. Rare & Threatened.

A. elliptica DC. : Soft, white woolly herb ; Southern W Ghats, Nilgiris & Anamalai hills, 2200 m.

A. lawii Gamble : A tall herb ; Northern E. Ghats, Circars 1500 m, Deccan-Nandidrug; W. Ghats, South of Coorg, 1600 m.

A. leptophylla DC. : Slender herb ; Southern W. Ghats, above 1600 m.

A. meeboldii Smith : Tufted woody plant ; Southern W. Ghats, Anamalais at 2000 m, Devicolam, Travancore, above 1700 m.

A. neelgerryana DC. : Low much branched shrub ; Southern W. Ghats, Nilgiris, above 2400 m.

A. notoniana : DC. Tomentose herb ; Southern W. Ghats, Nilgiris (Ootacamund) above 2400 m. & Cochin.

A. travancorica Smith : A large herb ; Southern W. Ghats, Palni & Travancore hills, 2400 m.

A. wightiana DC. : Erect herb with woody rootstock ; Southern W. Ghats, Nilgiris, Palni & Tirunelveli hills, 2000 m.

Blepharispermum subsessile DC. : An erect shrub ; Deccan, Bellary dist. at 600 900 m. W. Ghats, Karnataka & Nilgiris.

Blumea belangeriana DC. : Erect herb ; Throughout W. Ghats, Konkan, Karnataka, Malabar, 900 m.

B. malabarica Hook. f. : Tall erect plant ; W. Ghats, Konkan, Bababudan hills of Karnataka & Malabar, 1100 m.

Blumea venkataramanii Rao & Hemadri : An erect herb ; Maharashtra, Poona dist.

Carpesium cernuum Linn. var. **nilagiricum** Clarke : An erect herb ; Southern W. Ghats, Nilgiris & Palni hills, above 1800 m.

Centrantherum courtallense Benth. : Erect herb ; W. Ghats, Anamalais & hills of Travancore & Tirunelveli, at 1600 2400 m.

C. mayurii C.E.C. Fisch. : Robust herb ; Karnataka, Kemmangundi hills.

C. mollie Benth. : An erect herb ; Southern W. Ghats, Tirunelveli & Travancore, at low altitudes.

C. rangacharii Gamble : An erect herb ; W. Ghats, Tirunelveli hills, Travancore, 900 1600 m.

C. ritchei Hook. f. : Slender annual herb ; W. Ghats, Konkan Karnataka.

C. tenue (Wt.) Clarke : Erect herb ; W. Ghats, Konkan.

Emilia ramulosa Gamble : A wiry subshrubby branching herb ; Southern W. Ghats, hills of Anamalai, Travancore & Tirunelveli, above 1600 m.

Gynura nitida DC. : Tall succulent herb ; Hills of W. Deccan & W. Ghats, 900 1800 m.

G. travancorica Smith : Tall hispid herb ; Southern W. Ghats, Palni & Travancore hills, 1600 - 1800 m.

Helichrysum perlanigerum Gamble : An undershrub ; Southern W. Ghats, Anamalais, 1800 2200 m. Rare & Threatened.

H. wightii Clarke : Herb with woody rootstock ; W. Ghats, Nilgiris at 2250 m.

Lamprachaenium microcephalum Benth. : An erect herb ; W. Ghats, Konkan to Karnataka, 1300 - 1600 m.

Nanothamnus sericeus Thoms. : Herb ; W. Ghats of Maharashtra, Karnataka to Nilgiri & Palni hills.

Notonia shevaroyensis Fyson : Scapigerous glabrous herb ; Southern E. Ghats, Salem dist, 1400 m. Rare & Threatened.

Senecio ansteadii Tad. & Jacob : Slender shrubby climber ; Southern W. Ghats, Tirunelveli hills, 900 m.

S. calcadensis Ram. : Large climbing shrub ; Southern W. Ghats, Tirunelveli, 800 m.

S. candicans DC. : A sub-shruby climber ; Northern E. Ghats, Circars, Mahendragiri hills, 1500 m ; Deccan, Nandidrug in Karnataka ; W. Ghats, Nilgiris, above 1300 m.

Senecio dalzellii Clarke. : An erect herb ; W. Ghats, Konkan (?) to Karnataka. Rare & Threatened.

S. hewrensis (Dalz.) Hook. f. : Small herb ; W. Ghats, Konkan Junar hills, Poona dist.

S. hohenackeri Hook. f. : Undershrub with woody rootstock ; Southern W. Ghats, Nilgiris, Tirunelveli, 1800 2400 m.

S. kundaicus C.E.C. Fisch. ; Herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

S. lavandulaefolius DC. : Erect single stemmed herb ; Southern W. Ghats, Nilgiris & Palni hills, 1800 m & above.

S. lawsonii Gamble : Slender herb ; Southern W. Ghats, Nilgiris, 2250 m.

S. lessingianus Clarke : A hispidly pubescent herb ; Southern W. Ghats, Nilgiris, above 1800 m.

S. mayurli C.E.C. Fisch. ; An undershrub ; W. Ghats, Karnataka, Kemman gandi hills. Rare & Threatened.

S. neelgherrianus DC. ; A herb ; Southern W. Ghats, Nilgiris & Palni hills, above 1800 m.

S. polycephalus Clarke : A pubescent herb ; Southern W. Ghats, Nilgiris, above 1800 m.

Sonchus jainii Chandrab. & N.C. Nair : Erect herb ; Southern W. Ghats, Anamalais.

Tricholepis amplexicaulis Clarke : Tall erect herb ; W. Ghats, Konkan & Kanara.

T. angustifolia DC. : An erect herb ; Southern W. Ghats, S. Kanara, Malabar & Travancore.

T. radicans DC. : Slender herb ; W. Ghats, Konkan & Kanara; Deccan, widely distributed ; E. Ghats, Circars.

Vernonia anaimudica Shetty &Vivek. : Erect shrub ; Southern W. Ghats, Kottayam dist, Devicolam.

V. anamallica Bedd. : An erect shrub ; Southern W. Ghats, Anamalais, at higher altitudes.

V. beddomei Hook. f. : A straggling undershrub ; Southern W. Ghats, Travancore, at lower altitudes. Rare & Threatened.

V. bourdillonii Gamble : A small shrub ; Southern W. Ghats, Travancore, above 1250 m. Rare & Threatened.

V. bourneana Smith : A shrub/undershrub ; Southern W. Ghats, Palni & Travancore hills, 1250 - 2200 m.

Vernonia comorinensis Smith : A small tree ; Southern W. Ghats, hills Travancore & Tirunelveli, 900 1600 m.

V. conyzoides Wt. : An erect herbaceous undershrub ; Southern W. Ghats. Nilgiris, Palni & southwards, above 2000 m.

V. dalzelliana Drumm. & Hutch. : Erect or subscandent shrub ; W. Ghats of Karnataka, S. Kanara, Coorg, and Mysore, 600-900 m.

V. fysonii Calder : An erect undershrub ; Southern W. Ghats, Palni hills, 1800 2150 m. Rare & Threatened.

V. gossypina Gamble : A handsome undershrub ; Southern W. Ghats, Tirunelveli hills, 900 1600 m.

V. heynei Bedd. ex Gamble : An erect shrub ; Southern W. Ghats, hills of Travancore. Rare & Threatened.

V. indica Clarke : An erect undershrub ; W. Ghats, Konkan to Travancore, 1250 1800 m.

V. malabarica Hook. f. : A stout shrub ; W. Ghats, Bababudan hills in Karnataka to Nilgiris & Travancore hills, 1400 m.

V. meeboldii Smith : An erect undershrub ; Southern W. Ghats, Travancore.

V. membranacea Bedd. ex S. Moore ; Shrub ; Southern Ghats, Nilgiris & Attraimalais. Rare & Threatened.

V. multibracteata Gamble : Shrub ; Southern W. Ghats, Travancore hills, 1900 m. Rare & Threatened.

V. ornata Talb. : Shrub ; W. Ghats of Karnataka, N. Kanara Gersoppa falls.

V. peninsularis Clarke : Erect undershrub ; Southern W. Ghats, Anamalais, Palni & Travancore hills, above 1000 m. Rare & Threatened.

V. pulneyensis Gamble : A slender undershrub : Southern W. Ghats, Palni hills, 2200 m. Rare & Threatened.

V. ramaswamii Hutch. : Small undershrub ; Southern W. Ghats, Tirunelveli & Travencore hills, 900 1250 m.

V. recurva Bedd. ex. S. Moore : Shrub/small tree ; Southern W. Ghats, Anamalais, 1800 m. Rare & Threatened.

V. saligna DC. var. **nilghirensis** Hook. f. ; An erect undershrub ; Southern W. Ghats, Nilgiris & Wynaad. Rare & Threatened.

V. salvifolia Wt. : Shrub ; Southern W. Ghats, Tirunelveli & Travancore hills, 850 1000 m. Rare & Threatened.

V. shevaroyensis Gamble : Small tree ; E. Ghats, Salem dist. Also N. Circars (?). Rare & Threatened.

V. travancorica Hook. f.: A small tree; Southern W. Ghats, Travancore hills, 900 m.

Youngia nilgirriensis Bar. : Herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

Class : Liliopsida

(Monocotyledons)

APONOGETONACEAE

The Water Hawthorn family is monotypic, its single genus *Aponogeon* has *ca* 30 species which are palaeotropical in distribution. The members of the family occur in the Old World tropics and in northern Australia, but concentrated to a large extent in Africa and Madagascar. The species of this family inhabit aquatic or marshy places.

The family is represented in India by *ca* 5 species. *Aponogeton satarensis* and *A. appendiculatus* are endemic to Peninsular India. The latter grows in shallow water with leaves completely submerged. According to van Bruggen (1968), *A. appendiculatus* is very much similar to *Cryptocoryne ciliata* with regard to the embryo shape which is supposed to be an adaptation to brackish waters and might be ascribed to parallel evolution in similar habitat.

ENDEMIC TAXA :

Aponogeton appendiculatus van Bruggen : Aquatic herb ; Kerala, between Cochin and Allepey.

A. satarensis Raghavan : Scapigerous fresh-water herb ; Maharashtra, Satara dist., Mavashi plateau, 1200 m.

ARECACEAE

(*nom. altern.* Palmae)

The Palms comprise *ca* 217 genera and 2,500 species which are mostly tropical, with some subtropical and a few temperate outliers (The genus *Trachycarpus* extends up to 2,400 m altitude in the Himalayas). Except for a few species like *Cocos nucifera, Elaeis guineensis* and *Phoenix dactylifera*, most of the members of this family are rather well localised forming characteristic components of the tropical vegetation. The centres of development of this family in decreasing order of concentration are : (i) the tropics of the Eastern Hemisphere (with *ca* 97 genera), (ii) the New World, particularly S. America (with *ca* 64 genera), (iii) the Indian Ocean Islands, including Comora Islands, Madagascar and the Mascarenes (with *ca* 29 genera) and (iv) Africa (with *ca* 16 genera). Thus the family has its greatest development in the Eastern hemisphere while the relatively poorer representation in Africa can perhaps be attributed to the dessication and consequently rapid reduction of moist habitats during the Pleistocene.

The family is represented in India by *ca* 27 genera and 91 species of which 13 species (and 2 varieties) are endemic to Peninsular India. The genus *Arenga* which is chiefly Indomalaysian in distribution is represented

in India by *ca* 3 species of which *Arenga wightii* (the wild cocoanut) is endemic to Peninsular India. The genus *Bentinckia* shows an interesting disjunction of its two species complements : one occurs in the Nicobar Islands while the other (*B. coddapanna* or the Hill Areca-nut) is rare and endemic to the Southern W. Ghats of India. The Palaeotropical genus *Calamus* is represented in India by *ca* 31 species of which 8 species and 2 varieties are endemic to Peninsular India. *Calamus brandisii* and *C. huegelianus* are rare and threatened.

ENDEMIC TAXA :

Arenga wightii Griff. : Tall palm with green smooth stem (wild cocoanut) ; W. Ghats, throughout, 150 - 900 m.

Bentinckia coddapanna Berry : Tall palm with slender annulate stem. (The Hill Areca-nut) ; Southern W. Ghats, Tirunelveli & Travancore hills, 750 - 1800 m. Rare & Threatened.

Calamus brandisii Becc. : Slender scandent shrub ; W. Ghats, N. Kanara to Tirunelveli. Rare & Threatened.

C. gamblei Becc. var. **gamblei** : A moderate sized shrub, probably scandent ; W. Ghats, Mysore, Travancore, Nilgiris, Anamalais (Coimbatore,) 100 m.

C. gamblei Becc. var. **sphaerocarpa** Becc. : Medium shrub ; Southern W. Ghats, Nilgiris.

C. hookerianus Becc. ; Probably a tall slender climber ; W. Ghats.

C. huegelianus Mart. : Moderate sized climber ; W. Ghats, Chikmagalur, Hassan, Nilgiris, Anamalai & Tirunelveli hills, 1200 - 1800 m. Rare & Threatened.

C. metzianus Schlecht. : Climber ; W. Ghats, N. Kanara.

C. naghettai Fernandez & Dey : Climber ; W. Ghats, S. Kanara dist.

C. rheedii Griff. : Scandent shrub ; Southern W. Ghats, Malabar to Tirunelveli.

C. travancoricus Bedd. : Slender climber ; W. Ghats, Coorg to Tirunelveli, 1150 m.

C. thwaitesii Becc. var. **canaranus** Becc. : Climber ; W. Ghats of Karnataka, N. Kanara & Hassan dist.

Hyphaene dichotoma (White) Furtado : Branching Palm ; Diu Island off Saurashtra Coast ; Gujarat.

Phoenix robusta Hook. f. : Tall palm ; Northern W. Ghats, Konkan up to Poona dist; Parasnath in Bihar; E. Ghats, Northern Circars, 100 - 1500 m.

Pinanga dicksonii (Roxb.) Blume : Slender green stemmed palm ; W. Ghats, 300 - 900 m.

ARACEAE

The Aroids comprise *ca* 115 genera and 2000 species, the majority of which are pantropical. A few occur in temperate regions as well. They have a wide range of habit, including marsh plants.

In India the family is represented by *ca* 25 genera and 138 species of which 31 species, i.e. approx. 22% are endemic to Peninsular India. The genera with the highest representation of endemic species in Peninsular India are *Arisaema* (with 12 endemic species), *Cryptocoryne* (with 7 endemic species) and *Theriophonum* (with 5 endemic species). The genus *Anaphyllum* with 2 species is endemic to Peninsular India. The genus *Pothos* which occurs in Indomalaysia and Madagascar is represented in India by 5 species, of which 2 are endemic and rare in Peninsular India. The genus *Theriophonum* which is restricted to Peninsular India and Sri Lanka comprises of 5 species of which 4 species, i.e. 80% are endemic to Peninsular India. *Theriophonum fischerii* is very rare. Many of the endemic aroids are threatened. *Amorphophallus mysorensis* and *Cryptocoryne cognata* are in all probability extinct, as no collections have been reported after the original type collections.

ENDEMIC TAXA :

Amorphophallus commutatus (Schott) Engl. : Tuberous herb ; W. Ghats Konkan & Gujarat.

A. bohenackeri (Schott) Engl. & Gehrm. : Tuberous herb ; W. Ghats of Karnataka (Kanara, Bangalore, S. Kanara) & N. Travancore. Rare & Threatened.

A. mysorensis Barnes & Fisch. : Tuberous herbs ; W. Ghats of Karnataka, Billigirirangan hills. Probably extinct.

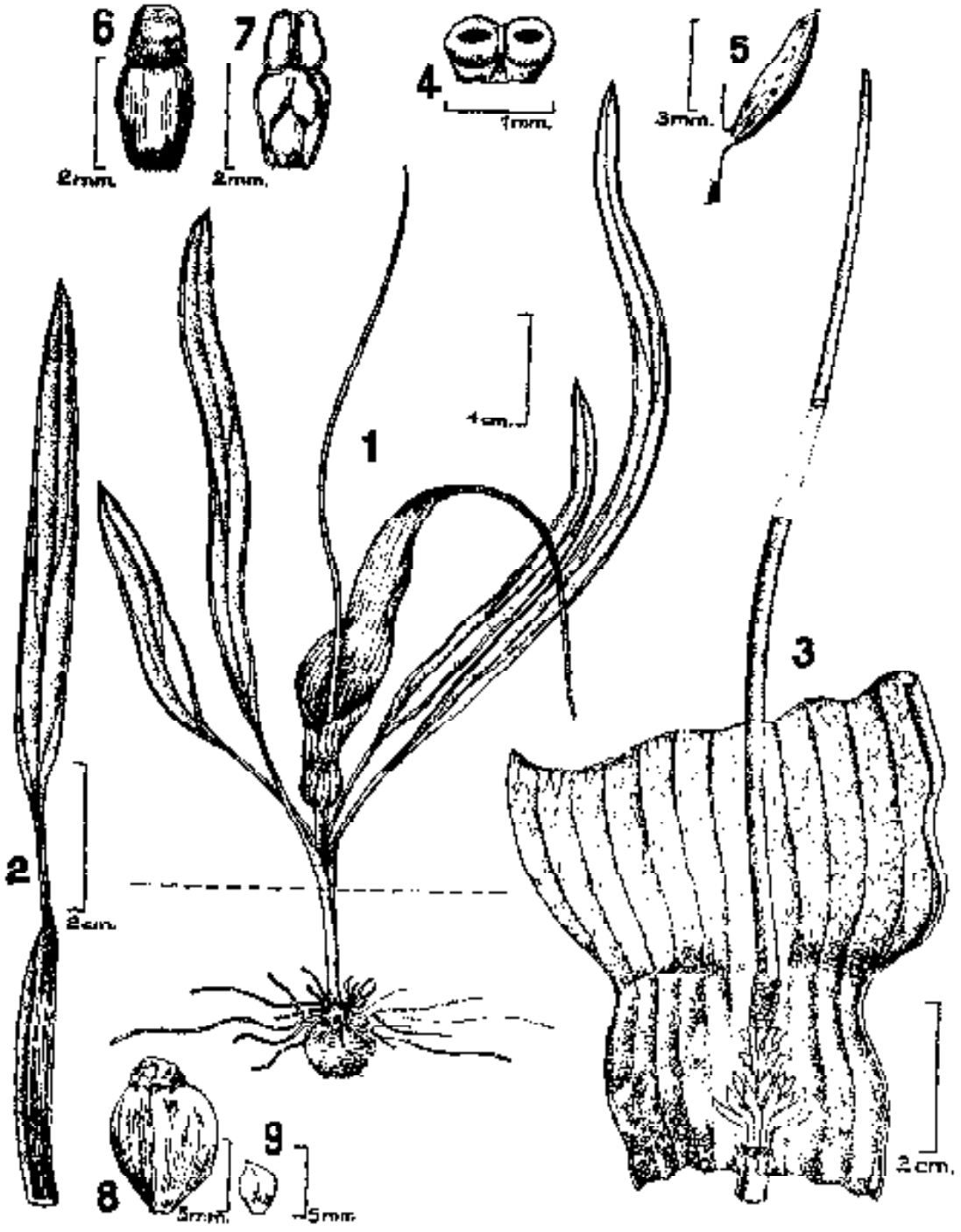
Anaphyllum beddomei Engl. : Tall herb with creeping rootstock ; Southern W. Ghats, Anamalai, Tirunelveli & Travancore hills, 1200 m. Rare.

A. wightii Schott : Tall herb with erect rootstock ; Southern W. Ghats, Travancore, Attapadi valley to Tirunelveli, 100 1200 m. Threatened.

Arisaema attenuatum Barnes & Fisch. : Succulent glabrous herb with tuber ; Southern W. Ghats, Travancore (Munnar, Naimakad & Pallivasal) at high altitudes. Threatened.

A. auriculatum Barnes : Large tuberous herbs ; Southern W. Ghats, Wynaad (Nilambur Ghats), Nilgiri, 750 900 m.

A. barnesii C.E.C. Fisch. : Tuberous herb : Southern W. Ghats, Mysore, Travancore, Nilgiris, Biligirirangans, Anamalais (Coimbatore), 1800 2100 m. Rare & Threatened.



Theriophonum sivagangaium (Ramam. & Seb.) Bognor

1. Plant. 2. Leaf. 3. Spathe split open (lower portion) showing the spadix with inflorescence. 4. Male flower. 5. Neuter flower. 6. Female flower. 7. L. S. of female flower showing the apical and basal ovules. 8. Fruit. 9. Seed.

Courtesy : Bull. Bot. Surv. India

Arisaema candatum Engl. ; Erect annual tuberous herb ; W. Ghats, Konkan, Mahableshwar & Panchgani Plateau.

A. murrayii (Grah.) Hook. f. : Tuberous herb ; Gujarat ; W. Ghats, Konkan to Nilgiris. Rare & Threatened.

A. peltatum C.E.C. Fisch. : Dioecious glabrous herb ; Southern W. Ghats, Travancore, 1350 1800 m.

A. psittacus Barnes : Herb ; Southern W. Ghats, Travancore. Rare & Threatened.

A. pulchrum N. E. Br. ; Tuberous herb ; Southern W. Ghats, Nilgiris, 4000 m. Rare & Threatened.

A. sarracenioides Barnes & Fisch. ; Herb ; Southern W. Ghats, Travancore (Naimakad, Munnar-Devicolam). Rare & Threatened.

A. translucens C.E.C. Fisch. : Tuberous herb ; Southern W. Ghats, Nilgiris, 1800 m. Rare & Threatened.

A. tuberculatum C.E.C. Fisch. : Tuberous herb ; Southern W. Ghats, Nilgiris, 2100 2250 m. Rare & Threatened.

A. tylophorum C.E.C. Fisch. : Tuberous herb ; Southern W. Ghats, Nilgiris, 1800 m. Rare & Threatened.

Cryptocoryne cognata Schott : Aquatic/marshy herbs with bulbous roots ; W. Ghats, Konkan. Rare & Threatened (Probably Extinct).

