



**RED DATA BOOK
OF INDIAN PLANTS**

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

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Bentinckia condapanna Berry ex Roxb.

A threatened palm species in cultivation in

Bonaccord Estate, Kerala,

Courtesy : Dr. M. Sanjappa, B.S.I.

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FOREWORD

During the Cretaceous period 60 million years ago, dinosaurs which roamed the earth suddenly disappeared. A number of living organisms also became extinct due to geological changes during this period. Another era of extinction of our biological systems is round the corner due to modern man's intervention with the environment. Environment, ecology and conservation have become the bywords during the last three decades, and greater awareness on these vital subjects has been built up. But, unfortunately, millions of hectares of tropical forests are being destroyed day in and day out. It is said that we are losing 60 hectares of forests every minute throughout the world. In India, the picture is grim and great efforts are required to retrieve the situation.

The Flora of India is very rich in plant diversity with an estimated 50,000 species of which about 15,000 are flowering plants. Of these, *ca* 5,000 species are endemic to India, while several hundred species are threatened.

It is in this context that the Botanical Survey of India had brought out a small booklet: "Threatened Plants of India—A State-of-the Art Report" in the year 1980. Since then the Botanical Survey of India has made intensive studies on threatened plants and brought out several useful publications which provide valuable base-line data for taking up conservation measures. As a result of these studies, it is now considered that about 10% of our flowering plants are threatened, i.e., about 1500 species.

I am indeed glad, the Botanical Survey of India is bringing out a series of Red Data Books of Indian plants. In the present volume about 230 rare, vulnerable and endangered categories of plants, worked out mainly by the botanists of the Botanical Survey of India and of a few others, are included. The information is also supplemented with line drawings and photographs for several species and will be useful in the proper identification of these species in the field and will also aid in planning suitable conservation measures. I am happy that this volume, edited by the Director, Dr. M. P. Nayar and Shri A. R. K. Sastry, Scientist, of the Survey, is being published by the Botanical Survey of India.

I have every hope that earnest attempts will be made by all concerned to conserve the threatened species and to save them from unnatural and untimely extinction.

B.P. Pal

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PREFACE TO THE FIRST REPRINT

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

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We are much obliged and grateful to all the botanists who have contributed the Red Data Sheets and illustrations included in this compilation. Shri U. C. Pradhan, Drs. J. Joseph, N. P. Balakrishnan, R. S. Raghavan, S. K. Katakai, M. Sanjappa and Shri M. Y. Ansari supplied the colour and black and white photographs included here and we thank them. Dr. K. Thothathri, Joint Director, Botanical Survey of India, made useful suggestions and we express our sincere thanks to him.

Dr. V. S. Agarwal, Editor of Publications, Shri S. C. Pal, Publication Officer and Shri R. V. Kammathy, Scientist-B, Botanical Survey of India have extended cooperation in processing publication of this book; Shri L. P. Sikder, Senior Artist, made improvements in some illustrations and Shri D. C. Chakravorty, Stenographer, rendered assistance in typing work; we thank them all for their help.

INTRODUCTION

Presently, there is a great awareness on the need to conserve natural plant resources world over. Studies undertaken during the last 3-5 decades on floras in several parts of the world have shown that many plant species are in danger of extinction while some have become extinct recently. On a global basis, the International Union for Conservation of Nature and Natural Resources (IUCN) have estimated that about 10% of world's vascular plant species totalling to about 20,000 - 25,000 species are under varying degrees of threat. Simultaneously, to include information on threatened biological species, the IUCN have started publication of Red Data Books on animals and plants.

In India, the problem on threatened plants was first discussed in the 11th Technical Meeting of the IUCN in 1969 in which important papers were presented on the subject. Subsequently, the Botanical Survey of India published a small book-let: *Threatened Plants of India—A State-of-the Art Report*, in 1980. Following this, concerted efforts on the subject were made in the years 1980-'85, through a programme: *Project on Study, Survey and Conservation of Endangered Species of Flora*, (POSSCEF) supported by the U. S. Fish & Wildlife Service (under PL-480 Scheme) in the Botanical Survey of India and valuable base-line data on nearly 1000 threatened and endangered plant species have been gathered, resulting in several useful and important publications. The Survey has also simultaneously taken up studies on endemic plant species. All this data had given impetus for writing up of Red Data Sheets on some threatened plants and a small beginning was made by the scientists working in the Project POSSCEF in the Botanical Survey of India and a book entitled: *The Indian Plant Red Data Book-I* (Eds. Jain & Sastry) with 125 Data Sheets of flowering plants was published in 1984.

Several other researchers in other botanical institutions have also started collecting valuable data on threatened and endemic plant species. This has prompted the Botanical Survey of India to gather all such information from different sources in order to bring out comprehensive publications of Red Data Books on threatened and endangered plants of our country. Hence this present volume.

This volume includes 235 vascular plant species of Indian flora. A majority of these data have been received from botanists of the Botanical Survey of India engaged in the revision of Flora of India and in field explorations in floristically rich areas in the country. The BSI has also obtained the benefit of some botanists, working in other research institutions who are knowledgeable on the subject.

In this volume, in presenting the scientific data for each species, the format given in the *IUCN Plant Red Data Book* (Eds. Lucas & Syngé, 1978) has largely been adapted. The families, genera and the species (and varieties) are arranged alphabetically. The currently used botanical name is given at the top of the page on the left side (in roman bold print) and its family on to its right (in capital letters). Illustrations for several species are given with suitable captions under each. These illustrations have been placed nearest to the corresponding data sheet. Besides, a few black & white and colour photographs for some species have been given at the beginning of the book.

The IUCN Plant Red Data Book categories have been adopted in assigning status for each species; the definitions to the categories are appended in Annexure-I for ready reference. To elucidate more details on the status survey of endangered species and the process of extinction in plant species, etc., some relevant portions from the chapter: Extinction of species and concept of rarity in plants, from the book: *Endemic Plants of Indian Region* (A. Ahmedullah & M. P. Nayar, 1987, published by the Botanical Survey of India), have also been given in Annexure-II.

It is evident from the information presented in these data sheets that the contributors have carefully considered information gathered from actual field observations, published literature and data from herbarium collections. The authors have also taken into consideration the major threat factors in the natural areas and degree of threats. In some cases, the editors have consulted knowledgeable botanists in assigning such species to the nearest category. Nevertheless, it should be admitted that although fairly accurate information on the species threatened, and their range of distribution are available, gaps still exist in our knowledge on the biology and status of several threatened species which are essential for planning appropriate conservation measures. Although the habitats of many threatened species are now incidentally included in the network of several of the National Parks, Wildlife Sanctuaries and the proposed Biosphere Reserve areas in the country, there is need for conservation of endangered species through multiplication and by including floristically rich areas in the conservation programmes. To fill these gaps, the Botanical Survey of India has taken up studies on status survey of threatened species and assessment of their appropriate categories through Endangered Species Programme.

The families of the data sheets are arranged in the order of sequence: angiosperms, gymnosperms, ferns and fern allies, and an index to the plant names of these is given at the end.

A majority of the species included in this Red Data Book are endemic to India. However, some of the endangered species are endemic to particular phyto-geographical zones which span beyond our national boundaries. Though they occur in adjoining countries in their distributional range, vulnerability to such taxa, no doubt, exists. So such taxa are also included.

Every effort has been made to bring uniformity in presentation of the text and citations, but some variations still exist as these data have been written by different botanists having different styles of presentation. However, it is hoped that this volume will serve the primary objective of a reference work on threatened plants of India and in planning effective conservation programmes. It is proposed by the Botanical Survey of India to publish series of Red Data Books on the threatened plants of India in the coming years.

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

THE RED DATA BOOK CATEGORIES*

The Red Data Book Categories are used by IUCN to indicate the degree of threat to individual species in their wild habitats. They are used for both flora and fauna. Below are given formal definitions of the categories together with additional information and examples to clarify and interpret them for use by botanists.

EXTINCT (Ex)

This category is only used for species which are no longer known to exist in the wild after *repeated* searches of the type localities *and other known or likely places*. As interpreted by IUCN, this includes species that are extinct in the wild but surviving in cultivation.

ENDANGERED (E)

"Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating.

"Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction."

This is interpreted to mean including species with populations so critically low that a breeding collapse due to lack of genetic diversity becomes a possibility, whether or not they are threatened by man. An example would be a perennial reduced to 100 specimens occurring on one inaccessible cliff where no man-made threats are likely, but where a land-slide could remove the whole population.

VULNERABLE (V)

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

"Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range."

RARE (R)

"Taxa with small world populations that are not at present Endangered or Vulnerable but are at risk.