C. cognatoides Blatter & McCann : Rhizomatous herb ; W. Ghats, N. Kanara.

C. consobrina Schott : Aquatic herb ; Southern W. Ghats, Travancore, Palghat, Malappuram & Coimbatore dist. Rare & Threatened.

C. meeboldii Engl. : Herb ; Wt. Ghats of Karnataka, Agalhatti-Hassan. Mysore, Shimoga.

C. tortuosa Blatter & McCann : Tall tufted herb ; W. Ghats, Near Mahableshwar, 1200 m.

C. unicularis W. : Herb with spathes ; E. Ghats/Coast N. Circars ; Nothern W. Ghats, Konkan.

C. wightii Schott : Herb : W. Ghats of Karnataka, Mysore dist, & Kerala, Calicut, Rare & Threatened.

Pothos armatus C.E.C. Fisch. : Climbing shrub ; Southern W. Ghats, Malabar, Wynaad, Trivandrum dist. Rare & Threatened.

P. thomsonianus Schott : Climbing shrub ; W. Ghats, Travancore (Quilon) & Tirunelveli. Rare & Threatened.

Theriophonum dalzellii Schott : Small cormous herb ; W. Ghats of Maharashtra (Thana & Bombay dist.) & Karnataka (N. &. S. Kanara).

Theriophonum fischeri Sivadasan : Small cormous herb : Southern W. Ghats, Palghat dist. Anamalais (Coimbatore) & Tirunelveli.

T. infaustum N.E. Br. : Small cormous herb ; Southern W. Ghats of Kerala.

T. sivaganganum (Raman. & Seb.) Bogner : Small cormous herb ; Southern Tamil Nadu, Ramanathapuram dist. Rare & Threatened.

Typhonium bulbiferum Dalz. : Tuberous herb : W. Ghats, Konkan (?), Palghat dist of Kerala. Rare & Threatened.

COMMELINACEAE

The Spiderwort family comprises *ca* 38 genera and 500 species distributed in the tropical and warm temperate regions of the world. Some species occur in Australia, China, Japan and the southern United States of America. The members of the family are adapted to damp or wet habitat conditions.

The family is represented in India by *ca* 13 genera and 80 species of which 17 species are endemic to Peninsular India. Most species are concentrated in South India. The Indomalaysian genus *Belosynapsis* is represented in India by two species which are endemic to Peninsular India. *B. kewensis* is rare. The genus *Commelina* is represented in India by 23 species, of which 4 species are endemic to Peninsular India. The palaeotropical genus *Cyanotis* is represented in India by *ca* 14 species of which 6 species and 1 variety are endemic to Peninsular India. Most of the endemic species of *Cyanotis* are rare. Of the 20 representatives of the tropical genus *Murdannia* only 3 species, 1 subspecies and 1 variety are endemic to Peninsular India.

ENDEMIC TAXA :

Amischophacelus cucullata (Roth) Rolla Rao & Kammathy : Herb ; Peninsular India, Bhopal, Maharashtra, Poona, Karnataka, Andhra Pradesh Hyderabad.

Belosynapsis kewensis Hassk. : Prostrate herb ; Southern W. Ghats, Travancore (Mahendra hill) & Tamil Nadu, (Tirunelveli & Kanyakumari), 900 m. Rare & Threatened.

B. vivipara (Dalz.) Sprague & C.E.C. Fisch. : Epiphytic subscapigerous herb with white flowers ; W. Ghats : Konkan, Sahyadri hills, Karnataka, Manjerabad, Wynaad & Anamalais, 900 - 1200 m.

Commelina hirsuta Clarke : Low hirsute herb ; W. Ghats, Belgaum, Nilgiris & Palni hills, 1800 2100 m. Rare & Threatened.

Commelina indehiscens Barnes : Prostrate herb ; W. Ghats, Coorg, Mysore, Travancore, Wynaad & Nilgiris, 900 1200 m.

C. tricolor Barnes : Herb ; Southern W. Ghats, Karnataka (?) Nilgiris.

C. wightii Rolla Rao : A herb ; Southern W. Ghats, Travancore, Palghat, Walayar & Anamalais. Rare.

Cyanotis arcotensis Rolla Rao : Annual hirsute herb ; Southern E. Ghats, of Tamil Nadu, North Arcot dist., Southern W. Ghats of Kerala, Palghat dist., 160 m.

C. burmanniana Wt. : Herb with small reddish leaves ; W. Ghats, throughout. Rare.

C. cerifolia Rolla Rao & Kammathy : Prostrate tomentose herb ; Southern W. Ghats, of Kerala (Cannanore) & Anamalais of Tamil Nadu, 1000 m. Rare.

C. concanensis Hassk. : Herb ; W. Ghats of Maharashtra, Goa to Igatpurighat, above 1000 m.

C. fasciculata (Heyne ex Roth) J. & J. Schultes var. **glabrescens** Clarke : Herb ; W. Ghats, Belgaum & Bijapur in Karnataka, 600 900 m.

C. vaginata Wt. : Herb ; Southern W. Ghats, Travancore, Anamalais up to 1000 m.

C. wightii Clarke : A tall herb ; W. Ghats, Panchgani, Mahableshwar.

Dictyospermum ovalifolium Wt. : Herb ; W. Ghats, N. Kanara to Travancore, 900 1200 m.

Murdannia crocea (Griff.) Faden ssp. **ochracea** (Dalz.) Faden : Erect herb ; W. Ghats, Konkan - Belgaum, S. Kanara, Shimoga, Coorg - Quilon. Rare & Threatened.

M. koenigii (Wall. ex Clarke) Brueck. : Herbs with blue flowers ; Southern W. Ghats, S. Kanara, Bangalore, Quilon, "Courtallum" Tirunelveli, Palamkotta, Red hills & Nilgiris 150 m.

M. lanuginosa (Clarke) Brueck. : Herb ; W. Ghats, Konkan, Mahableshwar, Belgaum, Coorg, Chikmagalur, Kanara, Bababudan, Brahmagiri hills & Nilgiris, 1200 1800 m.

M. versicolor (Dalz.) Brueck. : Small herb ; Gujarat, W. Ghats of Maharashtra (Mahableshwar); Karnataka (Coorg, Shimoga, Tumkur). Rare & Threatened.

M. zeylanica (Cl.) Brueck. var. **longicapsa** (Clarke) Rolla Rao & Kammathy : Herb with white flowers ; W. Ghats, Shimoga, "Courtallum", 1200 1800 m.

ERIOCAULACEAE

The family comprises *ca* 13 genera and 1,150 species distributed in the tropical and subtropical regions of the world. The members of the family are particularly well developed in South America. They mostly inhabit marshy places or seasonally inundated regions, while some are aquatic and a few grow on dry land.

The family is represented in India by a single genus *Eriocaulon*. This tropical and subtropical genus comprises of *ca* 400 species, of which *ca* 74 species are found in India. In India, the Peninsular region is the main centre of distribution for this family as evidenced by the greater number of endemic eriocaulons occurring in this region. About 33 taxa are endemic to Peninsular India. Many of the species like *E. gamblei*, *E. humile*, *E. indicum*, *E. margaretae* & *E. vanheurckii* are rare/threatened and are confined within a narrow distributional range. Field studies for the purpose of evaluating the endemic status of these plants are warranted.

ENDEMIC TAXA :

Eriocaulon bombayanum Ruhl. : Small herb ; Maharashtra, Bombay. Rare.

E. breviscapum Koern. : Aquatic herb ; W. Ghats, N. Kanara, Shimoga.

E. **christopheri** Fyson : Scapigerous herb ; Southern W. Ghats, Nilgiris.

E. conicum C.E.C. Fisch. : Herb ; E. Ghats, Ganjam, Mahendragiri hills ; W. Ghats (Karnataka), Agalhatti Mysore, Gudalur & Nilgiris.

E. cuspidatum Dalz. ; Stemless herb ; W. Ghats, N. Kanara, Shimoga. Rare & Threatened.

E. dalzellii Koern. : Herb ; Maharashtra (?), Karnataka Shimoga.

E. dianae Fyson var. **dianae** : Herb ; Mt. Abu, Bombay (Khandala, etc.) to Rudrasiri in Karnataka & Calicut.

E. dianae Fyson var. **longibracteata** Fyson : Herb ; Gujarat, Maharashtra & Karnataka (S. Kanara) & Calicut.

E. dianae Fyson var. **richardiana** Fyson : Herb ; Maharashtra, Karnataka (S. Kanara, Mysore, Coorg) to N. Malabar.

E. ellenorae Fyson : Herb ; Gujarat ; W. Ghats of Maharashtra (Mahableshwar) Hassan, Mysore, N. Kanara of Karnataka, Wynaad & Nilgiri.

E. **ensiforme** C.E.C. Fisch. : Herb ; Southern W. Ghats, Tirunelveli hills.

E. **gamblei** C.E.C. Fisch. : Herb ; Southern W. Ghats, Nilgiris, 1800 m. Rare & Threatened.

E. humile Mold. : Herb ; W. Ghats, Khandala. Rare.

Eriocaulon indicum Mold. : Herb ; W. Ghats, Poona dist., Khandala. Rare.

E. **lanceolatum** Miq ex Steud. : Aquatic herb ; W. Ghats, Konkan, North & South Kanara, near Bangalore.

E. **lanceolatum** Miq. ex Steud. var. **pilosum** Mold. : Herb ; W. Ghats, Poona dist., Khandala.

E. **margaretae** Fyson : Herb ; W. Ghats, Konkan Belgaum, Mysore, Shimoga of Karnataka. Rare & Threatened.

E. **mariae** Fyson : Herb ; Southern W. Ghats, Kodaikanal & Palni hills.

E. **minutum** Hook. f. : Small tufted aquatic herb ; Mt. Abu in Rajasthan, W. Ghats, Konkan, Kanara & Nilgiris, 2100 m.

E. **mysorense** Fyson : Herb ; Maharashtra & Karnataka (Mysore).

E. **nairii** Chandrab. & Chandras. : Tall scapigerous herb ; Southern W. Ghats, Anamalai (Coimbatore dist).

E. **odoratum** Dalz. : Odorous marshy herb ; W. Ghats, Konkan, southwards to Travancore, Anamalai & Palni hills (Madurai).

E. **pectinatum** Ruhl : Herb ; Southern W. Ghats, Nilgiris.

E. **polycephalum** Hook. : Herb ; W. Ghats, 900 2100 m.

E. **ritchieanum** Ruhl : Herb ; W. Ghats, Konkan, Karnataka to Nilgiris & Horsleykonda, 1200 2100 m.

E. **rivulare** Dalz. : Marshy/Aquatic herb ; Northern W. Ghats, Konkan, Mysore, N. Kanara & Shimoga.

E. **robustum** Steud. : Stout herb with rootstock ; Southern W. Ghats, Nilgiris, & Attapadi hills.

E. **robusto-brownianum** Ruhl : Herb ; W. Ghats of Karnataka (Coorg, S. Kanara, Shimoga), Malabar & Wynaad, up to 1150 m.

E. **rouxianum** Steud. : Caespitose herb ; Maharashtra, near Bombay.

E. **stellulatum** Koern. : Herb ; W. Ghats, Konkan, Mysore, Kanara, N. Shimoga to Wynaad & Malabar, 1100 m.

E. **tuberiferum** A.R. Kulkarni & Desai : Tuberous herb ; Maharashtra, Kolhapur dist., 938 m.

E. **vanheurckii** Muell.-Arg. : Herb ; Southern W. Ghats, N. Kanara, Shimoga & S. Kanara, near Bangalore & in Travancore hills.

E. **vanheurckii** Muell.-Arg. forma **minima** Mold. : Herb : Maharasbtra.

CYPERACEAE

The sedges comprise *ca* 90 genera and 4000 species which are world-wide or cosmopolitan in distribution, but unlike the grasses they have a narrow ecological range. They, however, have a propensity to inhabit wet, damp or marshy habitats of the temperate and subarctic zones. As such, the "true sedges" (*Carex* spp.) are said to have a considerable ecological range.

The family is represented in India by *ca* 22 genera and 446 species, of which 58 species and 7 varieties, i.e. approx. 13% are endemic to Peninsular India. The genera with the highest representation of endemic species in Peninsular India are *Fimbristylis* (with 29 endemic spp.) *Cyperus* (with 14 endemic spp.) and *Carex* (with 7 endemic spp.). The endemic genus *Ascopholis* is monotypic. The genus *Bulbostylis* is rather poorly represented in India by *ca* 4 species of which only 1 species and 1 variety are endemic to Peninsular India. The cosmopolitan genus *Carex* is represented in India by *ca* 140 spp. of which only 6 spp. and 1 variety are endemic to Peninsular India. *Cyperus* is represented in India by 100 spp. of which 14 spp. and 1 variety are endemic to Peninsular India.

The genus *Fimbristylis* which is distributed mostly in Indomalaysia and Australia is represented in India by *ca* 65 species of which 29 spp. and 1 variety are endemic to Peninsular India. This genus has a much greater concentration in the peninsular region and of late, many taxa new to science have been described. *Fuirena*, *Lipocarpha*, *Mariscus*, *Schoenoplectus* and *Scleria* are the other representative genera with a relatively small degree of endemism manifest in the Indian peninsular region.

ENDEMIC TAXA :

Ascopholis gamblei C.E.C. Fisch. : Erect glabrous herb ; W. Ghats, Hassan, Ooty, 2100 m.

Bulbostylis puberula Kunth var. **gracilis** C.E.C. Fisch. : A herb ; Southern W. Ghats, Mundanturai, Travancore, also Madhya Pradesh (Katni).

B. subspinescens Clarke : Annual herb ; E. Ghats, Orissa, Puri, Andhra Pradesh, Visakhapatnam ; W. Ghats, S. Kanara.

Carex christii Boeck. : Erect herb with perennial rhizome ; Southern W. Ghats, Nilgiri hills. Rare & Threatened

C. lindleyana Nees var. **mercarensis** C.E.C. Fisch. : A herb ; W. Ghats, S. Kanara to Tirunelveli, 1200 - 2400 m.

C. glaucina Boeck. : Herb ; Southern W. Ghats, Hassan, Mysore, N. Kanara, Mercara, Attapadi, Anamalai, Palni hills Madurai, 1500 2400 m.

Carex pseudo-aperata Boeck. : A herb ; Southern W. Ghats, Nilgiri hills, 1800 m. Rare & Threatened

C. raphidocarpa Nees : A herb ; Southern W. Ghats, Palni hills, 1800 m.

C. vicinalis Boott : Erect tall herb ; Southern W. Ghats, Nilgiri hills. Rare & Threatened.

C. wightiana Nees : A herb ; Southern W. Ghats, "Courtallam," Travancore. Rare & Threatened.

Cyperus atroglumosa Govindarajalu : Annual herb ; W. Ghats of Karnataka, Shimoga dist.

C. curvibracteatus Govindarajalu : Annual herb ; Southern W. Ghat, Nilgiris, 2500 m.

C. decumbens Govindarajalu ; A herb ; Maharashtra.

C. dwarkensis Sahni & Naithani ; A herb ; Gujarat, Dwarka. Rare & Threatened.

C. flavidus Retz. var. **nilagiricus** (Hochst. ex Steud.) Korla : Perennial herb ; Southern W. Ghats.

C. konkanensis T. Cooke : Rhizomatous herb ; Northern W. Ghats, Konkan.

C. latovaginatus Govindarajalu : Herb ; Tamil Nadu.

C. lurida Govindarajalu : Annual herb ; Tamil Nadu, Coimbatore dist.

C. malabaricus (Clarke) Cooke : Erect herb ; Peninsular India, Western Ghats of Maharashtra & Karnataka (N. Kanara, Shimoga).

C. pentabracteatus Govindarajalu & Hemadri : A herb ; Maharashtra.

C. plumheonuceus Govindarajalu ; A herb ; Tamil Nadu.

C. plurinodosus Govindarajalu : Annual herb with stolons ; Karnataka, Shimoga dist.

C. polyanthelus Govindarajalu : Perennial rhizomatous herb ; Tamil Nadu, Madurai, Kanyakumari, Coimbatore dist, 1500 2100 m.

C. rubriglumosus Govindarajalu : Annual stoloniferous herb ; Tamil Nadu, Madras, Thiruvattiyur.

C. stricticulmis Govindarajalu ; Annual herb with stolons ; Tamil Nadu, Coimbatore dist.

Fimbristylis aggregata C.E.C. Fisch. : A herb ; Southern W. Ghats, Anamalais. Rare & Threatened.

F. albicans Nees : A herb ; Peninsular India, Deccan.

Fimbristylis amplocarpa Govindarajalu : Perennial with woody root-stock ; Tamil Nadu, Palni hills, Kodaikanal, Shembaganur.

F. arnottiana Boeck. : A herb ; Southern W. Ghats, Cannanore in Kerala. Rare & Threatened.

F. bis-umbellata (Forsk.) Bub. var. **hirtistyla** C.E.C. Fisch. : A herb ; Southern W. Ghats, Palni & Tirunelveli hills.

F. contorta C.E.C. Fisch. : Southern W. Ghats, Courtallam. Rare & Threatened.

F. crystallina Govindarajalu ; Annual herb ; Tamil Nadu, Coimbatore dist.

F. dauciformis Govindarajalu : Annual herb ; Kerala, Sholayar Anakayam, Orukomban, Poringalkuthu.

F. digitata Boeck. : A herb ; W. Ghats, Konkan N. Kanara, Deccan (?)

F. eligulata Govindarajalu : Perennial herb ; E. Ghats, Tamil Nadu, Chingleput & Ramanathapuram dist.

F. junnarensis Hemadri ; Herb ; W. Ghats, Poona dist, Junnar.

F. kingii Clarke : A herb ; W. Ghats, Bangalore, Shimoga, Nilgiris, Palni hills & Attapadi valley, 1650 1800 m.

F. latiniglumifera Govindarajalu : Perennial herb ; Southern W. Ghats, Nilgiris.

F. latinucifera Govindarajalu : Perennial herb ; Southern W. Ghats Nilgiris.

F. ligulata Govindarajalu : Annual caespitose herb ; Goa, Maharashtra, Bombili, Bastar-Bailadila, 1700 m.

F. longistigma Govindarajalu : Perennial herb ; Tamil Nadu, Kanyakumari dist.

F. monospicula Govindarajalu : Annual herb ; Karnataka ; Mysore, Tamil Nadu Madurai & Salem, Biligirirangans, 1500 1650 m.

F. narayanii C.E.C. Fisch. : Herb ; Travancore, Courtallam.

F. paupercula Boeck. : Herb ; Southern W. Ghats, Nilgiris, Palni, Tirunelveli & Madurai hills.

F. pustulosa Govindarajalu : Perennial rhizomatous herb ; Tamil Nadu, Coimbatore dist., Madurai.

F. rectifolia Govindarajalu : Perennial with obliquely ascending rhizome ; Tamil Nadu, Nilgiri.

Fimbristylis rigidiuscula Govindarajalu : Perennial herb with woody rhizome ; Tamil Nadu, Kodaikanal, Palni hills.

F. **rugosa** Govindarajalu : Perennial herb with thick woody rootstock ; Tamil Nadu, Kanyakumari dist, Madurai, Nilgiris.

F. scabrisquama Govindarajalu : Perennial with short woody rhizome : Tamil Nadu, Madurai dist.

F. semidisticha Govindarajalu : Annual herb ; Karnataka Bababudan hills, Tamil Nadu Madurai dist, Nilgiris.

F. strigosa Govindarajalu : Perennial herb with thick woody rhizome ; Tamil Nadu, Coimbatore dist., Ramanathapuram dist.

F. tortifolia Govindarajalu : Perennial with thick creeping rhizome ; Tamil Nadu, Madurai dist.

F. uliginosa Steud. : A herb ; Nilgiri & Palni hills, 1800 2100 m.

F. unispicularis Govindarajalu : A herb ; Maharashtra

F. woodrowii Clarke : Slender herb ; W. Ghats, Sahyadri range (Khandala), Hassan, N. Kanara.

Fuirena pubescens Kunth var. **pergamentacea** C.E.C. Fisch. : Erect herb with creeping rhizome ; Southern W. Ghats, Palni hills.

F. **tuwensis** Deshpande & Shah : Perennial rhizome herb ; E. Gujarat, Tuwa, Panchmahal dist., Madhya Pradesh, Sivpuri.

Lipocarpha raynaleana Govindarajalu : A herb ; Tamil Nadu.

Mariscus bulbosus Clarke ; Herb with tuberous rootstock ; Peninsular India, W. Ghats, Karnataka, N. Kanara, Tirunelveli ; E. Ghats, Horselykonda, Chingelput & Salem dist., 1200 m.

M. pictus Nees : A herb ; Karnataka, Bangalore, Mysore, Nilgiris.

Schoenoplectus jacobii (C.E.C. Fisch.) Lye : A herb ; Nellore dist, Coimbatore dist., 200 m.

Scleria lithosperma (L.) Sw. var. **multispiculata** Govindarajalu : Perennial rhizomatous herb ; Tamil Nadu, Kanyakumari dist.