*Source: "How to use the IUCN Red Data Book Categories"—Threatened Plants Committee Secretariat, IUCN, Royal Botanic Gardens, Kew, England.

“These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.”

The categories ‘Rare’ and ‘Vulnerable’ have often been confused in the past or thought to be simply stages on a linear scale of increasing degrees of threat to species in danger. This is not the case because they represent the state of plants in fundamentally different situations, both of which can lead to the ‘Endangered’ category.

The ‘Rare’ species has a small world population but is under no known or immediate threat. It is not endangered but is simply at risk because of the size of its population. It may have a very restricted distribution, e.g. it may be endemic to a small island or a single mountain. Alternatively it may have a wider distribution but may be severely restricted by its habitat.

The borderline between ‘Rare’ and ‘neither rare nor threatened’ (‘nt’—see below) is a difficult one. Considering the following factors may be helpful.

(1) *Area of distribution:* When considering the area of distribution, the density of the population must also be borne in mind. Nevertheless, a plant which is restricted to a small area is obviously more at risk than one of a similar population which is more widely spread, and this should be taken into account.

In conclusion, most of the ‘Rare’ species will not only be endemic to a single mountain range or island but will also be either confined to one part of that area or not be very common throughout their range, unless the island is *extremely* small.

When assigning Red Data Book Categories to lists of island endemics, ‘Rare’ should only be used for those species that have *very restricted* distributions and/or *low* population densities, and of course that are under no immediate or known threat to their survival.

(2) *Population Size:* It was once considered that any species with less than 20,000 individuals should be considered ‘Rare’. The figure is perhaps in the correct order of magnitude and as such is a useful guide. However, there can be no hard and fast rule since some species have a much greater reproductive capacity than others. The situation is complex and each case must be decided on its own merits.

When a species of such a limited distribution comes under threat and starts to become depleted, it should be transferred to the ‘Vulnerable’ category if threatened over part of its range, or to the ‘Endangered’ category if all the population is under threat.

In contrast the ‘Vulnerable’ species is one that is (or was) more widespread but has become *depleted*. The critical difference between a ‘Rare’ species and a ‘Vulnerable’ one is that the former has a relatively stable population while the latter is on the decline.

INDETERMINATE (I)

"Taxa known to be Extinct, Endangered, Vulnerable or Rare but where there is not enough information to say which of the four categories is appropriate."

This category is used for species reported as "? Extinct" or "possibly Extinct" or "probably Extinct" on the assumption that they are either 'Extinct' or 'Endangered'.

INSUFFICIENTLY KNOWN (K)

"Taxa that are suspected but not definitely known to belong to any of the above categories because of the lack of information."

The key word here is *suspected*. An 'Insufficiently Known' species does not have to be *proved* to be in any of the three categories—'Endangered', 'Vulnerable' or 'Rare'. Also considered as 'Insufficiently Known' may be species of a complex genus, much of which is thought to be in some danger and whose members are not easily distinguished by field characters. An 'Insufficiently Known' species can always be transferred to another category when further information becomes available. It is hoped that listing a species as 'Insufficiently Known' will stimulate others to find out its true status.

OUT OF DANGER (O)

"Taxa formerly included in one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival has been removed."

"In practice, Endangered and Vulnerable categories may include, temporarily, taxa whose populations are beginning to recover as a result of remedial action, but whose recovery is insufficient to justify their transfer to another category."

Rescued species are put into the 'Rare' category if the threat has been completely averted, or the 'Vulnerable' category if the species is still partly under threat. When deciding on the category, it may be helpful to consider the following:

- (1) Is the plant conserved throughout its range or only in one part?
- (2) How well is it protected in that part?
- (3) What is the status of the reserve in which it occurs?
- (4) How permanent is its protection likely to be?

If only a few specimens survive, the species should still be considered 'Endangered'. Some species will in due course recolonize their former habitats and become common, so they will no longer remain 'Rare' or 'Vulnerable'. The category 'Out of Danger' should then be used.

"For species which are neither rare nor threatened, the symbol 'nt' is used."

Only species in the categories 'Extinct', 'Endangered', 'Vulnerable', 'Rare' or 'Indeterminate' are included in the Red Data Book and on lists of rare and threatened species. (The categories 'Insufficiently Known' and 'nt' are required where full lists of endemic species are given).

SPECIES ONLY KNOWN FROM OLD RECORDS

These fall into only 3 categories:

(1) 'Extinct'. As mentioned above, this is only used for plants not found in the wild after thorough and recent searches of their likely habitat.

(2) 'Indeterminate' is the category used for species known only from small areas (e.g. mountain localities) where they have not been recorded for a long time, but where the area has not been thoroughly botanised. However, the area has been botanised to an extent that if the species was refound, it would definitely fall into one of the 3 categories: 'Endangered', 'Vulnerable', or 'Rare'. In these cases one must be certain that it could not be abundant and widespread enough to be 'nt'. One cannot of course apply the categories 'Endangered', 'Vulnerable' or 'Rare' themselves since the species could turn out to be any one of them, or 'Extinct'.

(3) 'Insufficiently Known' is used when the area from which the plant was recorded has been worked in detail to such a small extent that it is a possibility that the species is 'nt'.

Where full screenings of floras for rare and threatened species are being undertaken, it is felt that 'Insufficiently Known' is the best category for those species that are taxonomically uncertain or whose exact delineation is uncertain. Many of these will be species known only from type collections in which it is uncertain whether or not they are good species. It is best to include such taxa on country lists until they have been definitely shown to be not specifically distinct. However, taxonomically clear species only known from *dubious* records in the country concerned (but obviously occurring elsewhere) are best omitted from such lists as are species predicted to occur in the country but not yet actually found there.

EXTINCTION ON SPECIES AND CONCEPT OF RARITY IN PLANTS

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 (Pleistocene overkill, *Natural History* 76: 32-38, 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, in *Bull. Bot. Surv. India* 19: 145-155, 1977) could not get evolutionary time span for survival or adaptive radiations.

Levins (Extinction. In: M. Gersteinhaber (ed.) *Some mathematical questions in Biology* 2: 77-107, 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 (The size and surroundings of nature reserves. In: E. Duffey & A. S. Watt (ed.) *The Scientific management of animal and plant committees in Conservation*, pp. 555-561, 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 foreseeable effects of demographic environmental and genetic stochasticity and natural catastrophes" (Hooper, 1971, *l.c.*). 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.*, The tropical rain forest: A renewable resource. *Science* 117: 762-765, 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 distributed 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 for 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*, *A blueprint for survival*, 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, *The Theory of Island Biogeography*, 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 groups 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.

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 (Rare species. *Biol. Conserv.* 6: 162-169, 1974), "a rare species is the one that occurs in widely separated small sub-populations so that interbreeding between sub-populations is seriously 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 geographical 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 orchids (*Paphiopedilium* spp.) may mainly survive in protected areas.

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 a 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 (Information needed to use the Endangered Species Act for Plant Conservation. In: Morse, J.L. & M. S. Henefin (ed.) *Geographical data organisation for rare plant conservation*, 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 (Degree reference system for plant records in India, mimeographed, 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 (Approaches to the monitoring of rare plant populations. In: H. Synge (ed.) *The Biological Aspects of Rare Plant Conservation*, 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 interval 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.