S. lithosperma (L.) Sw. var. muricata Govindarajalu : Perennial herb ; Kerala, Pallathadka.

GRAMINEAE

(*nom. altern.* Poaceae)

The ubiquitious grasses, which form one of the largest families of flowering plants, comprise *ca* 620 genera and 10,000 species. It is by far the most dominant family from an ecological viewpoint; spread as it is, from the Arctic across the equator to the Antarctic, occupying a wide and varied ecological range. Indeed the grasses form an essential component of almost every type of vegetation ranging from major grasslands such as steppes, prairies and savannas to densely canopied evergreen glades. As per conservative estimates the family forms a principal component in as much as 20% of the Earth's vegetational cover. Perhaps the present distiributional pattern, along with the great ecological tolerance or adaptation evinced by the grasses, was to a large extent governed through the ages by herbivorous animals, as much as by Man himself who has successfully tapped the vast economical potential of the family. The ecological diversity of the grasses is amply complemented/aided by the great genetic diversity that is seen by way of apomixis, cleistogamy and the like.

The family is represented in India by *ca* 241 genera and 1,243 species of which 180 species and 21 varieties, i.e. approx. 13% are endemic to to Peninsular India. At the generic level as many as 14 genera (of which 12 are monotypic) are endemic to Peninsular India. The monotypic genera are *Bhidea*, *Chandrasekharania*, *Danthonidium*, *Hubbardia*, *Indopoa*, *Limnopoa*, *Normanboria*, *Pogonachne*, *Pseudodicanthium*, *Silentvalleya*, *Trilochne*, and *Triplopogon*. The palaeoendemic genera *Manisuris* and *Glyphochloa* (which is a recent segregate of the genus *Manisuris* [*vide* W.D. Clayton in *Kew Bull* 35(4) : 825. 1981] are phytogeographically interesting (for detailed discussion, refer Chapter 3).

Of the 178 endemic grass species of Peninsular India as many as 93 species belong to the tribe Andropogonae. This reflects a high degree endemism of the tribe in Peninsular India and amply corroborates Hartley's (1958) surmise that of the two main centres of high concentration of the tribe Andropogonae, the Indian Peninsular region is one. The monotypic tribe Hubbardiae with its monotypic genus *Hubbardia* is on the verge of extinction, if not already so. However, intensive field studies in and around the vicinity of the type locality might help relocate some populations that are perchance still extant. The tribe Isachnae with its constituent genera (*Coelachne*, *Isachne*, *Limnopoa* and *Sphaerocaryum*) is very well established in Peninsular India with as many as 17 endemic species, most of which have very narrow distributional ranges. The genus *Isachne* is represented in India by *ca* 29 species of which as many as 15 species are strictly confined to the Western Ghats of Peninsular India,

reflecting the high development of the genus in this region. The tribe Bambusae which was treated by some earlier workers as a distinct family is now clubbed along with the grass family. The genera that represent the 10 endemic taxa of this tribe are *Arundinaria*, *Bambusa*, *Ochlandra* and *Oxytenanthera*.

Many of these endemic grasses are rare or threatened either due to narrow restricted distribution or due to other factors like habitat destruction, etc. Some species like *Isachne lisboa*, *I. meeboldii*, *I. mysorensis* and *Limnopoa meeboldii* are extremely endangered and possibly on the verge of extinction. Species like *Isachne borii* and *I. mysorensis* are known only from the original type collections, while others like *Chloris bournei*, *Oryza officinalis* ssp. *malampuzhaensis* and *Parahyparrhenia bellariensis* show interesting disjunctions in their pattern of distribution.

ENDEMIC TAXA :

Agrostis peninsularis Hook. f. : Erect perennial herb ; Southern W. Ghats, Nilgiris & Palni hills.

A. schmidii (Hook. f.) C.E.C. Fisch. : Erect perennial herb ; Southern W. Ghats, Nilgiris, Ooty. Rare & Threatened.

Andropogon longipes Hack. : Herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

A. polyptychus Steud. var. **deccanensis** Bor : Herb ; Southern W. Ghats, Nilgiris.

Anthoxanthum borii Jain & Pal : Tall perennial herb ; Southern W. Ghats of Tamil Nadu, Palni hills, (near Shentaldikanal).

Aristida stocksii (Hook. f.) Domin. : Herb ; W. Ghats, Konkan (Poona & Aurangabad districts).

Arthraxon deccanensis Jain : Annual herb ; Maharashtra (Poona dist.), Karnataka (N. Kanara).

A. depressus Stapf. ex C.E.C. Fisch. : Tall herb ; Karnataka, Bangalore, Chikmagalur (Agalhatti). Rare & Threatened.

A. inermis Hook. f. var. **tzvelevii** Jain : Slender perennial ; Maharashtra, Purandhar.

A. juhatus Hack. : Annual herb ; W. Ghats in Maharashtra and Kerala.

A. lanceolatus (Roxb.) Hochst. var. **meeboldii** (Stapf.) Welzen : Herb ; W. Ghats, Maharashtra (Khandala), Karnataka (Chikmagalur, Coorg, Hassan, N. Kanara, Shimoga & S. Kanara) Rare and Threatened.

Arthraxon lanceolatus (Roxb.) Hochst. var. **raizadae** (Jain, Hem. & Deshp.) Welzen : Annual ascending herb ; Maharashtra, (Satara dist, Mahableshwar), Karnataka (Chikmagalur).

A. lanceolatus (Roxb.) Hochst. var. **villosus** (C.E.C. Fisch.) Welzen : Annual herb ; Western Ghats of Maharashtra, Karnataka (Chikmagalur, Bababudan hills).

Arundinaria densiflora Munro : Gregarious bamboo ; Southern W. Ghats, Travancore, Anaimudi hills. Rare & Threatened.

Arundinella leptochloa (Nees ex Steud.) Hook. f. : Erect herb ; Peninsular India - Karnataka (Belgaum, Bijapur, Chikmagalur, Coorg) Kerala(?), Tamil Nadu (Tirunelveli).

A. mesophylla Nees ex Steud. : Erect herb ; Southern W. Ghats, Travancore & Anamalai hills.

A. metzii Hochst. ex Miq. : Erect herb ; Peninsular India, Karnataka (Belgaum, N. Kanara, Shimoga, S. Kanara) & southwards.

A. nervosa (Roxb.) Nees ex Hook. & Arn. : Erect herb ; Peninsular India, Karnataka.

A. purpurea Hochst. ex Steud var. **purpurea** : Erect herb ; W. Ghats, Chikmagalur, Hassan, S. Kanara, Nilgiris.

A. purpurea Hochst. ex Steud. var. **laxa** Bor : Erect herb ; Southern W. Ghats, Nilgiris (Sispara).

A. setosa Trin. var. **lanifera** C.E.C. Fisch. : Erect herb ; W. Ghats, Coorg, Kolar, Tumkur ; S.E. Ghats, Cuddapah dist., 900 m.

A. setosa Trin. var. **nilgiriana** Subba Rao & Kumari : Erect herb ; Southern W. Ghats, Nilgiris.

A. spicata Dalz. : Erect herb ; W. Ghats, Sahyadri range, Mahabaleshwar, Panchgani Plateau, Karnataka (Chikmagalur).

A. tuberculata Munro ex Lisboa : Erect herb ; Peninsular India up to Madhya Pradesh.

A. vaginata Bor : Herb ; Tamil Nadu.

Bambusa arundinacea Retz. var. **gigantea** Bahadur : Thorny bamboo ; Peninsular India (South India & Circars).

Bhidea burnsiana Bor : Annual herb ; Maharashtra ; Bombay, Borivili, Lonavala.

Brachiaria nilagirica Bor : Herb ; Southern W. Ghats, Nilgiris.

B. semiundulata (Hochst.) Stapf : Herb ; Southern W. Ghats, Nilgiris.

Cenchrus glaucus Mudaliar & Sundararaj : Perennial rhizomatous herb ; Karnataka (Bangalore), Tamil Nadu (Coimbatore).

Chandrasekharania keralensis Nair et al. : Herb ; Southern W. Ghats of Kerala.

Chloris bournei Rang. & Tad. : Herb ; Maharashtra, Karnataka (Bellary and Dharwar).

C. orientalis (Desv.) A. Camus : Herb ; W. Ghats, N. Kanara, Tirunelveli.

C. quinquesetica Bhide : Herb ; Karnataka, Bellary, Bijapur, (Chitradurg), N. Kanara (Raichur).

Chrysopogon asper (Heyne ex Hook. f.) Blatt. & McCann : Perennial herb ; Karnataka, Mysore, N. Kanara.

C. hackelii (Hook. f.) : Perennial herb ; Peninsular India hills, Karnataka.

C. orientalis (Desv.) A. Camus : Perennial herb ; South India "Madras State" Karnataka.

C. velutinus (Hook. f.) Bor : Perennial herb ; E. Ghats, Cuddapah hills of Andhra Pradesh. Rare & Threatened.

C. verticillatus (Roxb.) Trin. ex Steud. ; Perennial herb ; Peninsular India, Karnataka (Mysore).

Cleistachne stocksii Hook. f. : Herb ; W. Ghats, Konkan, Chikmagalur, Malabar, Travancore.

Coelachne minuta Bor : Annual tufted herb ; W. Ghats of Maharashtra, Mahableshwar, Ratnagiri (Amboli), 650-1375 m. Rare.

C. perpusilla (Arn. ex Steud.) Thw. var. **nilagirica** Ved Prakash & Jain ; Perennial tufted herb ; Southern W. Ghats, Nilgiris, Parthimund, 2300 m.

Cymbopogon coloratus (Nees) Stapf : Perennial tufted herb ; Peninsular India, up to Madhya Pradesh.

C. flexuosus (Nees ex Steud.) Wats. **coimbatorensis** Gupta : Perennial tufted aromatic herb ; Tamil Nadu, Coimbatore.

C. martinii (Roxb.) Wats. var. **tofia** Gupta : Perennial tufted herb ; Karnataka, (Belgaum, Bellary, Bidar, Bijapur, Chitradurg, Dharwar, Mysore, N. Kanara) & Kerala.

C. polyneuros (Steud.) Stapf : Perennial tufted herb ; Southern W. Ghats, Chikmagalur, Nilgiris.

C. travancorensis Bor : Perennial tufted herb ; Southern W. Ghats.

Cynodon barberi Rang. & Tad. : Perennial creeping herb ; Peninsular India, N. Kanara, Visakhapatnam, Puri

Cyrtococcum longipes (Wt. & Arn.) A. Camus : Perennial herb ; W. Ghats, Chikmagalur, Coorg, Mysore, Shimoga, S. Kanara, Nilgiris & Palni hills.

Danthonidium gammiei (Bhide) Hubb. : Herb ; Maharashtra (Borivili) Karnataka (N. Kanara).

Dicanthium armatum (Hook. f.) Blatt. & McCann : Annual erect herb ; Northern W. Ghats, Sahyadri ranges.

D. compressum (Hook. f.) Jain & Deshpande : Tall perennial tufted herb ; W. Ghats of Maharashtra, Poona dist., Lonavala, Khandala.

D. concanensis (Hook. f.) Jain & Deshpande : Perennial herb ; Western Ghats of Maharashtra & Karnataka (Hassan, N. Kanara).

D. filiculme (Hook. f.) Jain & Deshpande : Annual trailing herb ; Western Peninsular India in Maharashtra, Karnataka, Tamil Nadu.

D. foulkesii (Hook. f.) Jain & Deshpande : Herb ; Southern W. Ghats, Nilgiris, Tirunelveli, Palni (?) hills.

D. grahamii (Haines) Deshpande : Woody perennial herb ; Madhya Pradesh, Central Province, Amarkantak hills. Rare.

D. jainii (Desh. & Hem.) Deshpande : Perennial tufted herb ; W. Ghats, Sahyadri range, Ahmadnagar, Satara dist., Poona & Thana, above 1000 m.

D. maccannii Blatt. : Erect tufted herb ; Maharashtra, Panchgani plateau, Satara dist., Rare.

D. magdaleni (Almeida) Jain & Deshpande : Perennial herb ; Karnataka, Agumbe.

D. odoratum (Lisboa) Jain & Deshpande : Perennial robust aromatic herb ; Maharashtra (rarely in W. Bengal).

D. oliganthum (Hochst. ex Steud.) T.A. Cope : Dwarf annual herb ; Southern India W. Ghats, Nilgiris.

D. panchganiense Blatt. : Annual herb ; Maharashtra, Panchgani, Satara dist.

D. paranjpyeanum (Bhide) Clayton : Slender delicate herb ; W. Ghats, Ratnagiri to North Kanara.

D. tuberculatum (Hack.) T.A. Cope ; Herb ; Madhya Pradesh.

D. woodrowii (Hook. f.) Jain & Deshpande : Tufted herb with woody rootstocks ; Northern W. Ghats of Maharashtra, Poona dist., Mawal.

Digitaria duthieana Henrard ex Bor : Perennial herb ; Madhya Pradesh, Bundelkhand, Barwar, Sagar, near Jhansi.

Digitaria tomentosa (Koenig) Henr. : Herb ; South India, Karnataka (Bijapur).

Dimeria acutipes Bor ; Annual herb ; Tamil Nadu.

D. biafata C.E.C. Fisch. : Herb ; Karnataka, Chikmagalur, S. Kanara.

D. blatteri Bor : Herb ; W. Ghats, Poona dist, Khandala.

D. copeana Sreekumar et al. : Herb ; Kerala.

D. deccanensis Bor : Herb ; Karnataka (S. Kanara), Tamil Nadu.

D. fischeri Bor : Herb ; Peninsular India ; Tamil Nadu & Andhra Pradesh.

D. hohenackeri Hoschst. ex Miq. : Herb ; W. Ghats of Karnataka, Coorg, S. Kanara.

D. jainii Sreekumar et al. : Herb ; Kerala.

D. lawsonii (Hook. f.) C.E.C. Fisch. : Herb ; South India, Karnataka (Chikmagalur, Coorg, Mysore).

D. mooneyii Raizada ex Mooney : Herb ; Orissa, Karnataka (Shimoga), Tamil Nadu.

D. orissae Bor : Herb ; Northern E. Ghats, Orissa, Koraput dist.

D. ornithopoda Trin. var. **megalantha** Bor : Herb ; W. Ghats, Belgaum, N. Kanara.

D. santapaui Almeida : Annual grass ; Northern W. Ghats (Sahyadri range), Karnataka, (North Kanara).

D. stapfiana C.E. Hubb. ex Pilger : Herb ; Northern W. Ghats, Poona, Khandala & N. Kanara.

D. woodrowii Stapf ; Herb with rachis of raceme coiled ; W. Ghats, Ratnagiri, N. Kanara & Goa.

Enteropogon coimbatorensis Nair, Jain & Nayar : Slender herb : South India, Tamil Nadu (Coimbatore).

Eragrostis deccanensis Bor : Herb ; South India, Karnataka (Bangalore, Hassan).

E. rottleri Stapf apud Hook. f. : Herb ; South India, Tranquebar in Tamil Nadu, Rare & Threatened.

E. unioloides (Retz.) Nees ex Steud. var. **tremula** Jacob : Herbs with effuse panicle ; Southern W. Ghats, Travancore, Tirunelveli.

Eriochrysis rangacharii C.E.C. Fisch. : Perennial herb ; Southern W. Ghats, Nilgiris, 1800 m.

Eulalia wightii (Hook. f.) Bor : Perennial herb ; Southern W. Ghats, Palni hills.

Garnotia arborum Stapf ex Woodrow : Erect herb ; Peninsular India.

G. arundinacea Hook. f. : Erect herb ; W. Ghats, Chikmagalur, Hassan, Coorg of Karnataka to Malabar Anamalai & Nilgiri hills.

G. elata (Arn. ex Miq.) Janowsky : Erect herb ; Peninsular India, Cuddapah dist. of E. Ghats (Andhra Pradesh), W. Ghats, hills of Karnataka, Travancore, 'Courtallum', Nilgiri, Anamalai (Coimbatore).

G. schmidii Hook. f. : Perennial herb ; Southern W. Ghats, Mysore Nilgiris. Rare & Threatened.

Glyphochloa acuminata (Hack.) Clayton var. **acuminata** : Herb ; W. Coast/Ghats of Peninsular India (Mysore, N. Kanara, Shimoga).

G. acuminata (Hack.) Clayton var. **stocksii** (Hook. f.) Clayton : Herb ; W. Coast/Ghats of Peninsular India (Mysore).

G. acuminata (Hack.) Clayton var. **woodrowii** (Bor) Clayton : Herb ; W. Ghats, Mahableshwar, N. Kanara.

G. divergens (Hack.) Clayton var. **divergens** : Herb ; W. Ghats, Coorg, Mercara of Karnataka.

G. divergens (Hack.) Clayton **hirsuta** (C.E.C. Fisch.) Clayton ; Herb ; Karnataka, Bababudan hills at Kalahatti, 1800 m.

G. forficulata (C.E.C. Fisch.) Clayton : Herb ; Peninsular India, up to Bundelkhand hills.

G. goaensis (Rao & Hemadri) Clayton : Annual tufted herb ; Goa ; Verna village & Porvorum.

G. mysorensis (Jain & Hemadri) Clayton : Herb ; Karnataka, south of Belgaum & N. Kanara.

G. ratnagirica (Kulk. & Hem.) Clayton : Herb ; Northern W. Ghats, Sahyadri range, Ratnagiri dist.

G. santapaui (Jain & Desh.) Clayton : Herb ; Maharashtra, Ratnagiri dist.

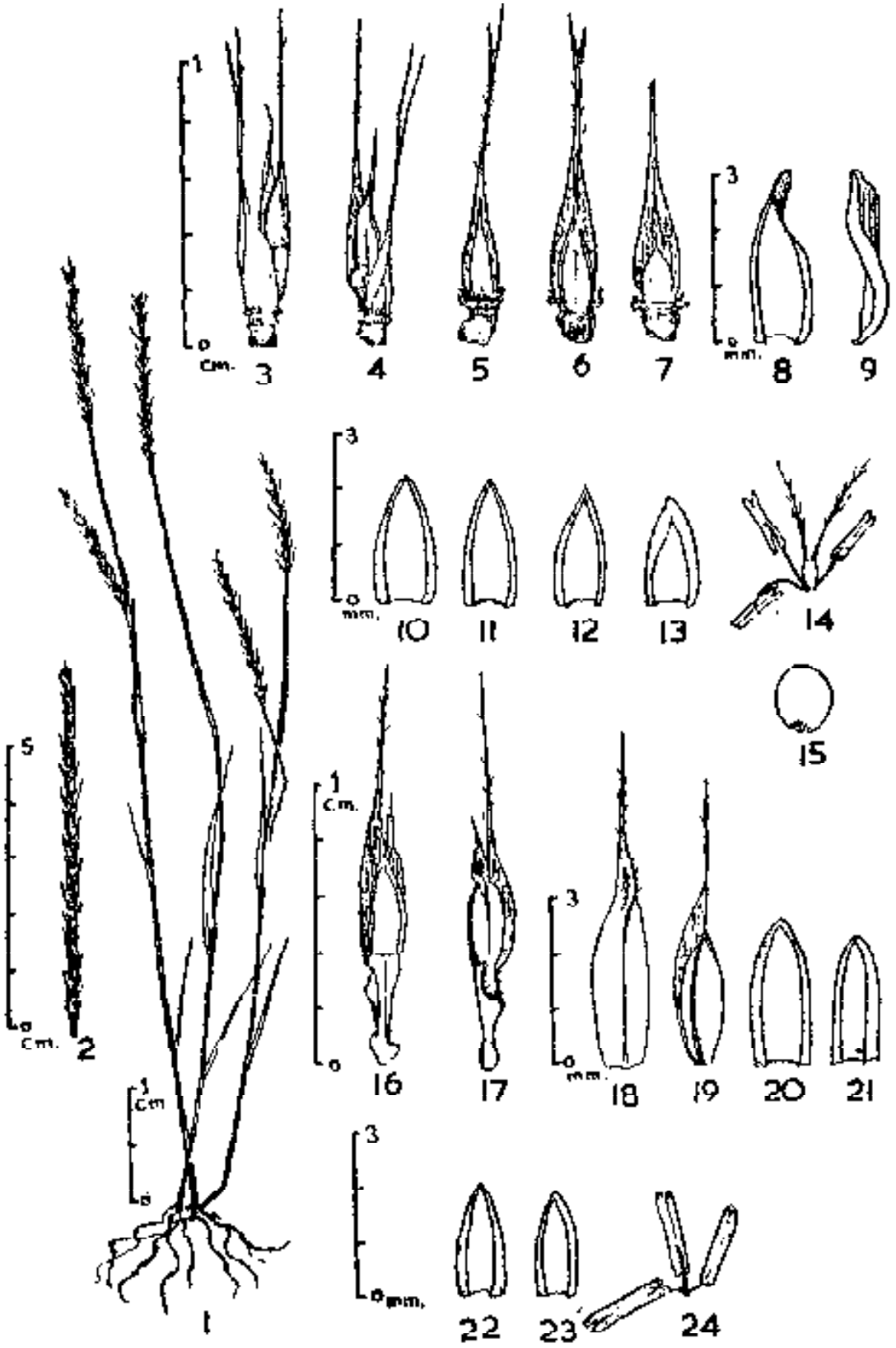
G. talbotii (Hook. f) Clayton : herb ; Goa, Marmagoa and other localities in Goa.

Helictrotrichon polyneurum (Hook. f.) Henr. : Herb ; Southern W. Ghats, Nilgiris.

H. schmidii (Hook. f.) Henr. : Herb ; Southern W. Ghats, Nilgiris & southwards.

Heteropogon fischerianus Bor : Perennial herb ; Southern W. Ghats of Tamil Nadu Palni & Anamalai hills.

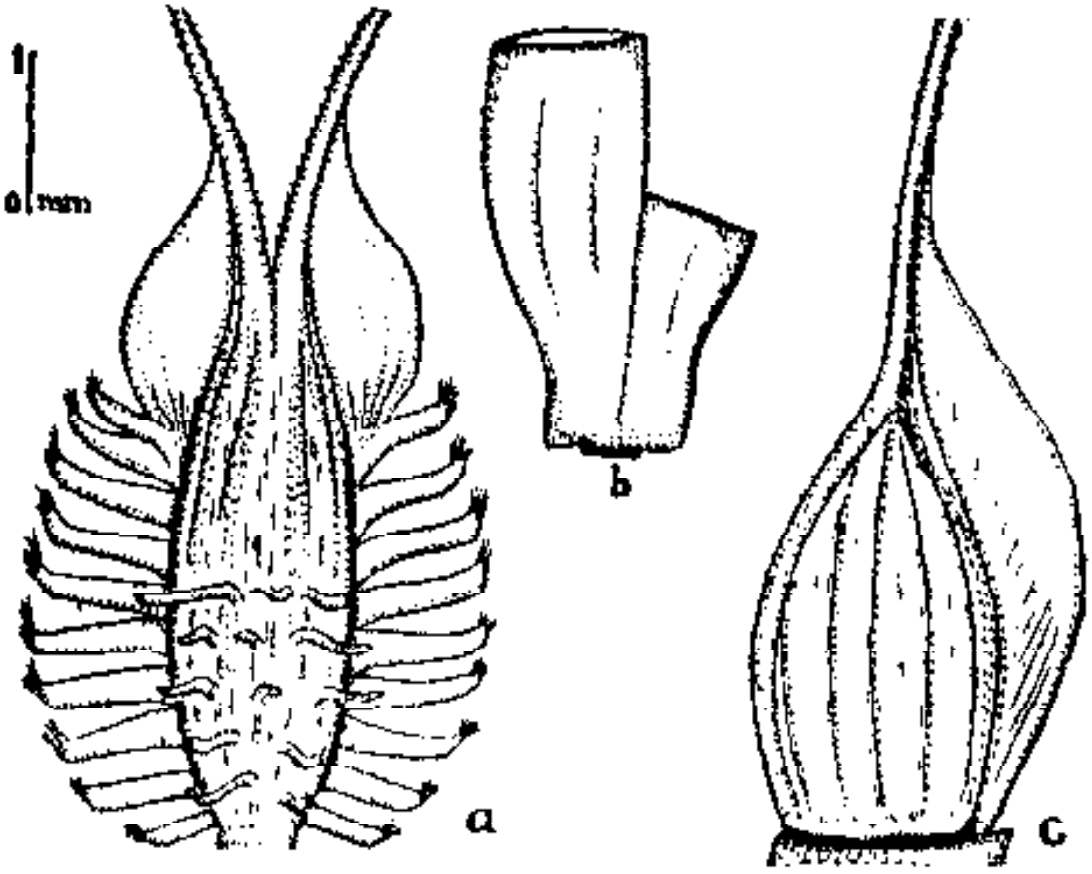
H. polystachyos (Roxb.) Schult. : Annual herb ; Peninsular India, Mahableshwar, Khandala & Deccan. Rare & Threatened.



Glyphochloa goaensis (Rolla Rao & Hem. Clayton

1. Whole plant. 2. Raceme. 3 & 4. Sessile and pedicelled spikelets showing 2 different views. (alongwith basal jointed tumid part). 5. Sessile spikelet—dorsal view. 6. Sessile spikelet—ventral view. 7. Lower glume of sessile spiklet—ventral view. 8. Upper glume of sessile spikelet. 9 Upper glume of sessile spikelet-inside view. 10. Lower lemma of sessile spikelet. 11. Upper lemma of sessile spikelet. 12. Lower palea of sessile spikelet. 13. Upper palea of sessile spikelet. 14. Androecium and gynoecium of upper floret of sessile spikelet. 15. Grain of the same. 16. Pedicelled spikelet—dorsal view. 17. Pedicelled spikelet—ventral view. 18. Upper glume of pedicelled spikelet. 19. Upper glume of pedicelled spikelet—side view. 20. Lower lemma of pedicelled spikelet. 21. Upper lemma of pedicelled spikelet. 22. Lower palea of pedicelled spikelet. 24. Androecium of upper floret.

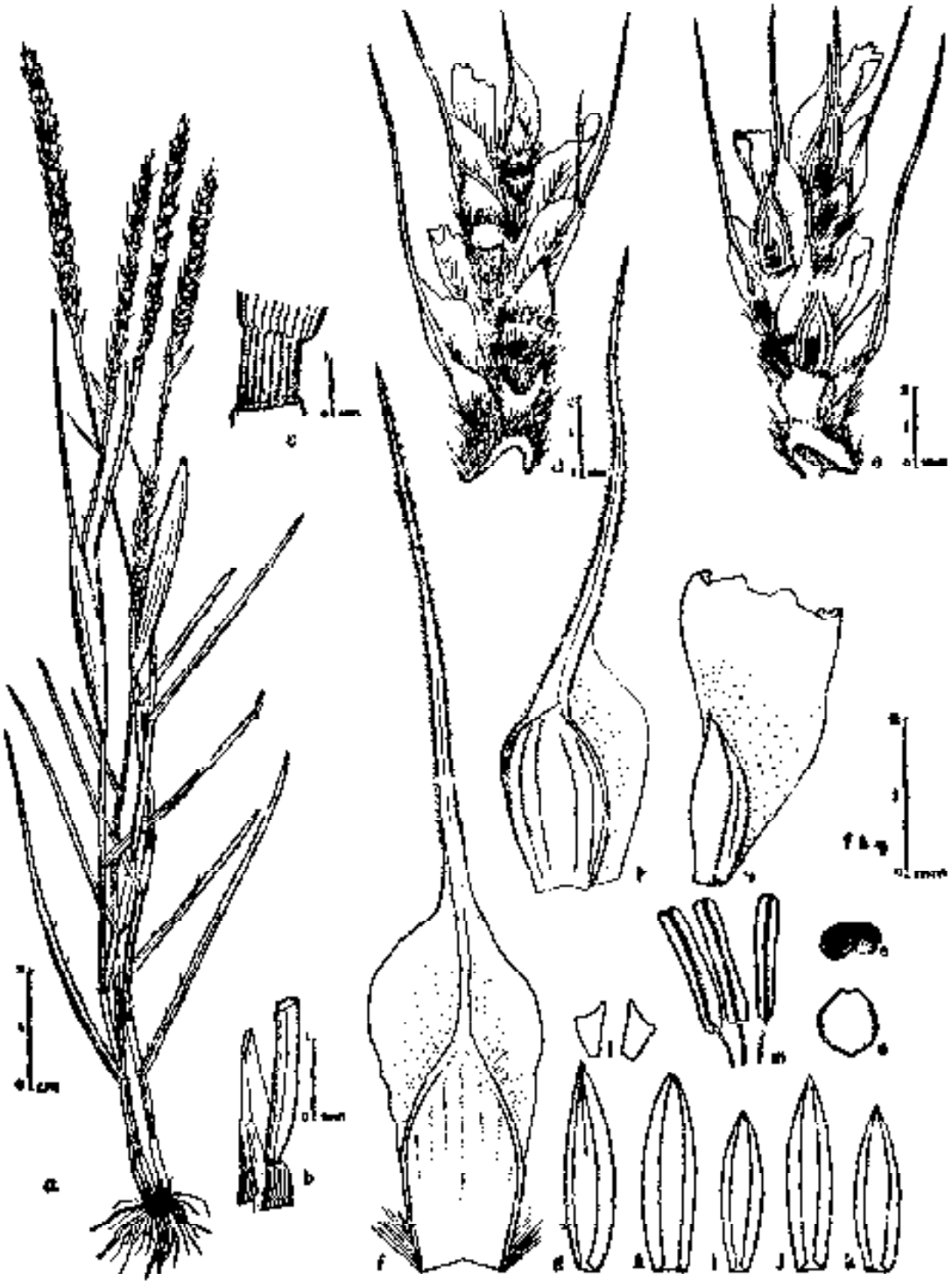
Courtesy : Bull. Bot. Surv. India



Glyphochloa mysorensis (Jain & Hemadri) Clayton

a. Lower glume of sessile spikelet. b. Joint and pedicel, unequal and without tuft of hairs. c. Lower glume of pedicelled spikelet. (All based on type *Gammie* 15643).

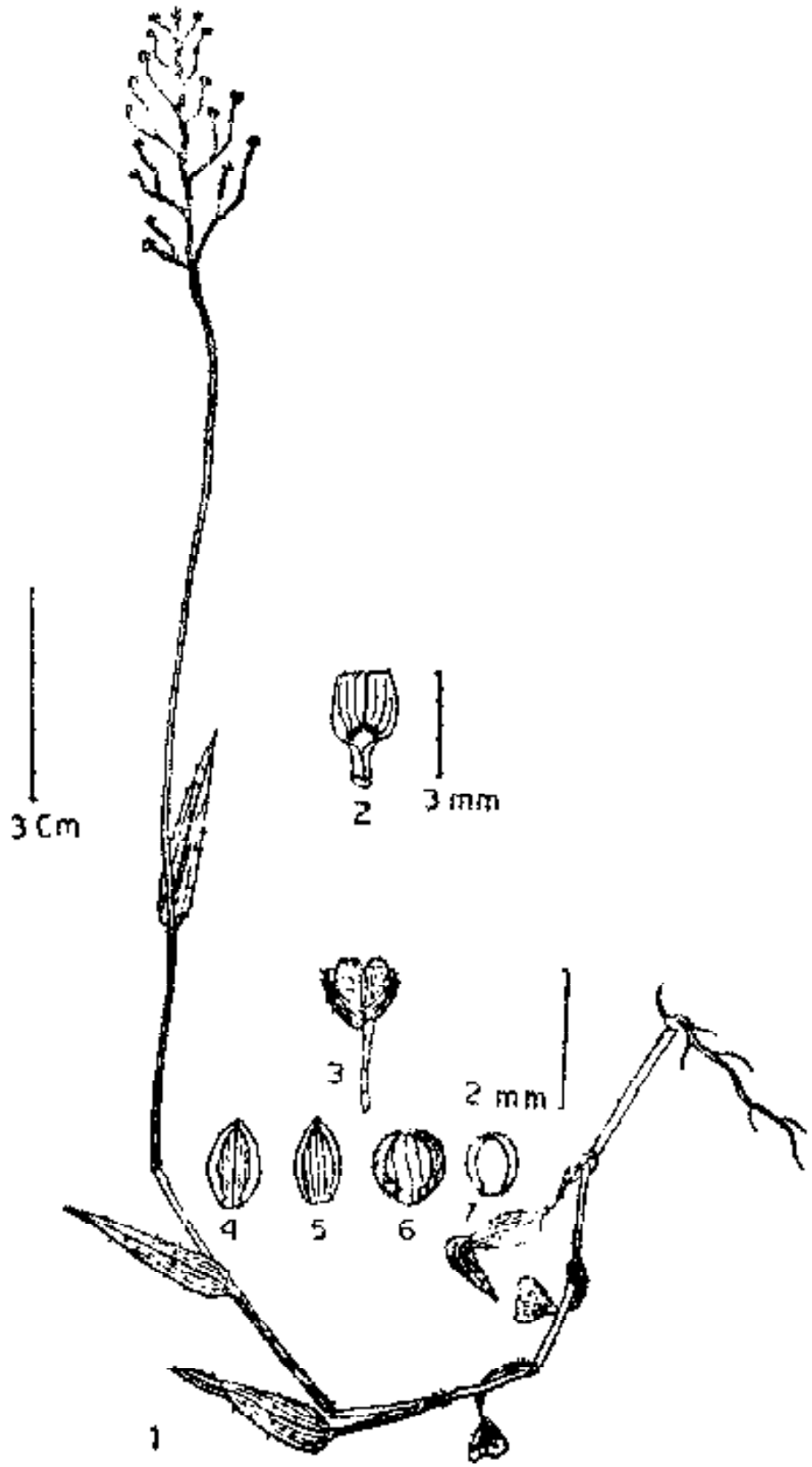
Courtesy : Bull. Bot. Surv. India



Glyphochloa santapaui (Jain & Deshpande) Clayton

a. Habit. b. Ligule. c. Node. d. & e. Two views of a portion of spike, joints and pedicels fused to form a boot-like structure seen at base. f-o. Sessile spikelet. f. Lower glume. g. Upper glume. h. Lower lemma. i. Lower palea. j. Upper lemma. k. Upper palea. l. Lodicules. m. Stamens. n. Grain. o. T. S. of grain. p-q. Pedicelled spikelet : p. Lower glume. q. Upper glume. (All based on type *Saldanha* 7130).

Courtesy : Bull. Bot. Surv. India



Isachne bicolor Naik & Patunkar

1. Habit. 2. Ligule. 3. Spikelet. 4 & 5. Lower and upper glume. 6. & 7. Lemma and palea. *Courtesy : Bull. Bot. Surv. India*

Hubbardia heptaneuron Bor : Delicate herb ; W. Ghats of Karnataka, Gersoppa falls & nearby hill cascades of N. Kanara & Shimoga. Endangered. Probably Extinct.

Indopoa paupercula (Stapf) Bor : Herb ; W. Ghats, Maharashtra (Khandala), Karnataka (Belgaum, Chikmagalur, Hassan, N. Kanara).

Isachne angladei C.E.C. Fisch. : Perennial herb ; Southern Ghats, Anamalai (Coimbatore), Palni hills (Madurai), 1200 1800 m.

I. bicolor Naik & Patunkar : Decumbent annual (with dark purple spikelets) ; Maharashtra, Mhaishnal-Aurangabad dist. (Ahmednagar) Panchgani, 600-1000 m.

I. borii Hemadri : Annual herb ; Maharashtra, Poona & Sholapur dist. Rare & Threatened.

I. bourneorum C.E.C. Fisch. : Perennial herb ; W. Ghats, Chikmagalur, Kottayam, Anamalai, Palni & Nilgiri hills, 1200-2200 m.

I. deccanensis Bor : Perennial ascending herb ; Southern W. Ghats, Nilgiris, 2000-2250 m. Rare.

I. elegans Dalz. : Annual tufted herb ; W. Ghats of Maharashtra (Poona, Khandala) & Karnataka (Chikmagalur, Coorg, Hassan, Kolar, Mysore), 600-1050 m.

I. fischeri Bor : Annual erect/ascending low herb ; Southern W. Ghats, Travancore Kottayam, Anaimudi (Idukki), 2,500 m. Rare.

I. gracilis Hubb. : Weak annual herb ; Peninsular India in Maharashtra, Karnataka, up to Madhya Pradesh.

I. lisboae Hook. f. : Annual, prostrate ascending herb ; W. Ghats of Panchgani & Mahableshwar, Karnataka Chikmagalur, N. Kanara, 1000 1500 m. Rare & Threatened.

I. meeboldii C.E.C. Fisch. : Perennial erect herb ; W. Ghats of Karnataka, Shimoga, Kumsi, 600 900 m.

I. mysorensis Raghavan : Annual, delicate erect herb ; W. Ghats of Karnataka, Shimoga dist. (Agumbe). Rare & Threatened.

I. oreades (Domini.) Bor : Perennial, ascending herb ; Southern W. Ghats, Nilgiris, 1500 2000 m. Rare & Threatened.

I. setosa C.E.C. Fisch. : Annual low herb ; W. Ghats, Chikmaglur, Hassan, Travancore (*Devicolam*), Cochin. Also in Tamil Nadu, 290 1800 m.

I. swaminathanii Ved Prakash & Jain : Perennial tall herb ; Northern W. Ghats, Satara dist., Mahableshwar, above 600 m.

I. veldkampii Bhatt & Nagendran : Annual erect herb ; W. Ghats of Karnataka, S. Kanara, Manipal, 250 m.

Ischaemum bolei Almeida : Annual herb ; Maharashtra, Ratnagiri dist., Savantwadi.

I. bombaiense Bor : Annual herb ; Maharashtra, Khandala (near Tata's lake).

I. dalzellii Stapf ex Bor ; Herb ; W. Ghats, Belgaum, Chikmagalur, N. Kanara. Rare.

I. diplopogon Hook. f. : Herb ; Maharashtra, Sahyadri range.

I. fumineum Bor : Perennial herb ; Maharashtra, Karnataka (N. Kanara), Tamil Nadu (Coimbatore).

I. huegelli Hack. : Herb ; Maharashtra, Sahyadri range.

I. impressum Kach. : Herb ; Maharashtra, Sahyadri range, Purandhar.

I. jayachandranii R. Ansari, Ramach. & Sreekumar : Stoloniferous perennial herb ; Southern W. Ghats, Kerala, Cannanore dist. Nileswar, ±175 m.

I. koenigii (Hook. f.) Stapf ex C.E.C. Fisch. : Herb ; Tamil Nadu.

I. lisboae Hook. f. : Herb ; W. Ghats of Karnataka, (N. Kanara, S. Kanara).

I. molle Hook. f. : Herb ; Maharashtra, Karnataka (Chikmagalur, N. Kanara, Shimoga), Kerala.

I. nilagiricum Hack. : Herb ; Southern W. Ghats, Mysore, Nilgiris.

I. pilosum (Klein ex Willd.) Wt. : Herb ; Peninsular India, extending up to Madhya Pradesh.

I. raizadae Hemadri & Billore : Annual erect herb ; W. Ghats of Maharashtra, Sahyadri range, perhaps southwards.

I. rangacharianum C.E.C. Fisch. : Herb ; Southern W. Ghats, Malabar.

I. ritchiei Stapf ex Bor : Herb ; W. Ghats, N. Kanara. Rare.

I. santapaui Bor : Herb ; Gujarat, W. Ghats of Maharashtra, Poona, Khandala, Thane.

I. thomsonianum Stapf ex C.E.C. Fisch. : Herb ; South India, Karnataka, (Chikmagalur, Hassan, Mysore), Travancore (Cochin).

I. travancorense Stapf ex C.E.C. Fisch. : Herb ; Southern W. Ghats, Travancore (Kerala).

I. tumidum Stapf ex Bor : Herb ; Peninsular India, Karnataka (Coorg, N. Kanara, Shimoga).

I. vembanadense Patil & DC'ruz : Perennial herb : Southern W. Ghats, of Kerala, Allepey dist.

Iseilema anthephoroides Hook. : Herb ; Peninsular India Maharashtra & Karnataka (Belgaum, Bellary, Bidar, N. Kanara).

I. bubbardii Murthy : Prostrate annual ; Madhya Pradesh, Ujjain.

I. venkateswarlui Satyavati : Prostrate annual ; E. Ghats, Guntur dist. of Andhra Pradesh.

Limnopoa meeboldii (C.E.C. Fisch.) C.E. Hubb. : Delicate floating herb ; Kerala, Ernakulam & Trichur dist. (Cochin). Rare & Endangered.

Lophopogon duthei Stapf ex Bor : Herb ; Madhya Pradesh.

L. tridentatus (Roxb.) C.E. Hubb. : Herb ; Peninsular India—Maharashtra, Karnataka, Madhya Pradesh.

Manisuris clarkei (Hack.) Bor : Herb ; Peninsular India, extending up to Parasnath in Bihar.

M. myuros Linn. : Herb ; Peninsular India Andhra Pradesh (Nellore dist.), Tamil Nadu (Coimbatore, Madura, Ramnad, S. Arcot, Chingeleput.)

Normanboria henrardiana (Bor) Butzin : Herb ; Tamil Nadu.

Ochlandra beddomei Gamble : Handsome bamboo ; Southern W. Ghats, Wynaad, Nilgiris. Rare.

O. chaeteata Raizada & Chatterjee : Reed-like bamboo ; Southern W. Ghats, Travancore (Trivandrum division, Punalur). Rare.

O. scriptoria (Dennst.) C.E.C. Fisch. : Erect bamboo ; W. Ghats, Hassan, N. Kanara, Malabar, Travancore (Cochin).

O. setigera Gamble : Erect/straggling bamboo ; Southern W. Ghats, Nilgiris, above 900 m. Rare.

O. sivagiriana Camus : Shrubby bamboo ; Southern W. Ghats, Sivagiri & Palni hills, 1200-2400 m. Rare.

O. talbotii Brandis : Reed-like bamboo ; W. Ghats, Coorg, N. Kanara. Rare.

O. travancorica Benth. ex Gamble : Gregarious bamboo ; Southern W. Ghats, S. Kanara, Travancore, Tirunelveli & Anamalais, up to 1500 m.

Ophiuros bombaiensis Bor : Herb ; Peninsular India Karnataka (Shimoga), Tamil Nadu.

Oropetium roxburghianum (Steud.) Phillips : Dwarf herb ; Peninsular India.

Oryza jeyporensis Govindaswami & Krishnamurthy ; Tall herb ; E. ghats of Orissa, Koraput dist.

O. nivara S.D. Sharma & Sashtri : Tall herb ; Maharashtra.

Oryza officinalis Wall. ex Watt. ssp. **malampuzhaensis** (Krish.) Tateoka ; Tall herb ; W. Ghats, particularly the southern portion ; also Nallamalais of E. Ghats.

Oxytenanthera bourdillonii Gamble : Straggling herb ; Southern W. Ghats, Travancore (Kerala), 900-1550 m. Rare.

Panicum deccanense Naik & Patunkar ; Herb ; Maharashtra.

P. fischeri Bor : Herb ; Southern W. Ghats, Nilgiris.

P. geradei Raghavan & Karthik. : Perennial herb ; Karnataka, Dharwar.

P. paianum Naik & Patunkar var. **paianum** : Herb ; Maharashtra.

P. paianum Naik & Patunkar var. **minor** Naik & Patunkar : Herb ; Maharashtra.

P. pholniciodes Naik & Patunkar ; Herb ; Maharashtra.

Parahyparrhenia hellariensis (Hack.) Clayton : Herb ; Andhra Pradesh (Anantapur dist.) & Gujarat (Rajkot). Rare.

Paspalum compactum Roth var. **fimbriatum** Bor : Herb ; Maharashtra, Mahableshwar.