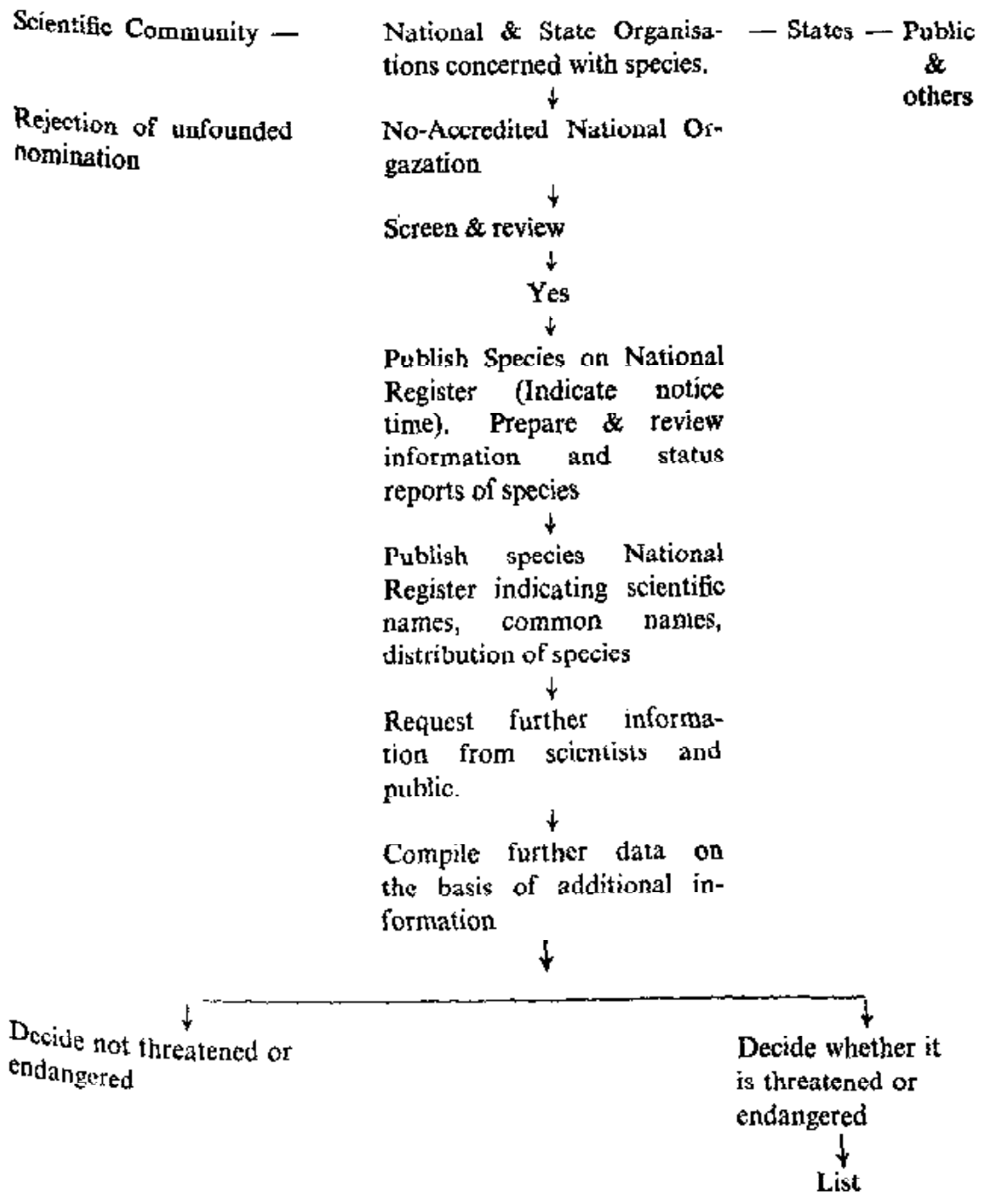
Another aspect of cardinal importance with regard to monitoring rare plants, is the biology of the species, along with its habitat or biotic conditioning and their interrelationships. A mere attempt at nursing a rare or endangered species in botanical gardens or arboreta can have no great impact on long-range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

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 appropriate 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.



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 habitats of species may also indicate the nature of threat to endermic species. Data storage of all information and updating of information is an important part of the exercise.

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 Henefin, *et al.* (Guidelines for the preparation of status reports on rare and endangered plant species. In: L. E. Morse & M. S. Henefin (ed.). *Geographical data organisation for rare plant conservation*, 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

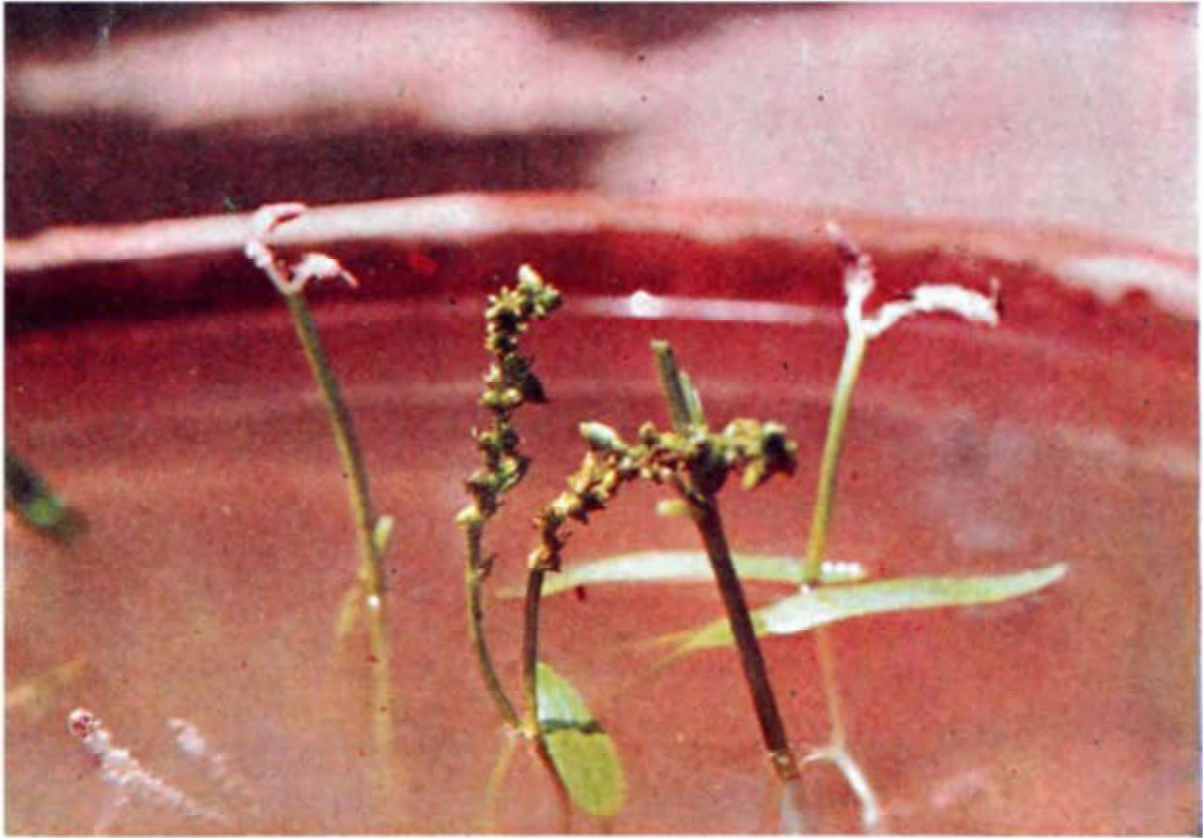
V. New Information

On the road to extinction:

The population dynamics of species (Cole, Population consequences of life history phenomena. *Rev. Biol.* 29: 103-107, 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, *l.c.*) 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.