Pogonachne racemosa Bor : Stilt-rooted herb ; W. Ghats of Maharashtra, Poona (Khandala, Matheran near coastal area), Thane & Colaba dist.

Pseudanthistiria hispida Hook. f. ; Annual herb ; W. Ghats, Konkan, Karnataka Belgaum, Dharwar, N. Kanara, S. Kanara. Also in Madhya Pradesh.

P. intermedia Birari & D'Cruz : Annual herb ; Maharashtra. Satpura (Toranmal) Range, Khandesh.

Pseudodichanthium serrafalcoides (Cooke & Stapf) Bor : Weak straggling herb ; Maharashtra.

Poa gamblei Bor : Herb ; Southern W. Ghats, Nilgiris, 2500 m.

Schimia sulcatum (Hack.) A. Camus : Herb ; Peninsular India, up to Madhya Pradesh.

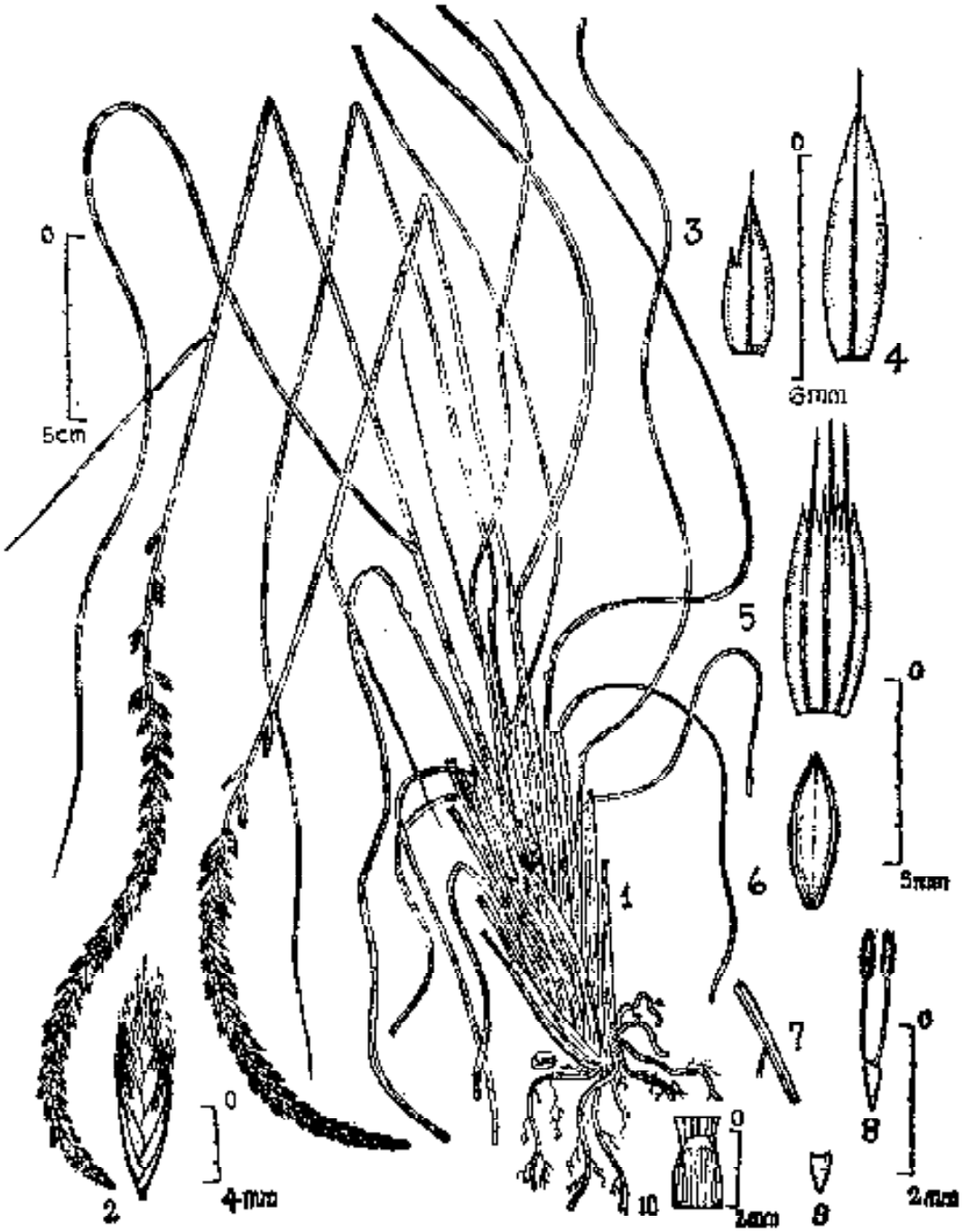
Silentvalleya nairii V.J. Nair et al. : Tufted perennial herb ; Southern W. Ghats, Kerala, Palghat dist.

Sorghum stapfii (Hook. f.) C.E.C. Fisch. : Herb ; Tamil Nadu, Palamkota. Rare.

Taeinostachyum beddomei C.E.C. Fisch. : Shrub/Tree ; Southern W. Ghats, Travancore, Nilgiris. Rare & Threatened.

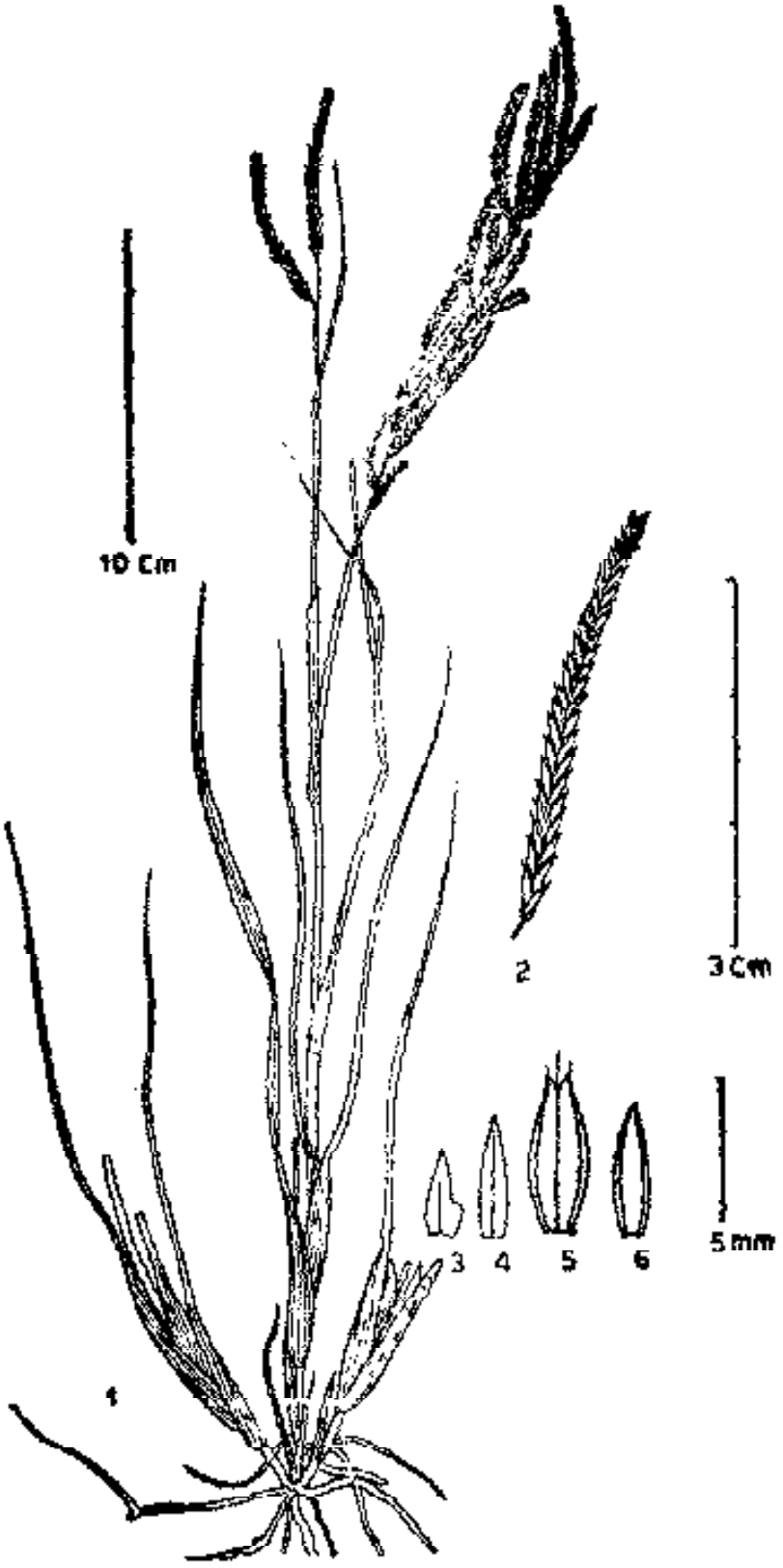
Themeda mooneyii Bor : Coarse gregarious herb : Eastern Ghats, Orissa, Koraput dist (Near Pottangi).

T. saxicola Bor : Coarse herb ; E. Ghats, Orissa, Koraput dist.



Tripogon ananzaswamianus Sreekumar, V. J. Nair & N. C. Nair

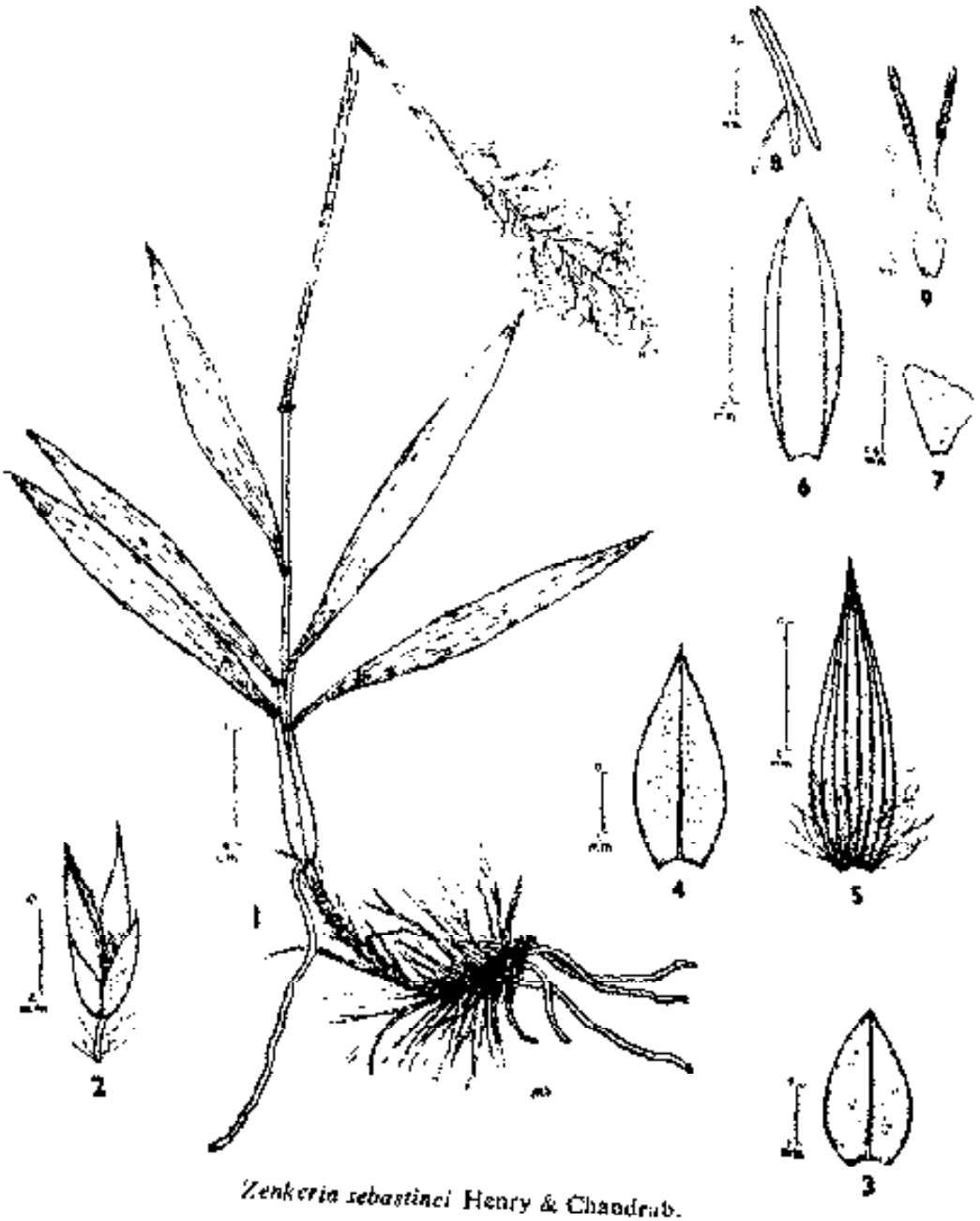
1. Habit. 2. Spikelet. 3. Lower glume. 4. Upper glume. 5. Lemma. 6. Palea. 7. Stamen. 8. Pistil. 9. Lodicule. 10. Ligule. *Courtesy : Bull. Bot. Surv. India*



Tripogon polyanthus Naik & Patunker

1. Habit. 2. Spikelet. 3 & 4. Lower and upper glume. 5 & 6. Lemma and palea.

Courtesy : Bull. Bot. Surv. India



Zenkeria sebastinei Henry & Chandrab.

1. Plant. 2. Spikelet. 3. Lower glume. 5. Lemma. 6. Palea. 7. Lodicule. 8. Stamen. 9. Pistil.

Courtesy : Bull. Bot. Surv. India

Tragus roxburghii Panigrahi : Annual herb ; Karnataka, most districts & Tamil Nadu (Velacherry).

Trilobachne cookei (Stapf) Schenck. & Henrard : Annual herb ; Northern W. Ghats, Konkan, N. Kanara.

Triplopogon ramosissimus (Hack.) Bor : Tall herb (with stilt root) ; Maharashtra, Sahyadri range.

T. bromoides Roem. & Schult : Slender tufted herb ; South India W. Ghats, Karnataka.

Tripogon anantaswaminus Sreekumar, V.J. Nair & N.C. Nair : Densely tufted herb ; Kerala, Idukki.

T. capillatus Jaub. & Spach. : Slender tufted herb ; W. Ghats, throughout & Parasnath. *Note* : The Parasnath species is a variant in context to upper glume.

T. jacquemontii Stapf : Slender tufted herb ; Peninsular India up to Gujarat.

T. polyanthus Naik & Patunkar : Densely tufted herb ; Maharashtra, Marathwada, Daulatabad.

T. pungens C.E.C. Fisch. : Slender tufted herb ; South India, Karnataka (Bangalore) & Tamil Nadu.

T. wightii Hook. f. : Slender tufted herb ; Peninsular India, Karnataka (Bellary).

Urochloa panicoides P. Beauv. var. **marathensis** (Henr.) Bor : Herb ; W. Ghats, N. Kanara.

U. panicoides P. Beauv var. **velutina** (Henr.) Bor : Herb ; Maharashtra, Poona dist.

Vetiveria lawsonii (Hook. f.) Blatter & McCann : Perennial herb ; Madhya Pradesh, Maharashtra, Karnataka, South India.

Zenkeria elegans Trin. : Tall perennial herb : Southern W. Ghats, Nilgiris, Palni hills.

Z. jainii Nair, Sreekumar & Nair ; Tall perennial herb ; Kerala, Idukki dt., Eravikulam Sanctuary.

Z. sebastinei Henry & Chandrab. : Tall perennial herb : Southern W. Ghats of Tamil Nadu, Tirunelveli dist., Agastaimalais.

MUSACEAE

The Banana and Manila Hemp family of gigantic, evergreen, perennial herbs comprises *ca* 2 genera and 42 species distributed in the Old World tropics. The family occurs chiefly in tropical Africa, Asia and Australia, i.e. from W. Africa to the Pacific (Southern Japan to Queensland). The genus *Musa* is essentially Asian, with its greatest diversity in Burma and

New Guinea, where most species grow in the wet tropical lowlands though some outliers do occur in the cooler hilly areas from southern Japan to the Himalayas. The predominantly African genus *Ensete* has a few representatives in S. China, Southeast Asia and Indomalaysia. *Ensete glaucum* is a relict species with polytopic endemism in Burma, Thailand, Philippines, New Guinea and Java. In India this phytogeographically interesting relict species has been reported from the E. Ghats of Visakhapatnam district in Andhra Pradesh.

The family Musaceae is represented in India by *ca* 15 species of which only one, i.e. *Ensete superbum* is known to be endemic in the W. Ghats.

ENDEMIC TAXA :

Ensete superbum (Roxb.) Cheesman : A shrub ; W. Ghats, 900 1500 m, extending up to Gujarat.

ZINGIBERACEAE

The Ginger family comprises *ca* 45 genera and 700 species distributed chiefly in the tropical Indomalaysian region. The family is of considerable economic importance, as the rhizomes of *Zingiber* and *Curcuma* are used as spice and condiment.

The family is represented in India by *ca* 17 genera and 133 species of which 17 spp. are endemic to Peninsular India. Relatively, the family is better represented in the Himalayas, than in Peninsular India. The palaeotropical genus *Amomum* is represented in India by *ca* 10 spp. of which 3 are endemic to Peninsular India. *A. microstephanum* is rare/ threatened. *Boesenbergia* is an Indomalaysian genus with 5 Indian representatives ; *B. pulcherrima* is reportedly rare/threatened. The genus *Curcuma* is represented in India by *ca* 19 spp. of which 6 spp. are endemic to Peninsular India. *C. decipiens* is a rare plant of the W. Ghats. Most of the Indian representatives (*ca* 25) of the genus *Hedychium* are mostly concentrated in the North Eastern region and Himalayas. However, *H. venustum* is endemic to the Southern W. Ghats. The small genus *Hitchenia* of 3 spp. is represented in India by 2 spp. of which the "Arrowroot plant of Mahableshwar" (*H. caulina*) is endemic to the W. Ghats of Maharashtra. *Kaempferia* is represented in India by *ca* 11 spp. of which only 3 are endemic to Peninsular India.

Paracautleya is monotypic and endemic to Peninsular India : the species complement *P. bhartii* is a small rhizomatous herb with yellow flowers, growing during monsoon in the moist rock crevices of S. Kanara hills in Karnataka state. The genus *Zingiber* is represented in India by *ca* 14 species, of which 3 species are endemic to Peninsular India.

ENDEMIC TAXA :

Amomum cannicarpum (Wt.) Benth. : Perennial herb with yellow flowers ; W. Ghats, 1200 1800 m.

A. microstephanum Baker : A perennial herb with extensive rootstock. W. Ghats, Hassan, Palghat & Anamalais. Rare & Threatened.

A. muricatum Bedd. : Perennial herb with white to yellow flowers ; W. Ghats, Mysore, Anamalais, 600 900 m.

Boesenbergia pulcherrima (Wall.) Kuntze : Leafy tuberous herb ; W. Ghats of Karnataka (Hassan, Shimoga & S. Kanara) & Kerala. Rare & Threatened.

Curcuma cannanorensis R. Ansari, V.J. Nair & N.C. Nair : Tuberous herb with white flowers, pinkish tinged outside ; Southern W. Ghats of Kerala, Cannanore dist., 175 m.

C. cannanorensis var. **lutea** R. Ansari, V.J. Nair & N.C. Nair : Tuberous herb with yellow flowers ; Southern W. Ghats of Kerala, Cannanore dist., Kalliaseri, 125 m.

C. decipiens Dalz. : Stemless herb ; W. Ghats, Shimoga. Rare and Threatened.

C. inodora Blatter : Rhizomatous herbs ; Maharashtra, Moolgaum, Salsette.

C. neilgherrensis Wt. : Stemless herb with tuberous rootstock ; W. Ghats, throughout at high altitudes.

C. pseudomontana Graham : Stemless herb with small rootstock ; W. Ghats, Konkan, Chikmagalur, Mysore, Anamalais (also Pachmarhi in M.P.)

C. purpurea Blatter : Tuberous herb with thick root fibres ; W. Ghats, Khandala.

Hedychium venustum Wt. : Perennial herb with white flowers ; W. Ghats, Konkan, Cochin, Malabar & Nilgiris, 600 1500 m.

Hitchenia caulina (Grah.) Balbo : Tuberous herb ; W. Ghats, Panchgani & Satara dist. (Mahableshwar).

Kaempferia evansii Blatter : A perennial herb ; Tamil Nadu, Madurai dist., 1650 m.

Paracautleya bhattii R.M. Smith : Small rhizomatous herb ; Karnataka, S. Kanara (Manipal), 100 m.

Zingiber cernuum Dalz. : Perennial herb with horizontal & tuberous rootstock ; W. Ghats, Konkan, Sahyadri range, Hassan (Bababudan hills), Chikmagalur.

Zingiber neesanum (Graham) Ramam. : Perennial herb ; W. Ghats, Konkan, Hassan, N. Kanara, Shimoga.

Z. roseum Roscoe : Perennial herb with red flowers ; E. Ghats, N. Circars, Rampa hills, 1150 m.

LILIACEAE

The Lilies form one of the largest families of flowering plants and comprise *ca* 250 genera and 3,700 species which are cosmpolitan, although some small groups are often restricted to definite floral regions. A few of the arborescent forms, e.g. *Dracaena* and *Yucca* occur in the tropical and warm temperate regions.

The family is represented in India by *ca* 36 genera and 159 species, with a greater concentration in the Himalayas. In Peninsular India as many as 27 species and 3 varieties are endemic. The percentage of endemism in relation to the Indian species of the family is approximately 17%. The Old World genus *Asparagus* is represented in India by *ca* 20 species of which 4 species, are endemic to Peninsular India. The genus *Chlorophytum* is represented in India by *ca* 12 species, of which 6 species are endemic to Peninsular India. Of the 9 Indian representative species of the genus *Dipcadi*, as many as 5 species are endemic to Peninsular India. The Indian species of the genus *Iphigenia* are mostly concentrated in the Northern W. Ghats with 5 endemic species. The genus *Scilla* is represented in India by only 3 species, of which one (*S. viridis*) is endemic in in Maharashtra. The genus *Urginea*, which is distributed in the Mediterranean, African and Indian region, is represented in India by 5 species, of which 3 species are endemic to Peninsular India. As many as 7 taxa are rare/threatened/endangered; *Dipcadi concanense*, *Scilla viridis* and *Urginea polyphylla* have not been collected after the original type collections.

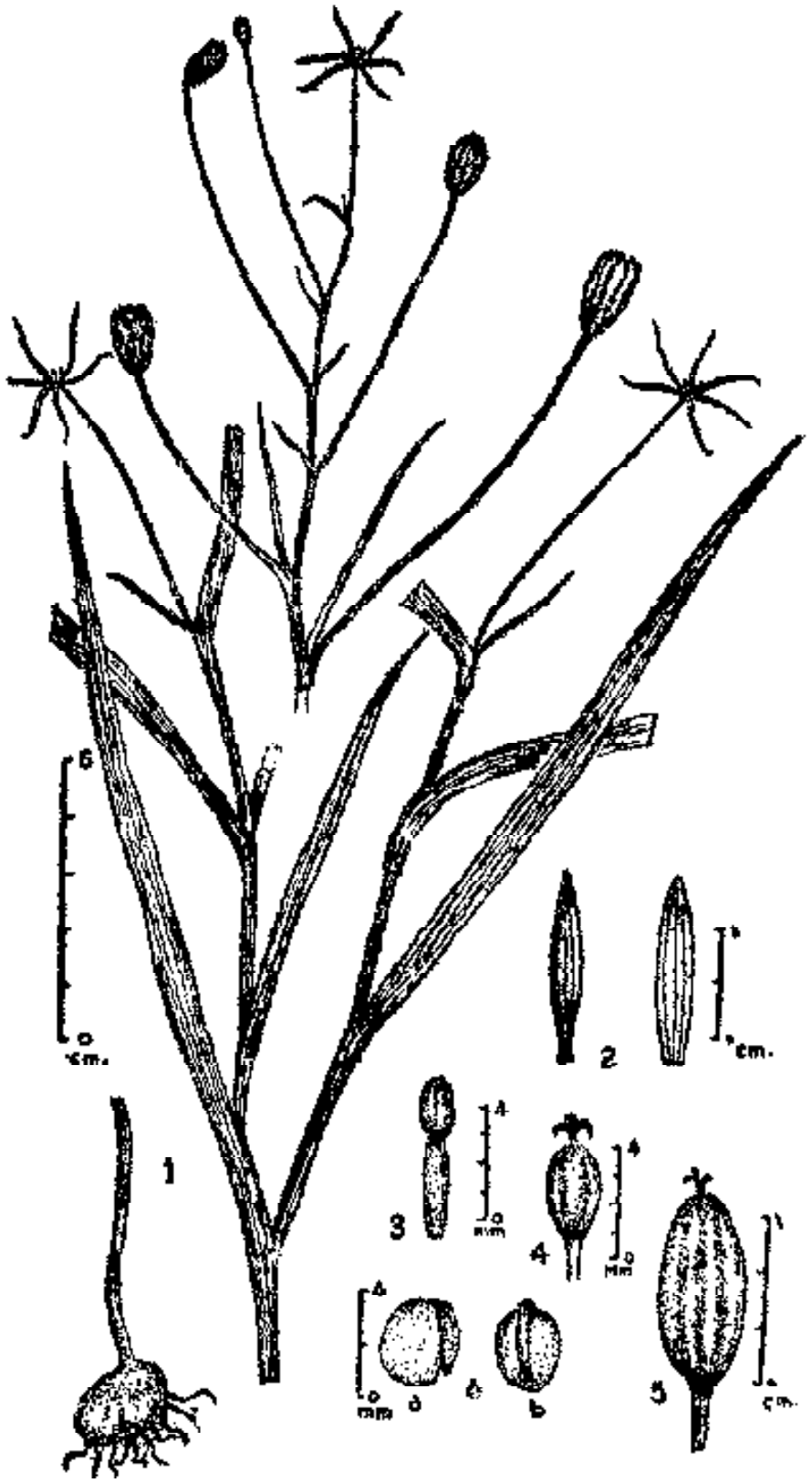
ENDEMIC TAXA :

Asparagus fysonii Macbride ; Scandent/erect undershrub ; Southern W. Ghats, Nilgiris, Anamalais & Palni hills, 1200 2400 m. Rare & Threatened.

A. jacquemontii Baker : Subscandent undershrubs ; Deccan ; Maharashtra, Poona dist.

A. laevissimus Steud. : Subscandent undershrub ; W. Ghats, Konkan, southwards to Nilgiris, 1800 m.

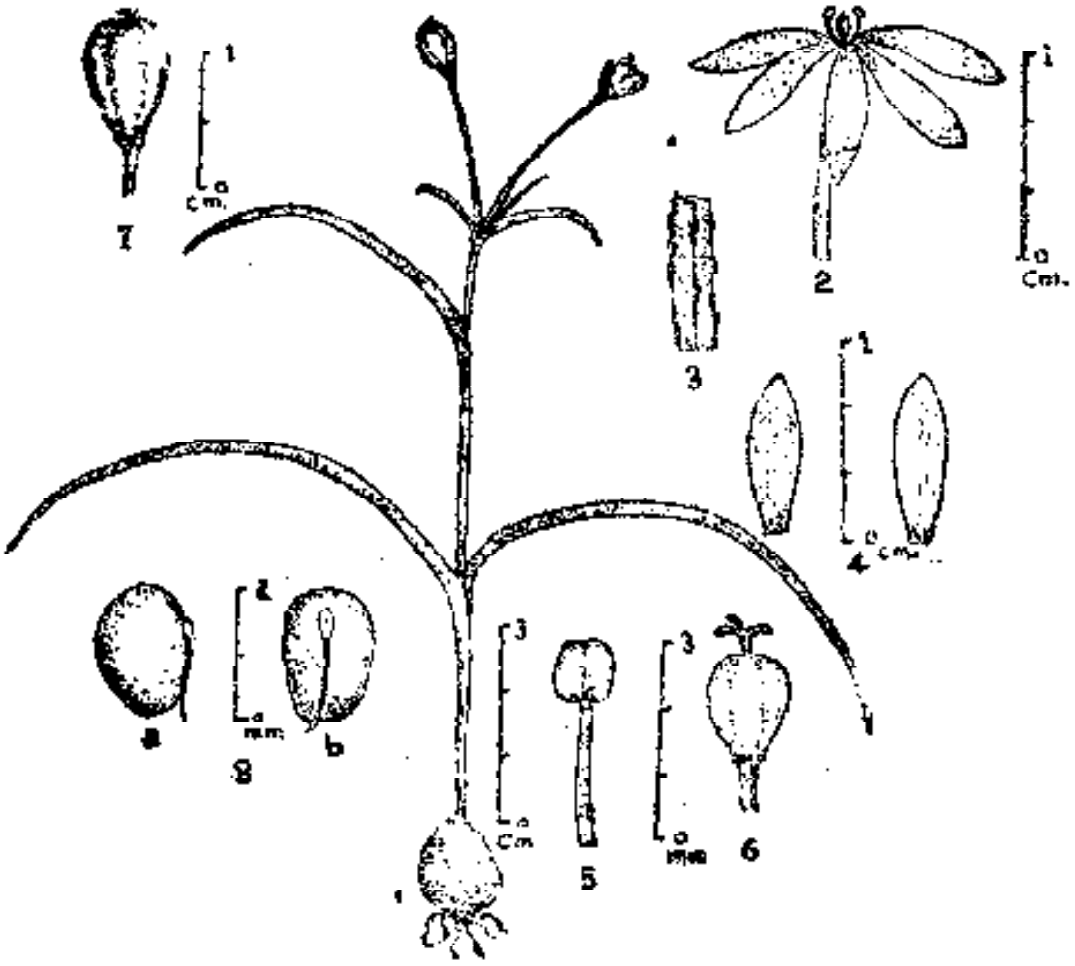
A. rottleri Baker : Scandent/erect undershrub ; Peninsular India, precise locality not known.



Iphigenia magnifica Ans. & Rolla

1. Whole plant. 2. Perianth segments. 3. Stamen. 4. Ovary with styles and stigma. 5. Capsule. 6a. Lateral view. 6b. Front view of seed, showing the raphe.

Courtesy : Bull. Bot. Surv. India



Iphigenia sahyadrica Ans. & Rolla

1. Whole plant. 2. Flower. 3. Part of a pedicel showing papillae. 4. Perianth lobes. 5. Stamen. 6. Ovary with style & sitgma. 7. Capsule. 8a. Lateral view of seed with thread–like raphe. 8b. Front view of seed with thread-like raphe.

Courtesy : Bull. Bot. Surv. India

Chlorophytum attenuatum (Wt.) Baker : Herb with fleshy root ; W. Ghats, 420 2100 m.

C. bharuchae Ansari, Raghavan & Hemadri : Perennial herb with long cylindrical roots ; W. Ghats of Maharashtra, Karnataka (Shimoga).

C. borivillianum Santapau & Fernandes : Perennial herb ; Greater Bombay, Borivili, & Gujarat. Rare & Threatened.

C. glaucoides Blatt. A herb ; Maharashtra.

C. glaucum Dalz. : Herb with cylindric root fibres ; W. Ghats, Konkan, Sahyadri range, N. Kanara, Chikmagalur and Mysore. Rare and Threatened.

C. malabaricum Dalz. : A herb : Southern W. Ghats.

Dipcadi concanense (Dalz.) Baker : Small bulbous scapigerous herb ; Maharashtra, Konkan (Malwan).

D. maharashtrensis Deb & Dasgupta : Herb with globose bulb ; Western Deccan, Maharashtra, Panchgani, Mahableshwar.

D. minor Hook. f. : Herb with ovoid bulb ; Deccan, Maharashtra, Konkan, Hewra plain near Junnar. Rare.

D. montanum (Dalz.) Baker var. **madrasicum** (Barnes & C.E.C. Fisch.) Deb & Dasgupta : Herb with ovoid/ellipsoid bulb ; Deccan plateau, 300 1700 m. up to Madhya Pradesh, Tamil Nadu (Coimbatore, Tirunelveli and Chingelput).

D. saxorum Blatter : Herb with globose bulb ; Deccan, Maharashtra, Panchgani and Mahableshwar & Salsette Island.

D. ursulae Blatter var. **ursulae** : Herb with globose/ovoid bulb ; W. Deccan, Maharashtra, Satara dist, Panchgani Plateau, 1500 m.

D. ursulae Blatter var. **longiracemosae** Deb & Dasgupta : Herb with white bulb ; W. Deccan, Gujarat, Maharashtra (Girnar hills).

Disporum leschenaultianum D. Don var. **angustifolium** Gamble : Erect herb ; Nilgiris of Southern W. Ghats.

Drimia razii Ansari : Herb ; Maharashtra.

Iphigenia magnifica Ansari & Rao : Erect glabrous herb ; Maharashtra, Dhule, Kolaba dist., Matheran.

I. mysorensis Arekal & Swamy : Erect leafy cormous herb ; Karnataka Hassan, Mysore.

I. pallida Baker : Leafy cormous herbs ; W. Ghats, Maharashtra and Karnataka (Belgaum, N. Kanara and Hassan).

I. sahyadrica Ansari & Rao : Small erect glabrous cormous herb ; Karnataka (N. Kanara and Shimoga), Tamil Nadu.

I. stellata Blatter : Erect leafy cormous herb ; W. Ghats, Panchgani & Mahableshwar.

Lilium neilgherrensis Wt. : Tall leafy herb ; W. Ghats. Billigirrangan hills (Karnataka), Palni, Anamalais, Nilgiris and Tirunelveli.

Scilla viridis Blatter & Hallberg : Leafy herb with tunicate bulb ; Maharashtra Khandala, Mahableshwar, Satara dist. Rare/Endangered/ Probably Extinct.

Smilax wightii A. DC. : Climbing shrub ; Southern W. Ghats, Anamalai & Nilgiris, 1200-2400 m.

Urginea nagarjunae Hemadri & Swahari : Herb ; Andhra Pradesh (Nalgonda dist.) & Tamil Nadu.

Urginea polyantha Blatter : Herb with tunicated bulb ; Gujarat, Maharashtra (Sahyadiri, Poona and Satara dist.) Karnataka, Tamil Nadu.

U. polyphylla : Hook. f. : Herb with ovoid bulbs ; Deccan Peninsula (Akya) (Known from type collection only).

AMARYLLIDACEAE

The Amaryllis or Daffodil family comprises *ca* 85 genera and 1100 species which are distributed in tropical, subtropical or even warm temperate regions. The genera *Galanthus* and *Narcissus* are found in temperate regions. Most of the members of family are xerophytic in nature, with bulbs or rhizomes.

The family is represented in India by *ca* 5 genera and 22 species of which 5 species, i.e. approx. 23% are endemic to peninsular India. The genus *Crinum* is represented in India by *ca* 11 species of which 3 species are endemic to the Northern W. Ghats of Peninsular India. The small genus *Pancratium*, having only *ca* 15 species occuring from Mediterranean to tropical Asia and tropical Africa, is represented in India by 8 species of which 2 species are endemic to the Western Ghats. *Pancratium parvum* is rather rare.

ENDEMIC TAXA :

Crinum brachynema Herbert : Bulbous herb ; Maharashtra, Sahyadri range, Mahableshwar.

C. **elenorae** Blatter & McCann : Bulbous herb ; Maharashtra, Sahyadri range, Mahableshwar.

C. **woodrowii** Baker : Herb with truncated bulbs ; Maharashtra, Sahyadri range, Mahableshwar.

Pancratium parvum Dalz. : Bulbous herb ; W. Ghats, Konkan, Belgaum Chikmagalur, Mysore, N. Kanara. Rare & Threatened.

P. **st-mariae** Blatter & Hallberg : Herb ; Bombay, Khandala.

DIOSCOREACEAE

The yams comprise *ca* 5 genera and 750 species most of which are pantropical. A few species also occur in temperate regions. The members of this family mainly constitute tropical climbers.

The family is represented in India by a single genus (*Dioscorea*) and *ca* 50 species of which only 3 species are endemic to Peninsular India. All these 3 endemic species are rare and threatened.

ENDEMIC TAXA :

Dioscorea belophylla Voigt. : Climbing shrub ; W. Ghats. Rare & Threatened.

D. kalkapershadii Prain & Burk. : Climbing herb ; Southern E. Ghats, Shevaroy hills. Rare & Threatened.

D. wightii Hook.f. : Climbing herb ; Southern W. Ghats, Courtallam, Kerala. Rare & Threatened.

BURMANNIACEAE

This is a small herbaceous family comprising *ca* 17 genera and 125 species distributed throughout the tropical and subtropical belt. They occur in the tropical forests of Brazil, equatorial Africa and Southeast Asia. Most members of this family are saprophytic in nature.

In India the family is represented by *ca* 2 genara and 7 species occurring chiefly in South India. A single monotypic genus *Haplothismia* (with its species complement *H. exannulata*) is endemic to Peninsular India or rather the Southern W. Ghats in particular. This rare and threatened plant grows in deep shade on the moist hill slopes that harbour fungus mycellia in the soil.

ENDEMIC TAXA :

Haplothismia exannulata Airy Shaw : Saprophytic herb ; Southern W. Ghats, Travancore, Cochin State, Annamalais, Parambikulam, 450-600 m. Rare & Threatened.

ORCHIDACEAE

The beautiful orchids form one of the largest families of flowering plants, comprising *ca* 735 genera and 17,000 species (30,000 according to Jayaweara in *Rev. Handb. Fl. Ceyl.* 2. 1981) which are cosmopolitan except in the Polar regions and a few isolated islands. They are highly concentrated in the tropical mountains of both the Old and New Worlds. The orchids have a wide ecological range and their growth is closely co-related with the environmental conditions. The members range from epiphytic herbs which are rather selective to saprophytic herbs which need particular edaphic and biotic conditions and terrestrial herbs which prefer acidic soils. However, some orchids also grow under extreme climatic conditions.

In India the family is represented by *ca* 131 genera and 956 species of which 111 species (+ 12 varieties), i.e. approx. 11% are endemic to Penin-

sular India. These 123 orchidaceous endemic taxa of Peninsular India are spread over 33 genera. The Indian orchids are concentrated chiefly in the three major phytogeographical regions : the Himalayas, North-East Region and Peninsular India. The genera with the highest representation of endemic species in Peninsular India are *Habenaria* (with 25 endemic spp. and 4 vars.) *Bulbophyllum* (with 12 endemic spp. & 1 var.) followed by *Dendrobium* (with 12 endemic spp.) *Oberonia* (with 11 endemic spp.& 2 vars.) and *Eria* (with 8 endemic spp. & 1 var.). The endemic genus *Proteroceras* is monotypic. The genera endemic and common to both Peninsular India and Sri Lanka are, *Diplocentron* and *Sirhookera* ; each with two species complements which are mutually exclusive in their distribution. *Dendrobium* with *ca* 1,400 species happens to be the largest orchidaceous genus and is represented in India by *ca* 79 species, many of which are distributed in the Himalayas and North Eastern Region. The genus *Habenaria*, of *ca* 600 species occurring in the tropical and warm temperate regions of both Old & New Worlds, is represented in India by *ca* 60 species, of which almost 40% are endemic to the Indian Peninsula reflecting its greater development in this region as against the other two phytogeogrphical regions which have relatively fewer endemic species of this particular genus. Similarly, the palaeotropical genus *Oberonia* is represented in India by *ca* 45 species of which approx. 24% are endemic in Peninsular region. The small genus *Trias* (of *ca* 6 species, which are essentially south East Asian) is represented in India by 3 species of which only one, i.e. *T. stocksii* is endemic to Peninsular India ; while *T. pusilla* is endemic to N.E. Region and *T. oblonga* is wide.

Some of the endemics like *Anoectochillus elatior*, *Bulbophyllum acutiflorum*, *B. nodosum*, *Dendrobium anamalayanum*, *Habenaria caranjensis*, *H. polyodon*, *Liparis beddomei*, *Nervilia hispida*, *Oberonia anamalayanum*, which have very narrow distributional range, are rare & threatened. Special mention must be made of the narrow or local endemic species of *Bulbopyllum aureum* and *Taeniophyllum scaberulum* which are extremely rare and endangered, thereby, warranting immediate attention. *Paphiopedilum druryi*, which is already listed in the the IUCN's Red Data Book, is feared to be on the very brink of extinction.

ENDEMIC TAXA :

Aerides maculosum Lindl. : Epiphytic herbs ; Peninsular India, W. Ghats, Konkan, Ramandrug, Belgaum, Bellary, Hassan ; Deccan up to Chota Nagpur, Bihar, Orissa & Rajasthan.

Anoectochilus elatior Lindl. : Decumbent terrestrial herb with white flowers ; W. Ghats in evergreen forests, Nilgiris (Coonoor), 900 1800 m.

A. rotundifolius (Blatt.) Balakr. : Terrestrial leafy herb ; Madurai dist. of Tamil Nadu.

Brachycorythis iantha (Wt.) Summerh. : Peninsular India in Southern W. Ghats of Kerala & Tamil Nadu, 2000 m. extending up to Bihar.

B. splendida Summerh. : Terrestrial herb ; S.W. Ghats, Calicut, Anamalai, Madurai, Devikolam, Kottayam, Nilgiri.

B. wightii Summerh. : Terrestrial herb ; Southern W. Ghats of Kerala-Trivandrum (Travancore) & Tamil Nadu.

Note : Seidenfaden reduced *Cirrhopetalum* to a section of the genus *Bulbophyllum* in *Dansk. Bot. Arkiv.* 33 (3) : 1 225. 1979. But J. Joseph (Orchids of Nilgiris, 1982) treated them separately.

Bulbophyllum acutiflorum A. Rich. : Epiphytic herb with greenish/creamy coloured flowers ; Southern W. Ghats of Nilgiris, 2000 m. Rare.

B. albidum (Wt.) Hook. f. : Epiphytic herb with creamish flowers with pale brown freckles ; Southern W. Ghats. Rare & Threatened.

B. aureum (Hook. f.) J.J. Smith : Epiphytic herbs with golden yellow flowers ; Southern W. Ghats of Kerala (Wynaad). Rare & Endangered.

B. elegantulum (Rolfe) J.J. Smith. : Epiphytic or lithophytic herb with yellow flowers, maroon striped ; W. Ghats, in Coorg & Nilgiris, 1450 m.

B. fimbriatum (Lindl.) Reichb. f. : Epiphytic herb with greenish/creamy flowers ; W. Ghats, Konkan to Kanara (Coorg).

B. fusco-purpureum Wt. : Small epiphytic herb with large dark purple flowers ; W. Ghats, Mysore, Nilgiris, 2000 m. Rare & Threatened.

B. kaitiense (Wt.) Reichb. f. : Epiphytic herb ; Southern W. Ghats of Kerala & Tamil Nadu (below Kartairy river), 1200 1800 m.

B. mysorense J.J. Smith : Epiphytic herb with almost white flowers & purple lip ; W. Ghats & Deccan, Karnataka hills (Hassan and Mysore). Rare & Threatened.

B. neilgherrense Wt. : Small epiphytic herbs with dull yellow flowers with dense racemes ; W. Ghats ; Konkan Karnataka region, Travancore, Nilgiris, 800 - 1800 m.