Aponogeton satarensis

Courtesy : R. S. Raghavan



Humboldtia unijuga var. *unijuga*

Courtesy : M. Sanjappa



Iphigenia stellata

Courtesy : M. Y. Ansari



Lilium macklineae

Courtesy : S. K. Katak



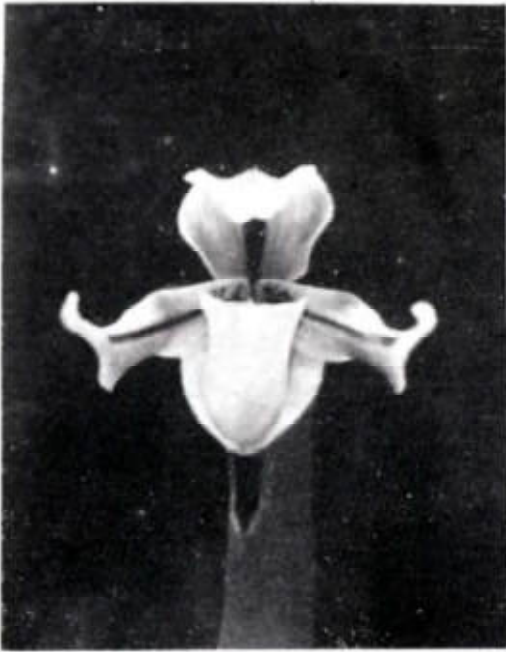
Cymbidium eburneum

Courtesy : S. N. Hegde



Diplomeris hirsuta

Courtesy : U.C. Pradhan



Paphiopedilum druryi

Courtesy : U.C. Pradhan



Paphiopedilum spicerianum

Courtesy : S. K. Katak



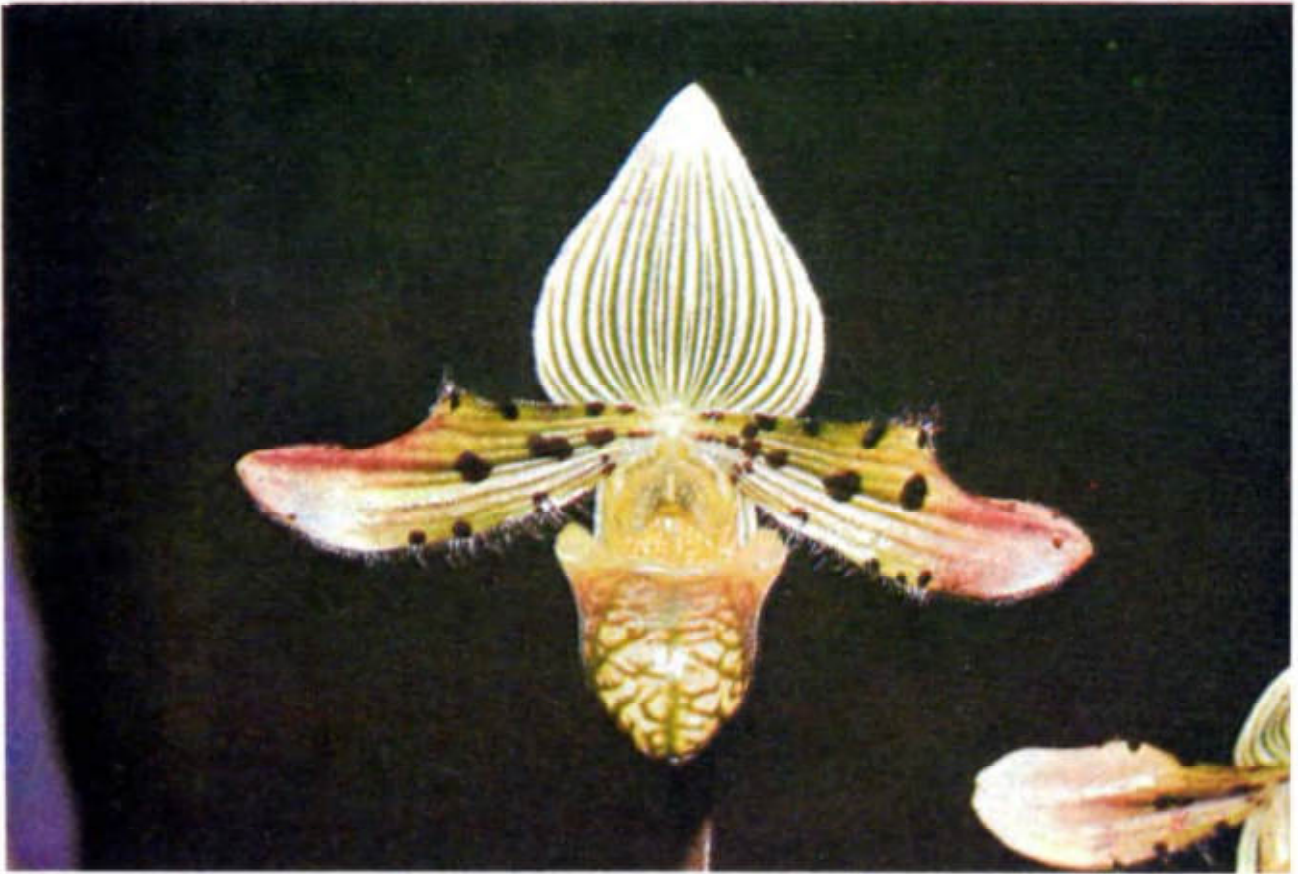
Paphiopedilum fairrieianum

Courtesy : U.C. Pradhan



Paphiopedilum insigne

Courtesy : U.C. Pradhan



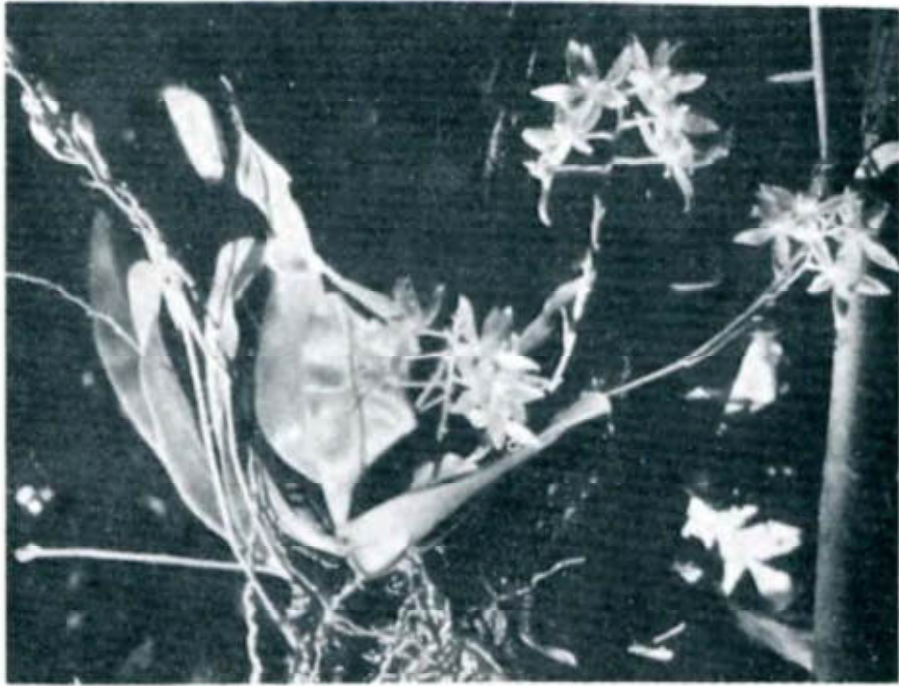
Paphiopedilum venustum

Courtesy : U. C. Pradhan



Renanthera imschootiana

Courtesy : J. Joseph



Phalaenopsis speciosa

Courtesy : N. P. Balakrishnan



Catamixis baccharoides

Courtesy : M. P. Nayar



Sapria himalayana

Courtesy : J. Joseph



Cycas beddomei

Courtesy : M. Ahmedullah

STATUS: Endangered. Causes for its disappearance are biotic interferences due to socio-economic developments during last 38 years in the vicinity of Mt. Abu.

DISTRIBUTION: India; endemic to Mt. Abu, Rajasthan state. It was first collected by Hallberg in 1916 from Dhobi Ghats at Mt. Abu and was described by Blatter in 1930 (1). Since then the species has not been collected either from Mt. Abu or adjoining hilly areas.

HABITAT AND ECOLOGY: In wastelands, particularly in shady and wet habitats.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Intensive explorations for rediscovery, collection and introduction of the plants and seeds in botanic gardens as an *ex situ* conservation measure.

BIOLOGY AND POTENTIAL VALUE: Closely allied to *D. micranthes* Nees; flowering and fruiting during October-November.

DESCRIPTION: Straggling shrub. Leaves opposite, ovate, acute, sparingly hairy with short stout hairs on the margins and longer ones on the nerves beneath. Cymes dense, axillary, generally 2-3 clusters in each axil and each cluster with about a dozen flowers. Flowers sessile, 2-together of which one may be rudimentary. Bracts 2, opposite, ovate-lanceolate, cuspidate, ciliate and scarious margined. Bracteoles subequal, lanceolate-acuminate. Calyx-lobes 5. Corolla tube white, 2-lipped; limb deep pink, hairy outside. Stamens 2; one larger anther placed below the smaller one. Pollen globose-oblong. Stigma capitate, oblique. Capsule yellowish. Seeds 4, suborbicular, hairy.

REFERENCE:

1. Blatter, E. (1930). New species of Indian plants. *Proc. Asiat. Soc. Bengal* 26 (1): 347.

The material for this sheet was supplied by V. Singh, Botanical Survey of India, Jodhpur.

STATUS: Endangered due to destruction of habitat.

DISTRIBUTION: Bastar District of Madhya Pradesh, Kalahandi and Koraput districts of Orissa and Visakhapatnam and E. Godavari Districts of Andhra Pradesh, India. Endemic.

HABITAT AND ECOLOGY: Shrubs growing on laterite and rocky places with considerable rain fall at an altitude of 900-1200 m.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Measures for *in situ* conservation and introduction of the species in botanic gardens are proposed.

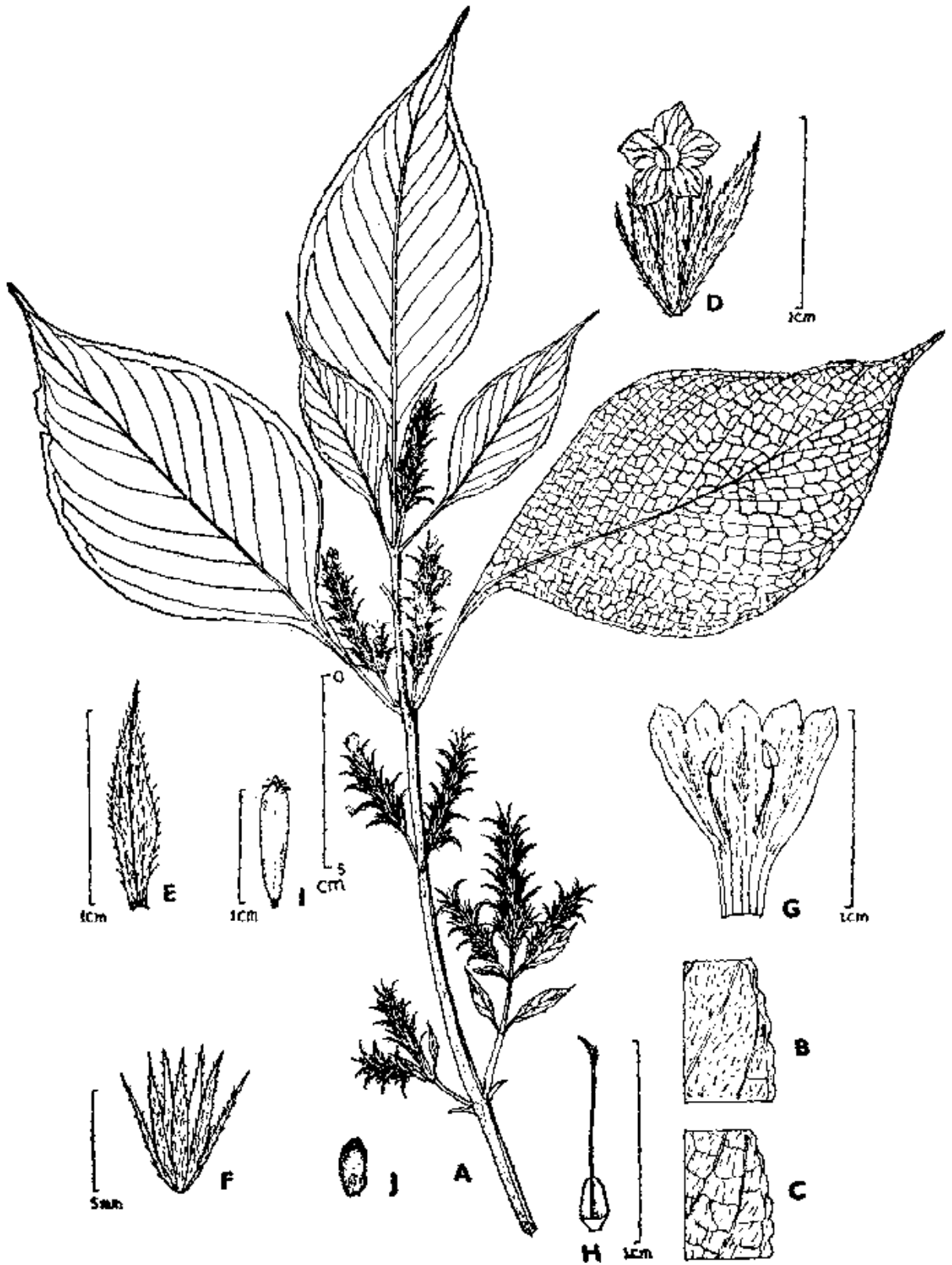
BIOLOGY AND POTENTIAL VALUE: Phytogeographical and academic interest; flowers are beautiful; this plant can be introduced in gardens as an ornamental shrub.

DESCRIPTION: Large shrubs up to 3 m high; branches lenticellate, ribbed. Leaves up to 12.6 × 6.8 cm, opposite, subcoriaceous, ovate, acuminate, margins crenulate and recurved, base rounded and decurrent on the petiole. Young leaves glabrous above and softly pubescent beneath, glabrous or hairy beneath when mature. Petioles upto 6 cm long. Spikes axillary, upto 7 cm long, often forming trichotomous panicles, glandular hairy. Flowers white with blue tips; bracts upto 1.4 × 0.3 cm, acuminate, recurved in fruit, glandular hairy without; bracteoles upto 0.8 cm long, linear-lanceolate, glandular hairy without. Calyx upto 0.8 cm long, densely glandular hairy without; tube upto 0.4 cm long; lobes 5, subequal, linear. Corolla upto 1.7 cm long, straight; cylindric part of the corolla tube upto 0.5 cm long, ventricose portion upto 1 cm long; lobes 5, unequal, spreading. Stamens 2, adnate to the base of ventricose part; filaments upto 0.9 cm long, hairy in the lower half; ovary upto 0.1 cm long, linear-oblong, seated on a 0.1 cm long disk; style upto 1 cm long, thickened and slightly hairy at top. Capsules upto 1.5 cm long, clavate, beaked, ciliate at apex. Seeds 2, ovate-oblong, upto 0.3 × 0.16 cm, discoid, areolate on each face, densely hairy except on the areolae.

REFERENCES:

1. Beddome, R.H. (1868-1874). *Ic. Plant. Ind. Orient.* t. 214.
2. Hooker, J.D. (1884). *Fl. Brit. India* 4: 436.
3. Gamble, J.S. & C.E.C. Fischer (1924). *Fl. Pres. Madras* 2: 1036.
4. Mooney, H. (1950). *Supplement to the Botany of Bihar and Orissa.* p. 111.
5. Bremekamp, C.E. (1944). Materials for a monograph of the Strobilanthinae. *Verh. Acad. Wet. apd. Natuurk.* sect. 2. 41(1): 169.

Material for this sheet was supplied by G.V. Subba Rao and G.R. Kumari, Botanical Survey of India, Coimbatore.



Phlebophyllum jeyporensis (Bedd.) Bremek. A. Flowering branch. B-C. Leaf surfaces. D-H. floral parts
I. Capsule. J. Seed.

STATUS: Endangered. The causes for its decline and possible extinction at Mt. Abu are long intervals in flowering and the topography of its habitat, since it grows on a steep ridge north-east of Usrat Valley. Chances of germination of seeds appear rather slender as they are likely to be washed away by the streams and run off water. The species was collected in 1916 by Hallberg and Blatter from behind the ridge north-east of Usrat Valley. No subsequent collector could collect this species from Mt. Abu or elsewhere.

DISTRIBUTION: India; endemic to Mt. Abu in Rajasthan state.

HABITAT AND ECOLOGY: In gravelly soils; flowering and fruiting during September-November. Vernacular name: 'Gahraj'.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: (a) Careful, thorough exploration of the area is essential since it blooms after long intervals, (b) collection of seeds and resowing in similar edaphic and climatic conditions to check the carrying off seeds by streams and run-off water, (c) declaration of the habitat as protected reserve.

BIOLOGY AND POTENTIAL VALUE: A very striking member of the genus *Strobilanthes*, having horticultural value due to its attractive spikes. Very close to *S. callosa* Nees.

CULTIVATION: Not known in cultivation; however, may be cultivated for ornamental purposes.

DESCRIPTION: Large shrubs, upto 3 m high; branches quadrangular, warty, thickened at the nodes. Leaves opposite, ovate-elliptic, acuminate, dentate-ciliate at the margins, strongly lineolate and with cystoliths above. Spikes obtuse, strobilate, about 10-flowered. Bracts densely imbricate, ovate, obtuse. Calyx-segments 5, linear, appressed hairy, slightly enlarged in fruit. Corolla purple, with yellow long hairs within. Stamens didynamous, included; anthers 2-loculed, muticous. Ovary 2-loculed; locules 2-ovuled; stigma 2-lobed. Capsule flattened. Seeds flat, thin, rectangular.

REFERENCE:

1. Blatter, E. (1930). New species of Indian plants. *Proc. Asiat. Soc. Bengal* 26 (1): 345.

The material for this sheet was supplied by V. Singh, Botanical Survey of India, Jodhpur.

STATUS: Vulnerable. Causes for its depletion are largely due to its over-exploitation for industrial use (2, 6) and increasing manifold use by local people in the Western Himalayas (1).

DISTRIBUTION: India; Western Himalaya from Kashmir to Kumaon covering Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh (8).

HABITAT AND ECOLOGY: The species is the largest maple in the Western Himalayas. It grows at 2130—3050 m altitude in its distribution range. It is characteristic of the moist temperate deciduous forest subtype of Lower Western Himalayan temperate forests occurring in association with temperate deciduous tree genera like *Corylus*, *Aesculus*, *Prunus*, *Ulmus*, *Carpinus* and *Betula* and the *lauraceous* genera like *Litsea*, *Lindera* and *Machilus*. In Upper wet Himalayan temperate forests the species is in *Quercus-Abies* and *Quercus-Acer* association with dominating Oaks like *Quercus incana*, *Q. semicarpifolia*, *Q. dilatata* and *Abies pindrow*.