B. nodosum (Rolfe) J.J. Smith : Rhizomatous herb with reddish brown flowers, white speckled ; Southern W. Ghats, Nilgiris (?).

B. proudlockii (King & Pantl.) J.J. Smith : Pseudobulbous herbs with pale yellow flowers ; W. Ghats, Chikmagalur, Hassan, Mysore, Nilgiris, 1200 1400 m.

B. tremulum Wt. : Rhizomatous creeping herb with large yellow flowers with purple marks ; W. Ghats, Coorg, Mysore southwards Travancore, Wynaad, Nilgiris & Anamalais, 800 1150 m.

Coelogyne glandulosa Lindl. var. **glandulosa** : Epiphytic/lithophytic herb, white flowers ; W. Ghats Tamil Nadu, Nilgiris, Kodaikanal-Palni & Kudramukh.

C. glandulosa Lindl. var. **bournei** Das & Jain : Epiphytic/lithophytic herb ; Southern W. Ghats, Palni hills.

C. glandulosa Lindl. var. **sathyanarayanae** Das & Jain : Large epiphytic/lithopytic herb with fragrant flowers ; Southern W. Ghats, Nilgiri & Palni hills. Rare & Threatened.

C. mossiae Rolfe *emend* Das & Jain : Epiphytic herb ; Southern W. Ghats of Kerala & Tamil Nadu (Nilgiris).

C. nervosa A. Rich. : Creeping epiphytic ligthophytic herb with large white flowers ; W. Ghats, hills of Karnataka (Mysore) to Travancore, Nilgiris & Tirunelveli, 1600 2200 m.

C. odoratissima Lindl. var. **angustifolia** (Rich.) Lindl. : Epiphytic herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

Dendrobium anamalayanum Chandrab., Chandras. & Nair : Epiphytic herb ; Southern W. Ghats, Anamalai, 1400 1900 m.

D. aqueum Lindl. : Epiphytic herb with white flowers : Southern W. Ghats, Konkan, Hassan, Nilgiris (?), Anamalais (?), 900 1100 m.

D. barbatulum Lindl. : Caespitose herbs, creamy white flowers ; Gujarat ; W. Ghats, Konkan to Travancore and Nilgiris, 1300 m.

D. herbaceum Lindl. : Erect herbs with white flowers at nodes ; Mostly throughout Peninsular India, extending up to Bihar (Parasnath).

D. heyneanum Lindl. : Epiphytic herb with white flowers ; Southern W. Ghats, throughout from Konkan, Hassan, Shimoga, Bolampatti hills, to Nilgiris (?), Cannanore, Courtallam & Tirunelveli, 1500 m.

D. lawianum Lindl. : Epiphytic herb ; W. Ghats, Konkan (Sahyadri range) Belgaum, Hassan & Kanara.

D. mabelae Gammie : Pseudobulbous herb with whitish flowers ; Peninsular India, Maharashtra & Karnataka (Belgaum, Hassan, N. Kanara).

D. microbulbon A. Rich. : Small epiphytic herb with white flowers ; Gujarat. W. Ghats, Konkan, N. Kanara, Nilgiris, Anamalais. Rare & Threatened.

D. nanum Hook. f. : Small caespitose herb, white flowers ; W. Ghats, Karnataka hills (Coorg, Hassan, Mysore), Anamalais, extending eastwards, through Madurai to Shevaroys of E. Ghats, 1200 m.

D. nutans Lindl. var. **rubrilabris** Blatter : Erect caespitose herb, with white flowers ; Southern Peninsular India, Madurai dist.

Dendrobium ovatum (Willd.) Kranzl. : Stout herb, with coloured flowers ; W. Ghats, Konkan, N. Kanara, Belgaum & Hassan, up to 1500 m.

D. wightii Hawkes & Heller : Epiphytic/lithophytic caespitose herbs, pinkish white flowers ; W. Ghats, Chikmagalur, Travancore, Anamalai, Nilgiris & Tirunelveli hills, up to 600 m.

Diplocentrum congestum Wt. : Epiphytic herb with pinkish flowers ; Peninsular India W. Ghats throughout & Deccan up to Orissa.

Erla albiflora Rolfe : Pseudobulbous herbs with white flowers ; W. Ghats, Hassan, Wynaad, Nilgiris (Ooty). Rare & Threatened.

E. dalzelli Lindl. : Pseudobulbous herb with creamy yellow flowers ; W. Ghats, Konkan Hassan, Mysore to Nilgiris, 800 m.

E. exilis Hook. f. : Small delicate pseudobulbous herbs ; Almost throughout W. Ghats, Konkan to Travancore & Tamil Nadu hills.

E. microchilos Lindl. : Pseudobulbous epiphytic herbs ; Throughout W. Ghats, Konkan Travancore & Tamil Nadu hills.

E. **muscicola** (Lindl.) Lindl. var. **breviliguis** Joseph & Chandrabose : Tiny bulbous creeping epiphytic herb with large greenish yellow flowers ; Southern W. Ghats, Agastyamalai, Trivandrum dist. (Kerala), 1800 m.

E. mysorensis Lindl. : Caespitose, pseudobubous herbs with white flowers ; Almost throughout W. Ghats, Konkan to Nilgiris, 1100 1800 m.

E. nana A. Rich. ; Spreading herbs with greenish yellow flowers ; W. Ghats, Mysore, Nilgiris, 1500 2200 m.

E. pauciflora Wt. : Lithophytic, caespitose herbs with white flowers ; W. Ghats, Mysore, Nilgiris, Anamalai, Kollimalai, Tirunelveli & Madurai hills, 1600 - 2000 m.

E. polystachya A. Rich : Pseudobulbous, caespitose herbs with pale yellowish creamy white flowers ; Southern W. Ghats, Nilgiris, 1800 2000 m.

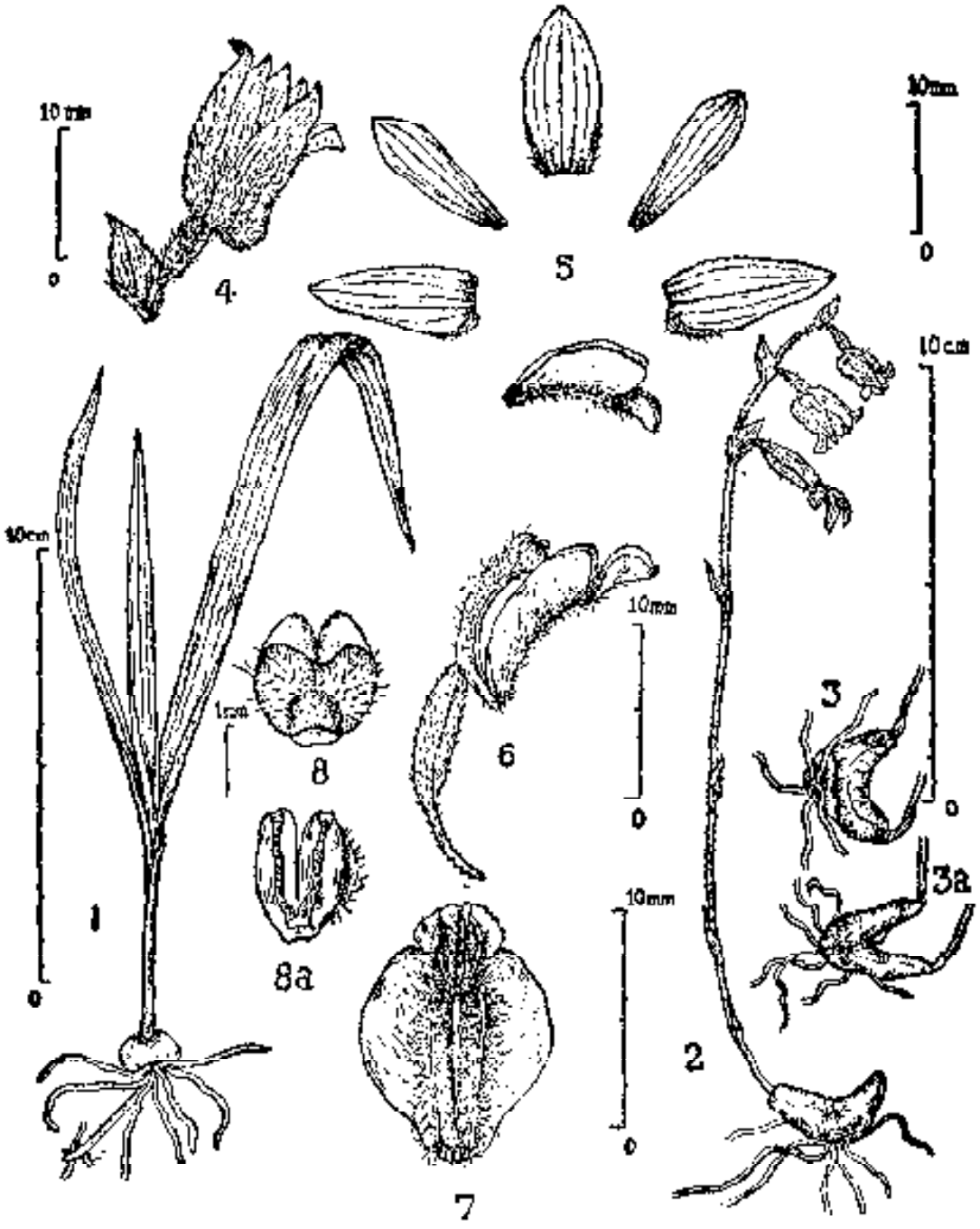
Eulophia emilianae Saldanha : Herb with horizontal tubers ; Karnataka, Chikmagalur & Hassan dist., Shiradi ghat.

E. hirsta Joseph & Vajravelu : A terrestrial herb with bright yellow flowers ; Southern W. Ghats, Travancore, Palghat dist. (Kerala), 1150 m.

E. ochreata Lindl. : Terrestrial orchid ; Gujarat W. Ghats, Konkan, Dharwar, N. Kanara, E. Ghats, Visakhapatnam hills, 1000 m.

E. ramentacea Lindl. ex Wt. : Terrestrial herb ; Gujarat ; W. Ghats, Konkan, Belgaum, Dharwar, Mysore, Raichur. Rare & Threatened.

Flickingeria nodosa (Dalz.) Seidenf. : Epiphtyic herb ; Throughout the W. Ghats.



Eulophia hirsuta Joseph & Vajravelu

1. Habit (vegetative). 2. Habit (flowering). 3 & 3a. Tubers. 4. Flower with bract. 5. Floral parts. 6. Ovary with column & lip (side view). 7. Lip (spread out, dorsal view). 8. Anther (dorsal view). 8a. Anther cells (ventral view).

Courtesy : Bull. Bot. Surv. India

Gastrochilus flabelliformis (Blatt. & McCann) Saldanha : Epiphytic herb ; W. Ghats, N. Kanara & Hassan.

Habenaria barnesii Summerh. : Slender tuberous herbs ; Southern W. Ghats, Travancore, Nilgiris, 2100 m. Rare & Threatened.

H. caranjensis Dalz. : Tuberous herb ; W. Ghats, Konkan, near Bombay. Probably Extinct.

H. cephalotes Lindl. : Tuberous herbs with white fragrant flowers ; Southern W. Ghats, Nilgiris, 2100 m.

H. crassifolia A. Rich. : Flowers greenish white, spur green ; W. Ghats, Konkan, Nilgiris & Palni hills, 1800 2100 m.

H. deciplens Wt. : Tuberous herb ; Southern W. Ghats, Nilgiris, Tirunelveli, up to Shevaroy 1200 - 2100 m.

H. denticulata Reichb. f. : Tuberous herb ; Southern W. Ghats, Nilgiris. Rare & Threatened.

H. digitata Lindl. var. **travancorica** C.E.C. Fisch. : Tuberous herb with greenish flowers ; Southern W. Ghats, Palni hills, 1200-2100 m.

H. gibsonii Hook. f. var. **gibsonii** : Tuberous herb, greenish flowers ; W. Ghats, Konkan, Mysore & N. Kanara.

H. gibsonii Hook. f. var. **foetida** Blatt. & McCann : Tuberous herb ; W. Ghats, Maharashtra.

H. gibsonii Hook. f. var. **foliosa** (A. Rich.) Santapau & Kapadia : Tuberous herb ; Southern W. Ghats, Nilgiris, 2100 2400 m.

H. elliptica Wt. : Tuberous herb ; W. Ghats, Mysore, Nilgirs & Palni hills, 2100 2400 m.

H. elwesii Hook. f. : Erect herb with long flowers ; W. Ghats of Karnataka (Hassan, Mysore) to Nilgiris, 900 m.

H. grandifloriformis Blatt. & McCann : Herb with white flowers ; W. Ghats, Konkan, hills of Karnataka to Shevaroys of E. Ghats.

H. heyneana Lindl. : Small tuberous herbs with white flowers ; W. Ghats, Konkan, throughout Karnataka hills to Nilgiris ; eastward to Shevaroys, 1600 2400 m.

H. hollandiana Sant. : Tuberous herb ; Widely distributed in Peninsular India - W. Ghats & E. Ghats, Circars in Orissa (extending northwards).

H. longicornu Lindl. : Tuberous herb with white flowers ; W. Ghats, from Karnataka (Mysore) to Travancore, Nilgiris ; E. Ghats, Horsley konda Kollimalai hills, 1500 2000 m.

H. longicorniculata Graham : Herb, white flowers with green spur ; W. Ghats, Konkan, Karnataka hills to Nilgiris, 800 1900 m.

Habenaria multicaudata Sedgw. : Tall terrestrial herb with pale brownish-green flowers ; W. Ghats, N. Kanara, Hassan, Nilgiris & Anamalais, 600 m.

H. ovalifolia Wt. : Terrestrial herb ; Almost throughout W. Ghats, 600 1200 m.

H. panchganiensis Santapau & Kapadia : Terrestrial herb ; Northern W. Ghats, Panchgani, Mahabaleshwar.

H. panigrahiana S. Misra : Terrestrial erect herb ; E. Ghats, Ganjam dist.

H. panigrahiana S. Misra var. **parviloba** S. Misra : Erect herb ; E. Ghats, Ganjam dist. of Orissa.

H. perrottetiana A. Rich : Terrestrial tuberous herb with yellowish green flowers ; W. Ghats, Mysore, Nilgiris, Palni hills, 160 2100 m.

H. polyodon Hook. f. : Terrestrial herb with flowers in dense spike ; Southern W. Ghats, Nilgiris.

H. ramayyana Ramachandrachary & Wood : Terrestrial herb with pale pinkish white flowers : Andhra Pradesh, Amrabad forest Reserve, Bahrapur, 700 m.

H. rariflora A. Rich. : Often lithophytic with white flowers ; W. Ghats, Konkan, Kolar, Mysore, Shimoga to Travancore, Nilgiris, 900 2000 m.

H. richardiana W. ; Slender herb with white flowers ; Southern W. Ghats, Anamalai & Nilgiris. 2000 m. Rare & Threatened.

H. roxburghii Nicol. & Saldanha : Herb with white flowers ; Throughout Peninsular India, up to 1150 m.

H. suaveolens Dalz. : Herb with white fragrant flowers ; W. Ghats, Konkan, Chikmagalur, Bababudan hills.

Hetaeria ovalifolia Benth. : Leafy terrestrial herb ; South India "Courtallum".

Liparis beddomei Ridley : Terrestrial herb ; Southern W. Ghats, Palni hills, 1500 m.

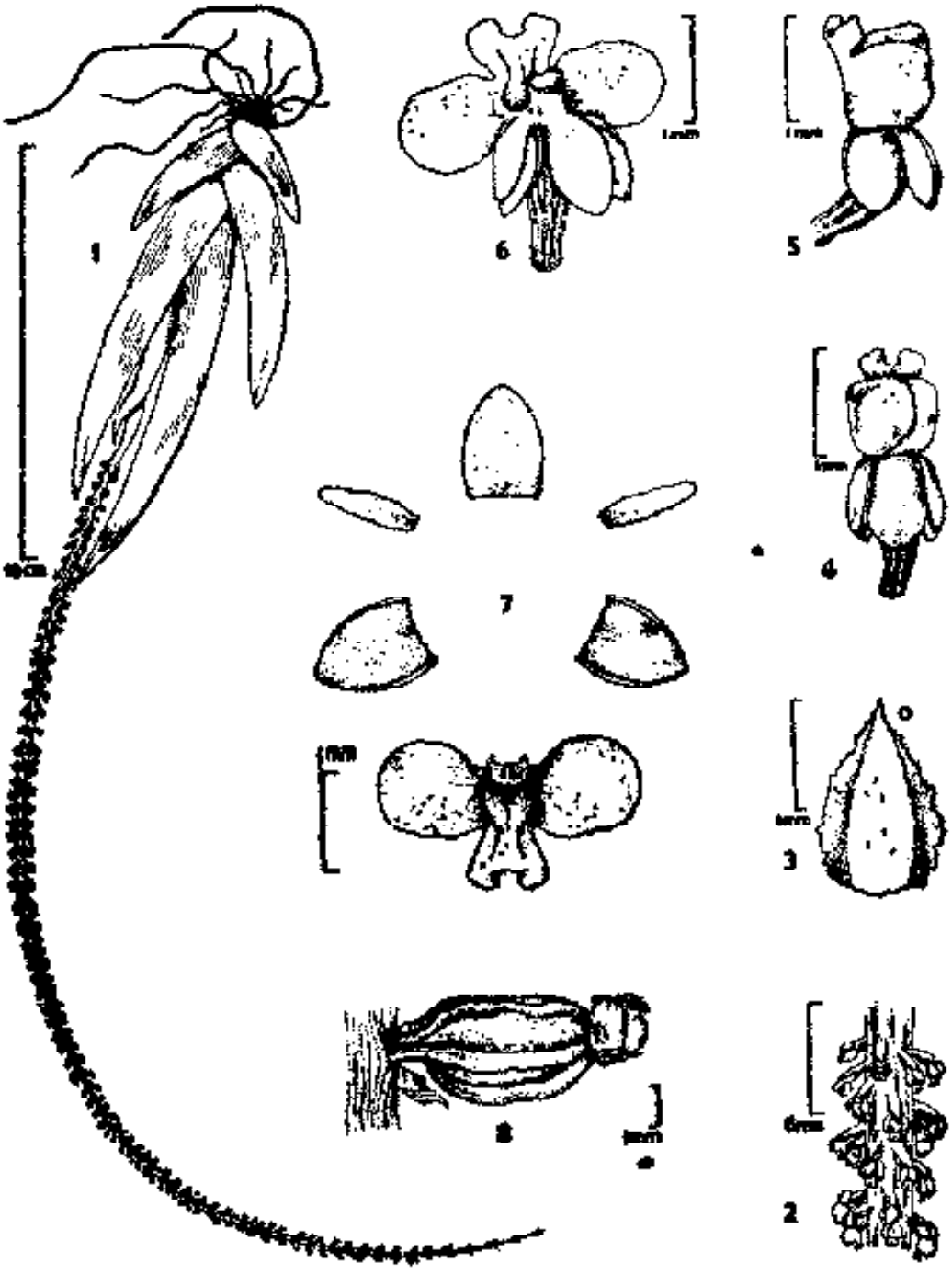
L. biloba Wt. : Small pseudo-bulbous herb with purple flowers ; W. Ghats, Chikmagalur, Nilgiris, 2200 m.

L. platyphylla Ridley : A dwarf terrestrial herb with green flowers ; W. Ghats, Mysore, Anamalais & Nilgiris, 1000 m.

Loxoma maculata (Dalz.) Garay : Epiphytic herb ; W. Ghats, Konkan-Kanara.

L. stramines (Saldanha) U.C. Pradhan : Epiphytic herb ; W. Ghats of Devalkere in Hassan dist., also Palghat dist.

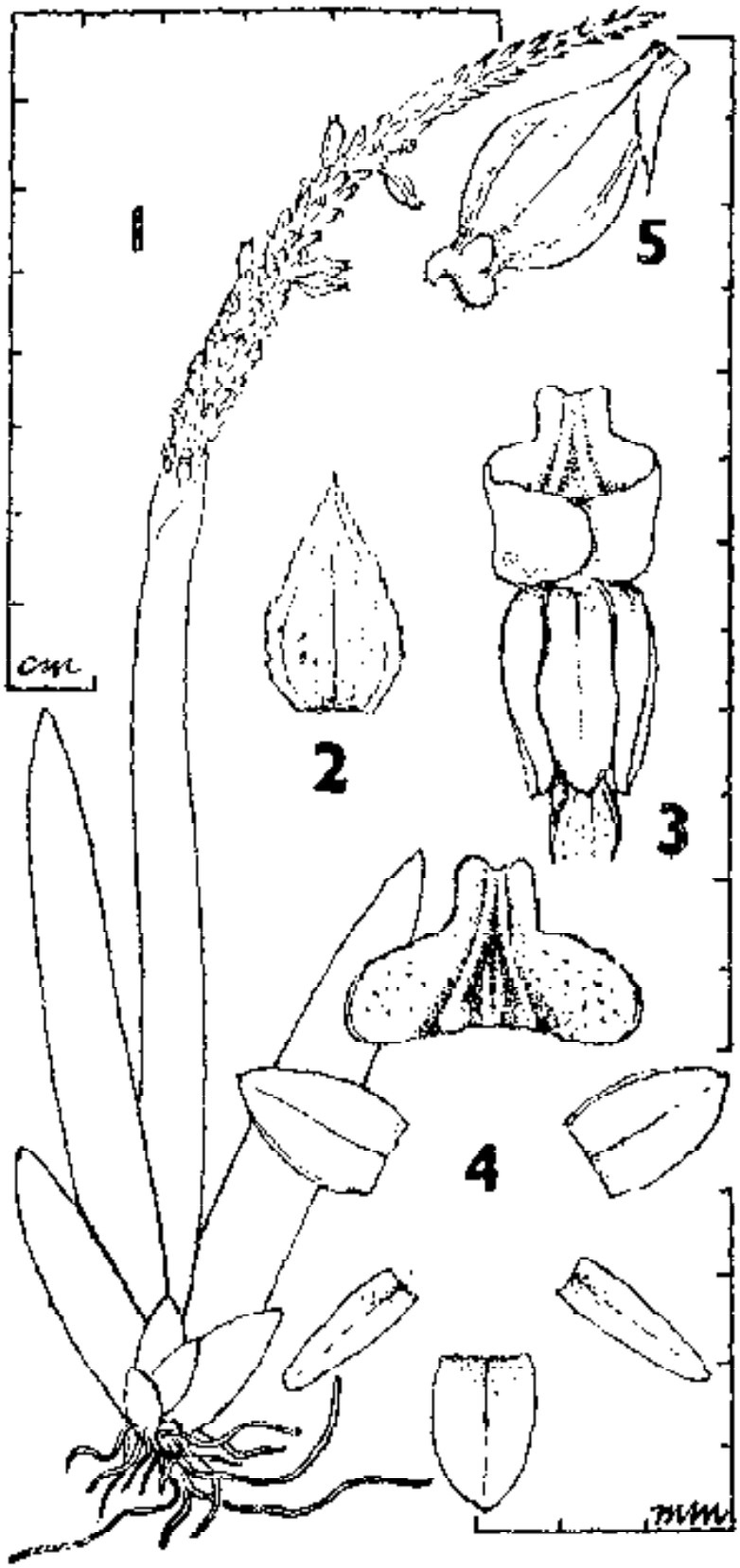
Luisia abrahamii Valsala : Epiphytic herb ; South India.