CONSERVATION MEASURES TAKEN: Decades back it was a common tree in the Western Himalayas usually found in open grassy places and in moist patches of broad-leaved forests (9). Only recent surveys (4, 5) denote that the existence of the species in the western Himalayas is threatened. No measure to eliminate threat to its existence is presumably yet taken.

CONSERVATION MEASURES PROPOSED: (i) To introduce the species in protected reserve forests of Western Himalayan States, (ii) to maintain its germ-plasm by keeping its seeds in seed banks and replacing them by fresh collection every year as seeds of *A. caesium* have poor viability (3).

BIOLOGY AND POTENTIAL VALUE: This is the largest *Acer* in Western Himalaya and is termed as the Indian Maple (10), often attaining a height of 20-25 m and a girth of about 3.6-3.9 m (1), twigs reddish blue, giving a handsome and distinctive look in forest landscape. The wood is strong, can take well seasoning and is suitable for furniture, turnery frames, boarding, bowls and other domestic appliances (1).

CULTIVATION: Not known.

DESCRIPTION: Large deciduous broad-leaved trees, andromonoecious. Dormant flower buds large and prominent. Leaves 8-18 × 10-20 cm, palmately 5-lobed, upper surface green, lower surface characteristically caesio-pruinose, base deeply cordate, 5-nerved, leaf lobes caudate-acuminate, petioles 6-15 cm long, reddish. Inflorescence corymbose-panicle, erect, terminal, puberulous, appearing after the leaves. Flowers pale greenish-yellow to yellow. Sepals longer than petals. Stamens 8, inserted into the disc, exserted. Ovary pubescent, style 2, connate half way up. Fruit a samara, samara wings slightly divergent.

REFERENCES:

1. Anon. (1948). *Acer* species. In: *Wealth of India* 1. p. 21-22. C.S.I.R., New Delhi.
2. Anon. (1952). Notes on the utilization and silviculture of the timbers used in wood based industries of India. *Ind. For.* 78: 274-288, 348-370.
3. Dent, T.A. (1948). Seed storage with particular reference to the storage of seeds of Indian forest plants. *Ind. For. Rec. (N.S.) Silviculture* 7 (1). Govt. of India, Delhi.
4. Hajra, P.K. (1983a). Plants of North Western Himalayas with restricted distribution—a census. In: Jain, S. K. & Rao, R. R. (ed). *An assessment of threatened plants of India*. Botanical Survey of India, Howrah. p. 1-12.
5. Hajra, P.K. (1983b). Western Himalayas. In: Jain, S. K. & Sastry, A. R. K. (ed). *Materials for a catalogue of threatened plants of India*. Botanical Survey of India, Howrah. p. 49-61.
6. Karnik, M. G. & Misra, A. K. (1964). Maple wood (*Acer caesium*) for tooth-pick industry. *Ind. For.* 90:310-311.
7. Murray, E. (1975). Aceraceae. In: Nasir, E. & Ali, S. I. (ed.) *Flora of West Pakistan* No. 92. p. 1-7 with 5 pl.
8. Nayar, M. P. & Anukul Datta (1982). Aceraceae. *Fasc. Fl. India* 9: 1-22, with plates. Botanical Survey of India, Howrah.
9. Parker, R. N. (1918). *A forest flora for the Punjab with Hazara and Delhi*. p. 102-105.
10. Watt, G. (1889). *Dictionary of economic products of India*. 1: 67-72 (reprinted ed. 1972) Dehra Dun.

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

STATUS: Endangered. The type of this variety had been collected in 1862 by T. Anderson in October, 1862. Pax (4) determined it as a variety of *A. hookeri* in 1886. No further collection of the variety from its type locality or from elsewhere of Sikkim and Darjeeling or other states is reported till date. *Anderson 407* is the only collection available in India (CAL) representing the variety (3). Since then it has not been seen in the wild. Causes for its decline and possible extinction may be over-exploitation of forest flora for timber and firewood and massive deforestation for cultivation by hill people (1).

DISTRIBUTION: India, endemic to Sikkim and Darjeeling district of West Bengal. It was collected from a place between Rirbi and Rinchingpong, Sikkim (with altitude range from 600 to 1500 m).

HABITAT AND ECOLOGY: Occurs in much lower elevation than the species. The forests of the area are typified as East Himalayan subtropical wet Hill forests associated with *Castanopsis tribularis*, *Engelhardtia spicata*, *Betula cylindrostachys*, *Schima wallichiana*, *Alnus nepalensis*, *Cedrela* and *Eurya* spp. The taxon is also closely associated with *Acer thomsoni* (2).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) To survey extensively its type locality and adjacent places and to examine as far as possible the population areas of *A. hookeri*, (b) if rediscovered, to declare its place/places of occurrence as protected reserve/reserves, (c) to ban collection of the plants, if extant, for botanical interests/scientific studies, (d) to attempt for regeneration and introduction to other areas having similar habitat and ecological conditions, (e) to conserve its germ-plasm (seed) in modern seed banks.

BIOLOGY AND POTENTIAL VALUE: The variety differs from the species in respect of leaves which are thicker (leathery), larger and with margin imperfectly biserrate and serrature less cuspidate; samara wings straight.

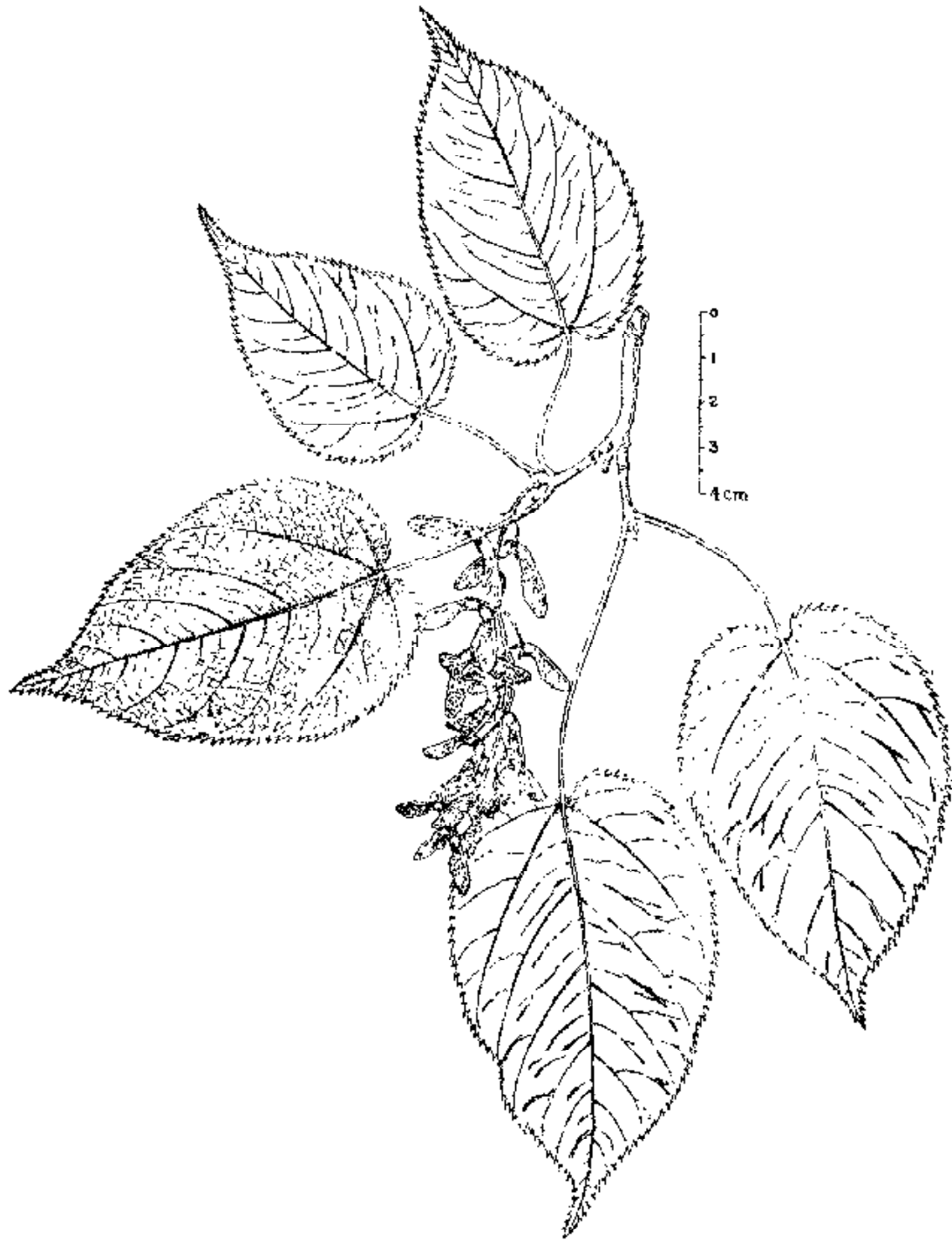
CULTIVATION: Not known.