Oberonia sebastiana Shetty & Vivek.

1. Plant. 2. Portion of inflorescence showing arrangement of flowers. 6. Flower with the labellum spread out. 7. Outer 3 sepals, inner 2 petals with the labellum spread out. 8. Capsule (Drawn from *Rathakrishnan* 16238).

Courtesy : Bull. Bot. Surv. India



Oberonia seldenfadentana Joseph & Vajravelu

1. Habit. 2. Bract. 3. Flower. 4. Petals and Sepals. 5. Capsule.

Courtesy : Bull. Bot. Surv. India

Luisia macrantha Blatt. & McCann : Epiphytic herb ; W. Ghats. Hassan, N. Kanara.

L. **pulniana** Valsala : Epiphytic herb ; South India.

Malaxis crenulata (Ridley) Kuntze : Terrestrial herb ; Southern W. Ghats, Nilgiris.

M. intermedia (A. Rich.) Seidenf. : Small terrestrial herb ; W. Ghats, Kanara (Bababudan hills), Nilgiris (Ootacamund, Naduvatam).

Nervilia hispida Blatt. & McCann : Terrestrial tuberous herb ; W. Ghats, N. Kanara.

Oberonia anamalayana Joseph : Epiphytic/Lithophytic herb ; Southern W. Ghats, Travancore (Idukki), Anamalais (Coimbatore dist.), 1500 m.

O. bisaccata Manilal : Caespitose epiphytic herb with pale yellow flowers ; Southern W. Ghats, Kerala, Idukki dist., Silent valley.

O. brachyphylla Blatt. & McCann : Epiphytic herb ; W. Ghats, Hassan, N. Kanara, Palghat dist.

O. brunoniana Wt. : Large erect/pendulous herb, pale yellow flrs. ; W. Ghats most districts of Karnataka, Nilgiris, 800 2200 m.

O. chandrasekharanii : V.J. Nair, V.S. Ramachandran & R. Ansari ; Epiphytic herb ; Southern W. Ghats of Kerala.

O. josephii Saldanha : An acaulescent epiphyte with orange flowers ; Karnataka, Hassan dist. (Genkalbett).

O. platycaulon Wt. : Very large herb, flowers pale yellow/whitish ; W. Ghat, Nilgiri & Palni hills, 1700-2150 m.

O. proudlockii King & Pantl. : Small herb ; W. Ghats, N. Kanara & Nilgiris, 925 1300 m.

O. santapaui Kapadia : Herb with straw-coloured flowers : W. Ghats, Chikmagalur, Hassan, Mysore, N. Kanara to Nilgiris. 400 1600 m.

O. sebastiana Shetty & Vivek. : Pendulous epiphytic herb, yellow flowers ; W. Ghats of Kerala (Anaimudi, Rajamallay, Devicolam), Tamil Nadu (Anamalais), 1550 2100 m.

O. seidenfadeniana Joseph & Vajravelu : Small caespitose epiphyte with golden yellow flowers ; SouthernW. Ghats, Anamalais, 1350 m.

O. wightiana Lindl. var. **nilgirensis** R. Ansari & N.C. Nair : Epiphytic herb ; Southern W. Ghats of Kerala (Kottayam) & Tamil Nadu (Nilgiris).

Paphiopedilum druryi (Bedd.) Stein : Terrestrial herb with succulent root-fibres & solitary flowers ; Southern W. Ghats, Travancore hills, 1500 1830 m. Endangered. Almost Extinct in wild.

Peristylus brachyphyllus A. Rich : Terrestrial herbs with dull yellow flowers ; W. Ghats, Kanara to Nilgiris, 1200 2000 m.

P. stocksii (Hook. f.) Kranzl. : Terrestrial herb with yellow flowers ; W. Ghats, Konkan up to Karnataka.

Phalaenopsis mysorensis Saldanha : Epiphytic herb ; Karnataka. Hassan dist., Vanagur, 900 m.

Porpax chandrasekharanii Bhargavan & Mohanan : Pseudobulbous epiphytic herb with dull white flowers ; Southern W. Ghats of Kerala, Palghat dist, Silent valley, 1000 m.

P. jerdoniana (Wt.) Rolfe : Pseudobulbous epiphyte with yellowish flowers ; W. Ghats, Konkan, hills of Karnataka & Malabar Travancore.

P. reticulata Lindl. : Small pseudobulbous epiphytic herb ; W. Ghats, throughout, 950 m.

Proterocerus holttumii Joseph & Vajravelu : Herb ; W. Ghats in Tamil Nadu, Vellingiri hills-Coimbatore dist.

Schoenorchis latifolia (C.E.C. Fisch.) Saldanha : Epiphyic herb ; Karnataka, Mysore & Hassan dist. Rare & Threatened.

Sirhookera latifolia (Wt.) Kuntze : Stemless epiphytic herb : W. Ghats, southwards to Cochin & Nilgiris (Single report from Sri Lanka, Ramboda in 1896.)

Spathoglottis malabarica (Reichb. f.) U.C. Pradhan : Terrestrial herb ; Peninsular India, W. Coast/hills of Malabar.

Spiranthes sinensis (Pers.) Ames var. **wightiana** Lindl. ; Small slender herb ; Southern W. Ghats, Nilgiris.

Taeniophyllum scaberulum Hook.f. : Small epiphytic herb ; Southern W.Ghats, Travancore. Rare & Endangered.

Thrixspermum muscaeflorum A.S. Rao & Joseph var. **nilagiricum** Joseph & Vajravelu : Small erect herb ; Southern W. Ghats, Nilgiris, 500 m.

Trias stocksii Hook. f. : Rhizomatous, epiphytic herb ; W. Ghats, Konkan to Chikmagalur, Hassan, N. Kanara & Shimoga.

Vanda wightii Reichb. f. : A little known plant ; Peninsular India, Nilgiris (?).

Vanilla wightiana Lindl. : Straggling terrestrial climbers ; Southern W. Ghats, Travancore. Rare & Threatened.

REFERENCES

Ahmed, M. & Nayar, M. P. 1984

The Red Sanders tree (*Pterocarpus santalinus* Linn f.) on the verge of depletion. *Bull. Bot. Surv. India* 26 (1-2) : 142-143.

Annonymous, 1966

International Union for Conservation of Nature and Natural Resources, 1966 *Red Data Book*, Morges, Switzerland.

Bande, M. B. 1973

A petrified dicotyledonous wood from the Deccan Intertrappean beds of Mandla district, Madhya Pradesh. *Botanique* 4 : 41.

Bande, M. B. 1974

Two fossil woods from the Deccan Intertrappean beds of Mandla district, Madhya Pradesh. *Geophytology* 4 : 189-195.

Bor, N. L. 1951

A new genus of Indian grasses. *Kew Bull.* 1950 (3) : 385-388.

Bramwell, D. 1972

Endemism in the flora of the Canary Islands. *In* : Valentine, D. H. (ed.) Taxonomy, Phytogeography and Evolution, pp. 141 159. Academic Press, London.

Braun—Blanquet, J. 1923

L 'origine et le Developpement des Flores dans le Massif Central de France (Paris).

Briquet, J. 1908

Les reimmigrations postglaciaires des flores en Suisse. *Act. Soc. Helv. Sci. Nat.* Vol. 1.

Bruggen, H.W.E. van, 1968

Revision of the genus *Aponogeton* (Aponogetonaceae). 2. A new species of *Aponogeton* from India. *Blumea* 19 : 264 265.

Carlquist, S. 1965

"Island Life" : A Natural History of Islands of the world. New York.

Chatterjee, D. 1940

Studies on the endemic flora of India and Burma. *Journ. Asiat. Soc. Bengal, Sci.* 5 (1) : 19-68.

Chevalier, A & Guenot, L. 1925

Biogeographie, Chep x. Pueplement des espaces vides, Paris.

Clayton, W.D. 1981

Notes on the tribe *Andropogoneae* (Gramineae). *Kew Bull.* 35 (4) : 815.

Cole, L. C. 1954

The population consequences of life history phenomena. *Rev. Biol.* 29 (2) : 103-137.

Cronquist, A. 1981

An integrated system of classification of flowering Plants. Columbia Univ. Press, New York.

Davy, A. J. & Jefferies, R. L. 1981

Approaches to the monitoring of rare plant populations. *In* : *The Biological Aspects of Rare Plant Conservation*. Hugh Synge [Ed.] John Wiley & Sons Ltd.

Decandole, A. P. 1855

Geographie Botanique Raisonnee Vols. I & II. Geneva.

Diels, L. 1909

Geographie der Pflanzen. Berlin.

Drude, O. 1890

Handbuch der Pflanzengeographie. Stuttgart.

Drury, W. H. 1974

Rare species. *Biol. Conserv.* 6 : 162-169.

Eckholm, E. 1979

The Age of Extinctions. *Span* 21 (3) : 22-27.

Ellis, J. L. 1981

The Flora of Nallamalais on the Eastern Ghats of India-I. A Preliminary list. *Bull. Bot. Surv. India* 10 : 149-160.

Engler, A. 1882

Versuch einer Entwick Lungsgeschichte der Pflangenwelt. Leipzig.

Favarger, C. 1972

Endemism in the montane floras of Europe. *In* : Valentine, D. H. (ed.), Taxonomy, Phytogeography and Evolution. pp. 191-204. Academic Press, London.

Favarger, C. & Contandriopoulos, J. 1961

Essai sur l'endemism. *Ber. Schweiz. bot. Ges* 71 : 384-406

Friis, I. 1975

The giant species of *Cirsiums* (Asteraceae) in southern Ethiopia. *Norw. Journ. Bot.* 22 : 201-207.

Fyson, P. F. 1932

The Flora of the South Indian Hill Stations. Vols-1-2, pp. 1-697, 1-611

Gamble, J. S. 1915-1936

Flora of the Presidency of Madras. London. 2 Vols.

Goldsmith, E., Allen, R., Allaby, M., Davull, J. & Lawrence, S. 1972

A Blueprint for Survival 1-172. Tom Stacey Ltd., London.

Gomez-Pompa, A., Vazquez-Yanes, G., Guevara, A. 1972

The tropical rain forest : A renewable resource. *Science* 117 : 762-765.

Good, R. 1964

The Geography of flowering Plants. Longmans Green & Col. Ltd., London.

Grant, V. 1971

Plant Speciation. Columbia University Press, New York & London.

Haines, H. H. 1921-1925

Botany of Bihar & Orissa. 3 Vols.

Hartley, W. 1958

Studies on the origin, evolution and distribution of the Gramineae-1. The Tribe *Andropogoneae*. *Austr. J. Bot.* 6 : 116-128.

Hawkes, J. G. 1978

The Taxonomists Role in Conservation of Genetic Diversity *In* : Street, H. E. (Ed.) Essays in Plant Taxonomy pp. 125-142. Academic Press, London, New York, San Francisco.

Henefin, M. S., Morse, L.E., Reveal, J. L., Macbryde. B. & Lawyer I. I. 1979

Guidelines for the preparation of status reports on rare and endangered plant species. *In* : L.E. Morse & M. S. Henefin (eds.) Geographical data organisation for rare plant conservation. New York Botanical Garden, Bronx, NY.

Herzog, Th. 1926

Geographie der Moose. Jena.

Hooper, M. D. 1972

The size and surroundings of nature reserves. *In* : E. Duffey & A. S. Watt (eds.) *The Scientific Management of Animal and Plant Committees in Conservation*, pp. 555-561. Blackwell Scientific Publications, Oxford.

Hutchinson, J. 1973

The families of Flowering Plants, 1-968 (3rd ed.) Oxford. The Clarendon Press.

Jain, S. K. 1970

The genus *Manisuris* L. (Poaceae) in India. *Bull. Bot. Surv. India* 12 : 6-17.

Kapoor, S. L. 1964

A contribution to our knowledge of the Flora of Mahendragiri Hills of Orissa. *J. Bomb. Nat. Hist. Soc.* 61 : 354-396.

Lakhanpal, R. N. & Dayal, R. 1962

Mallotoxylon kariense Gen. et. sp. nov.—a fossil dicotyledonous wood from the Deccan Intertrappean series, India. *Palaeobotanist* 11 : 149-153.

Lakhanpal, R. N. 1973

Tertiary floras of the Deccan trap country. *Bull. Nat. Sci. Acad.* 41 : 127-153.

Levins, R. 1970

Extinction. In : M. Gerstinhaber (ed.). *Some Mathematical Questions in Biology* Vol. II, pp. 77-107. American Mathematical Society, Providence.

Legris, P. & Viart, M. 1961

Bioclimates of South India and Ceylon. *Inst. In. Pondicherry Trav. Sect. Sci. Teoh.* 3 (2) : 165-179.

Legris, P. & Meher-Homji, V. N. 1982

The Eastern Ghats : Vegetation and Bioclimatic aspects. *Abstracts*-National Seminar on Resources, Development and Environment of the Eastern Ghats, March 24-27.

Mabberly, D. J. 1974

The pachycaul Lobelias of Africa and St. Halena. *Kew Bull.* 29 : 535-584.

Mac Arthur, R. H. 1967

The Theory of Island Biogeography. Princeton Univ. Press, Princeton, N. J.

Mac Arthur, R. H. & Wilson, E. O. 1963

An equilibrium theory on insular Zoogeography. *Evolution* 17 : 353-387.

Macbryde, B. 1979

Information needed to use the Endangered Species Act for Plant Conservation. *In* : Morse, J. L. and M. S. Henefin (Eds.) 1979. Geographical Data Organisation for Rare Plant Conservation. New York Botanic Garden, Bronx, New York.

Martin, P.S. 1967

Pleistocene overkill. *Natural History* 76: 32-38.

Mussel, H. 1952.

Flora, Jena 139: 333-393.

Myers, N. 1980

Address to the World Future Society—Third General Assembly 1980. *Futurist* 14(5) : 13.

Nayar, M.P. 1972

Centres of development and patterns of distribution of the family Melastomataceae in Indomalasia. *Bull. Bot. Surv. India* 14 : 1 12

Nayar, M. P, 1977

Changing patterns of the Indian flora. *Bull. Bot. Surv. India* 19 : 145 155.

Nayar, M.P. 1980

Endemic Flora of Peninsular India and its significance. *Bull. Bot. Surv. India* 22 : 12-23.

Nayar, M.P. & Raju, D.C.S. 1974.

Degree reference system for plant records in India. (Mimeographed).

Nayar, M.P., Ahmed, M. & Raju, D.C.S. 1984.

Endemic and Rare plants of Eartern Ghats. *Indian Journ. For.* 7(1) : 35-42.

Nayar, M.P. & Ahmed, M. 1984.

Phytogeographical significance of the endemic genera (Angiosperms) common to Peninsular India & Srilanka. *Bull. Bot. Surv. India* 26 : 65-70.

Perring, F.H. & Farwell, L. 1977

British Red Data Books. I. *Vascular Plants* (Society for the Promotion of Nature Conservation, London).

Prakash, U. 1958

Studies in the Deccan Intertrappean flora-4. Two silicified woods from Madhya Pradesh. *Palaeobotanist* 7 : 12-70.

Prakash, U. & Dayal, R. 1963.

Fossil woods resembling *Elaeocarpus* and *Leea* from the Deccan Intertrappean beds of Mahurzari near Nagpur. *Palaeobotanist* 12 : 121-127.

Qureshi, I.M. 1985

Tropical Rain Forests of India and their silvicultural and ecological aspects. Symposium on Ecological Research in Humid Tropics Vegetation, Kuching, Sarawak. 1963, 120-136.

Rao, R.S. 1958

Observation on the vegetation of Rampa & Gudem Agency Tract of the Eastern Ghats. *Bomb. Nat. Hist. Soc.* 58 : 155 170.

Rao, R.S. 1978.

Floristic patterns along the Western Ghats of India. *Notes Roy. Bot. Gardn.* 37 (i) : 95 111

Raven, R.H. & Axelrod, D. 1974

Angiosperm biogeography and past continental movements. *Ann. Missouri bot. Gardn.* 61 : 529 573.

Richardson, I.B.K. 1978

"Endemic Taxa and the Taxonomist", *In* : Street, H.E. (Ed.) Essays in Plant Taxonomy pp. 245-262. Academic Press.

Sebastine, K.M. 1968

Natural vegetation of the Eastern Ghats. Mountains & Rivers of India. *21 Intern. Geogr. Congr. India* pp. 153 166.

Seetharam, Y.N. & Pocock, S.A.J. 1978

Taxonomy and pollen morphology of *Poeciloneuron* (Guttiferae). *Bull. Jard. Bot. Nat. Belg./Bull Nat. Plantentium Belg.* 48 (3-4) : 359-396.

Schott, A.J.A. 1979.

A revision of *Rhodomyrtus* (Myrtaceae). *Kew Bull.* 33 (2) 311-329.

Spate, O.H.K. 1957.

India and Pakistan. A General and Regional Geography. Ed. 2, London,

Steenis, C.G.G.J. van, 1969.

Plant speciation in Malesia. *In* : R.H. Lowe-McConnel (ed.) Speciation in Tropical Environment. *Biol. Journ. Linn. Soc.* 1(1&2) 1-246. Academy Press, London & New York.

Stebbins, G.L. 1938

Cytological characteristics associated with the different growth habits in the dicotyledons. *Amer. Journ. Bot.* 25 : 189-198.

Stebbins, G.L. 1942

The genetic approach to problems of rare and endemic species. *Madrona* 6 : 241-258.

Stebbins G.L. 1980

Rarity of plant species : a synthetic view point. *Rhodora* 82(829) : 77-86.

Stebbins, G.L. & Major, J. 1965

Endemism and speciation in the Californiadet flora. *Ecol. Monogr.* 34 : 1-35.

Subramanyam, K. & Nayar, M.P. 1974

Vegetation and Phytogeography of the Western Ghats. *In* : M.S. Mani (ed.) Ecology and Biogeography of India. The Hague, Netherlands.

Takhtajan, A.L. (ed.) 1975

Red Data Book : Native Plant species to be protected in the USSR Leningrad pp. 204 (in Russian).

Tischler, G. 1935.

Die Bedeutung der Polyploidie fur die verbreitung der Angiospermen. *Bot. Jahrb.* 67 : 1-36.

Tischler, G. 1935

Der Grad der Polyploidie beiden Angiospermen in Verschiedenen, Grossarealen, *Cytologia* 20 : 101-118.

Turrill, W.B. 1964

Plant Taxonomy, Phytogeography and Plant Ecology. *In* : *Vistas in Botany*, Vol. IV. Pergamon Press, London.

Willis, J.C. 1922

Age and Area. Cambridge University Press.

Wulff, E.V. 1950

An Introduction to Historical Plant Geography. 1-223, Walthan, Massachusetts, U.S.A.

INDEX TO THE FAMILIES

Shri M. Ahmedullah, Senior Research Fellow of the Botanical Survey of India is working for his Ph.D. degree from 1982 onwards under the guidance of Dr. M. P. Nayar, Director, Botanical Survey of India. After graduating with First Class from the Osmania University he took his Masters degree from the Andhra University. He has been working on the endemic and rare plants of India. He has published about ten papers on the rarity and endemism of plants of India.

Dr. M. P. Nayar, Botanical Survey of India received M.Sc. degree from the University of Kerala (1955) with a First Class and First Rank and Ph.D. from the University of London (1966). He worked as Botanist at Kew, Royal Botanic Gardens, Kew, U.K. from 1961-1967. He visited several Herbaria and Gardens in Europe during 1961-1967. He monographed the family Melastomataceae for South East Asia. He is the author of five books and a book on "The Names of Flowering Plants" is under publication. He has about 150 original scientific papers to his credit and he described about 110 new species in the above mentioned publications. He represented the Department of Environment as the leader of the Indian Team on Plant Working Group for the Convention of International Trade on Endangered Species in Fabruary 1984 at Tuscon, U.S.A. He is also working as Consultant and Chairman, Indian Subcontinent Plant Specialist Group, Species Survival Commission of IUCN.