DESCRIPTION: Trees, 12-16 m tall, andro-monoecious or dioecious. Branches green, whitish striped, later grey-brown. Leaves 10-14 × 5.5-8.5 cm, adult leaf coriaceous, margin imperfectly biserrate, serration less cuspidate, ovate, apex caudate—acuminate to cuspidate, base 5-nerved. Inflorescence appearing with leaves, bracteate, puberulous, brown to greenish-yellow. Flowers glabrous, yellow-green. Sepals and petals equal, 2.5-3.0 mm long. Fruit a samara, sub-horizontal, erect, nuts rounded, glabrous, wings straight.

REFERENCES:

1. Anon. (1907). Forests, Gazetteer of the Darjeeling District. *Bengal District Gazetteers*, Government of Bengal, Calcutta. p. 98.
2. Anon. (1970). *Tenth working plan for the Darjeeling Forest Division, Northern Circle*. 1967-68—1976-77. vol. 1 (part 1 & Appendices i-xiv) and vol. 2 (part 2 & Appendices xv—xx). Directorate of Forests, Government of West Bengal. Calcutta.
3. Nayar, M. P. & Anukul Datta (1982). Aceraceae. *Fasc. Fl. India* 9:1-22. Botanical Survey of India, Howrah.
4. Pax, F. (1886). Monographie der Gattung *Acer*. In: Engler, A. *Bot. Jahrb.* 7: 177—263. (see p. 216).

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



Acer hookeri Miquel var. *majus* Pax
Fruiting twig.

STATUS : Endangered. Till date, the taxon has been collected only from Mussoorie, near Dehra Dun, Uttar Pradesh for only five times. It has not been seen in the wild since 1957 when Banerji collected it from Jharipani, Mussoorie and established its varietal status in 1963 (1).

DISTRIBUTION : India, endemic to a single locality in Mussoorie in Uttar Pradesh (4). On two occasions G. King collected it from Mussoorie, one in 1869, another having no date. From the same area P. W. Mackinnon collected it in 1896 and in 1899. Further collection of it either from the type locality or from elsewhere in the country is not reported.

HABITAT AND ECOLOGY : In lower Western Himalayan temperate forests dominated by *Quercus incana* (Ban oak forests) from Jharipani to the upper ridges of Mussoorie hills (alt. 1500—1800 m) in association with tree species like *Rhododendron arboreum*, *Machilus odoratissima*, *M. duthiei*, *Phoebe lanceolata*, *Cornus microphylla*, *Aesculus indica* along with *Acers* like *A. laevigatum*, *A. caesium*, *A. cappadocicum* and *A. oblongum* var. *oblongum*; conifers are much less common here, only *Pinus roxburghii* is abundant. Most of the trees above 1500 m are broad-leaved as 8 months of the year are comparatively dry (3, 6, 7).

CONSERVATION MEASURES TAKEN : None. The variety is recognized (1) recently and remained unknown to its early collectors.

CONSERVATION MEASURES PROPOSED : (a) To survey Mussoorie and vicinity in the outermost range of the Himalayas and adjacent Siwalik ranges to examine as far as possible all the *A. oblongum* stands of the area/areas, (b) if rediscovered, to declare its localities as protected reserve/reserves, (c) to take up stringent measures for its *in situ* conservation as the local people use the timber of *A. oblongum* for making various domestic utensils and agricultural equipments which is a potential threat factor, (d) to attempt for its regeneration and introduction in habitats with identical ecological conditions, (e) to preserve its seeds either collected from living plant in the wild, or if non-extant, from all possible private and institutional collections.

BIOLOGY AND POTENTIAL VALUE : Unlike var. *oblongum* and var. *microcarpum* of the species, this variety has very thin papery leaves which are dull red or reddish-brown on both the surfaces. So unlike the trees of var. *oblongum* in which foliage assume red colour in spring time (2) the foliage of the trees of this variety wear dazzling red/reddish brown colour throughout the year giving it a distinctive appearance.

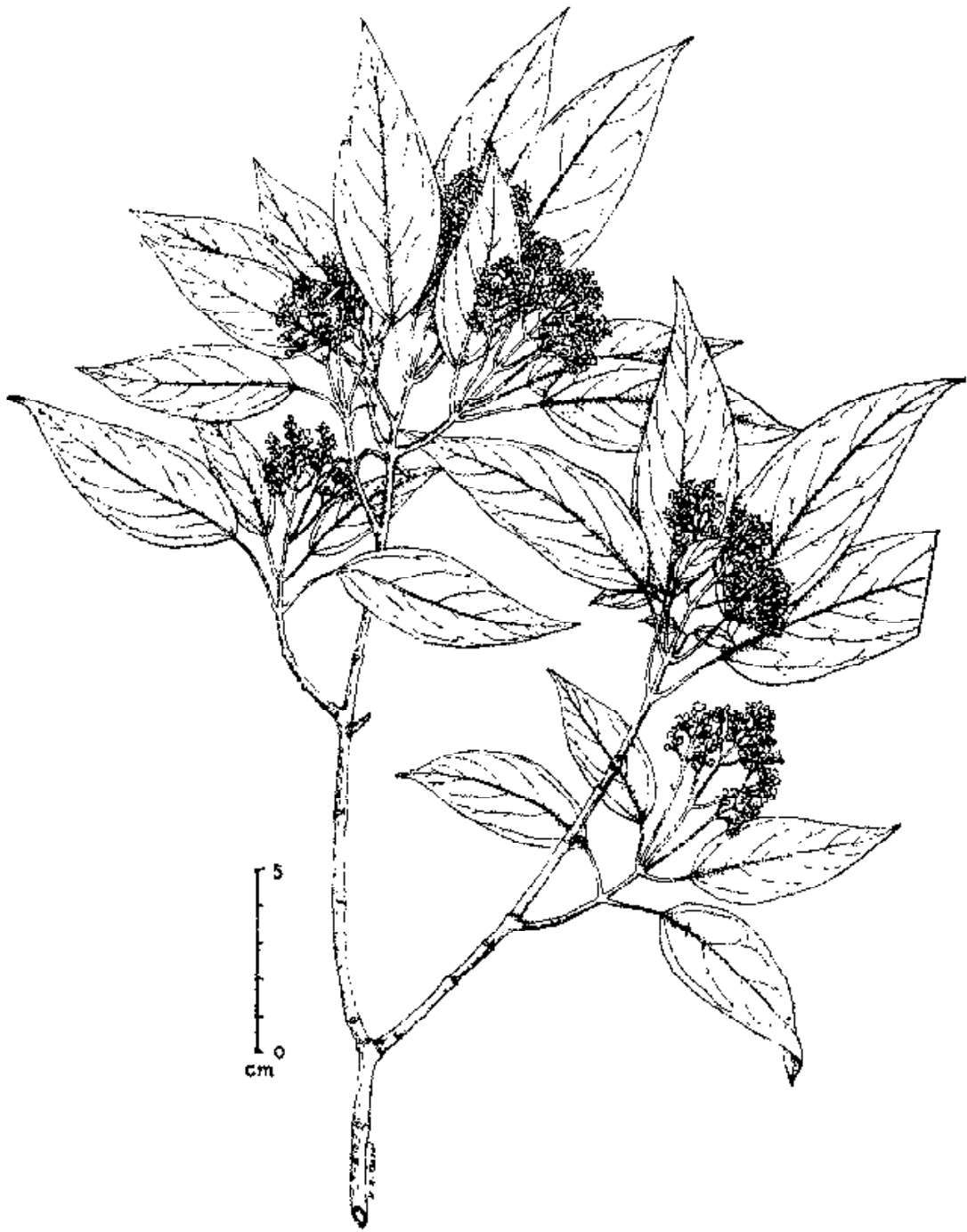
CULTIVATION : Not known. *A. oblongum* is regarded as an ornamental plant and is cultivated in gardens (5). Efforts should be made for introducing this variety along with var. *oblongum* in gardens.

DESCRIPTION : Trees, 15-18 m tall, evergreen, andro-monoecious, buttressed at base, stems with elliptical white scars, bark smooth to wrinkled, white and green. Leaves membranaceous, 5-17 × 3-7 cm, ovate-lanceolate, glabrous, minutely reticulate or reticulation obsolete, base acute to subacute, dull red or reddish-brown, concoloured, 3-nerved, pubescent. Inflorescence appearing with leaves, minutely pubescent. Flowers minute, 5-merous, greenish-white to yellow-green, 7.8 mm across. Sepals linear or lanceolate, 2.4 mm long. Petals elliptic-lanceolate, equal to or shorter than sepals. Stamens 8, inserted into the disc. Ovary densely hairy. Fruit a samara, 1-3 cm long, wings divergent. Flowering in March-April, fruiting in April to September.

REFERENCES :

1. Banerji, M. L. (1983). *Phytologia* 9 (5): 265-266.
2. Dakshini, M. B. (1984). Role of forest trees in landscaping. *Indian Forest Bulletin* 277 (N.S.) *Botany*. Controller of Publications, Government of India, Delhi. p. 1-15.
3. Gupta, R. K. (1967). *Seasonal flowers of the Indian summer resorts : Mussoorie Hills*. Navayug Traders, New Delhi.
4. Nayar, M. P. & Anukul Datta (1982). *Aceraceae. Fasc. Fl. India* 9:1-22. Botanical Survey of India, Howrah.
5. Parker, R. N. (1918). *A forest flora for the Punjab with Hazara and Delhi*. p. 102-105.
6. Raizada, M. B. (1959). Mussoorie and its plants. *Ind. For.* 85: 668-690.
7. Raizada, M. B. & Saxena, H. O. (1978). *Flora of Mussoorie*. 1. Bishen Singh and Mahendra Pal Singh, Dehra Dun.

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



Acer oblongum Wall. ex DC. var. *membranaceum* Banerji
Flowering twig.

STATUS : Endangered. Hiern (3) in the Flora of British India cited a collection of *A. oblongum* of William Griffith from Mishmee Hills and doubtfully attributed it to a varietal status of the species, which was later confirmed by Pax (6); causes for its decline or possible extinction may be due to factors mentioned in the report on *A. sikkimense* var. *serrulatum* (1).

DISTRIBUTION : India, endemic to Mishmee Hills, Lohit district, Arunachal Pradesh.

HABITAT AND ECOLOGY : In subtropical pine forests dominated by *Pinus insularis* along with the association of forest elements mentioned in the report on *Acer sikkimense* var. *serrulatum* (2, 4).

CONSERVATION MEASURES TAKEN : None. Since the collection of Griffith, there is no report of its further collection. The area in the remotest northeastern part of the country requires further extensive exploration in the Arunachal Pradesh region.

CONSERVATION MEASURES PROPOSED : (a) To survey extensively Mishmee hill area and vicinity to locate the species, (b) if rediscovered in the wild, to declare the area as a protected reserve by the State Government, (c) to check its further depletion, to ensure that no collection of the taxon is made from the wild, (d) to try for its introduction in other areas having similar habitat and ecological environment. (e) to preserve and maintain its germplasm in seed bank.

BIOLOGY AND POTENTIAL VALUE : The variety is taxonomically distinct from the species in respect of leaf size, which are much smaller than those of the species.

CULTIVATION : Not known.

DESCRIPTION : Trees, 15-18 m tall, evergreen, andro-monoecious, buttressed at base, bark smooth to wrinkled, white and green. Leaves chartaceous, 5-12 × 3-5 cm, ovate-lanceolate, glabrescent, minutely reticulate, base rounded, 3-nerved. Inflorescence appearing with leaves, pubescent, lateral shoots 5-15 cm long. Flowers 5-merous, greenish-white to yellow-green, 7-8 mm across. Sepals linear or lanceolate, outside barbate, 2-4 mm long. Petals elliptic-lanceolate, equal to or shorter than sepals. Stamens 8, inserted on or inside the disc. Ovary densely pubescent. Fruit a samara, small, 1 cm long, wings divergent.

REFERENCES :

1. Anon. (1908). Mishmi Hills. *The Imperial Gazetteer of India*, vol. 17. (New Edition) Clarendon Press, Oxford.
2. Champion H. G. & Seth, S. K. (1968). *A revised survey of the forest types of India*. Manager of publications, Government of India, Delhi.
3. Hiern, W. P. (1875). *Acer* in Sapindaceae. In: Hooker, J. D., *Fl. Brit. India* 3:693.

4. Joseph, J. & Chauhan, A. S. (1983). Namdapha Wild Life Sanctuary, Tirap, Arunachal Pradesh. *In: Jain, S. K. and Sastry, A. R. K. (compiled). Botany of some Tiger habitats in India.* Botanical Survey of India, Howrah.
5. Nayar, M. P. & Anukul Datta (1982). Aceraceae. *Fasc. Fl. India* 9 : 1-22. Botanical Survey of India, Howrah.
6. Pax, F. (1886). Monographie der Gattung Acer. *In: Engler, A. Bot. Jahrb.* 7: 177-263.

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



Acer oblongum Wall. ex DC. var. *microcarpum* Hiern
Fruiting twig.

STATUS : Endangered. A natural hybrid of *Acer laevigatum* Wall. and *Acer campbellii* Hook. f. et Thoms. ex Hiern. It has been reported only 5 times since its discovery by B. B. Osmaston from Salombong, Darjeeling in October, 1903. Causes for its decline and possible extinction may be due to its restricted occurrence in a small pocket of Darjeeling Himalayan belt where rapid settlements by local hill people have replaced vast forest tracts. Regeneration of the species in the wild is also a chance-occurrence as the viability of Maple seeds, in general, is very short lived (3).

DISTRIBUTION : India. Endemic to a few restricted localities of Darjeeling district in West Bengal State, in the Eastern Himalaya. It was reported by B. B. Osmaston in 1903 from Salombong, Darjeeling (9) and later again by him from Birch Hill, Darjeeling in 1904. In 1915, C.E.A. Modder collected it from Darjeeling (deposited at CAL) and in 1958 by Ghose (6) from Mirik of the same district. From Birch Hill again Mehra *et al* (7) collected it in 1972. There is a report, however, of its recent collection (not later than 1963 as evidenced by sheet data) from Dehra Dun district, Uttar Pradesh (9).

HABITAT AND ECOLOGY : The taxon was reported from Darjeeling Himalaya in the alt. 1500—2400 m in association with *Machilus edulis*, *Alcinandra cathcartii*, *Cinnamomum obtusifolium*, *Magnolia campbellii*, *Schima wallichiana*, *Castanopsis tribuloides*, *Litsea*, *Engelhardtia* and *Machilus* spp. in the lauraceous forests and with *Quercus lamellosa*, *Q. lineata*, *Symplocos theaeifolia*, *Betula alnoides*, *Eriobotrya bengalensis*, *Itea macrophylla*, *Meliosma wallichii*, *Rhus succedanea* along with *Acer campbellii*, *A. laevigatum*, *A. hookeri* and *A. sikkimense* in the Buk-oak forest of Darjeeling montane wet temperate forests. In Dhera Dun the hybrid is reported to occur on the hill slopes at lower elevation.

CONSERVATION MEASURES TAKEN : None for the wild habitat.

CONSERVATION MEASURES PROPOSED : (a) To survey its type locality and the places of its previous collections for its present status in the wild and to declare them as protected reserves by the State/Central Government and to take steps to increase its population in the wild, (b) to obtain seeds from all possible private and institutional collections and grow them for replanting in the original and known habitat, (c) in the event of failure of seed germination for long storage which is characteristic of *Acer* (3), propagation and conservation through grafting may be tried.

BIOLOGY AND POTENTIAL VALUE : The taxon is unique as it is the only natural hybrid among the Indian Acers. It is taxonomically distinct from other Indian Acers in having both lobed and unlobed leaves in the same plant (8). Besides, as reported by Gamble (5) and observed by Nayar and Datta (9) this species with its dazzling red colour of the emerging young leaves, should be of ornamental value. Its commercial value as a timber plant is not ruled out as both of its parent species, *A. laevigatum* and *A. campbellii* are regarded as commercial timber-yielding plants and extensively cultivated.

CULTIVATION : Not known.

DESCRIPTION : Trees upto 30 m tall, polygamous. Branches olive to purplish—brown. Leaves 12-15 × 6-8 cm, glabrous above, thickly reticulate beneath, when lobed with 2-3 lobations in upper half, lobes erect, ovate-lanceolate, apex long, caudate-acuminate, base rounded or slightly cordate, margin acutely serrate. Inflorescence pedunculate cymes in terminal panicles, 7-10 cm long. Flowers greenish to creamy yellow, 5-merous. Stamens 8, inserted inside the disc, filaments subulate, anthers oblong, minutely papillose. Ovary silky-villose. Samaras erect to divergent.

REFERENCES :

1. Anon. (1907). Forests. Gazetteer of the Darjeeling District, *Bengal District Gazetteers*, Govt. of Bengal, Calcutta. p. 98.
2. Anon. (1959). *Fourth working plan for Kurseong Forest Division : 1954-55-1963-64*, 1 (part 1 & Appendices i-xi). Directorate of Forests, Govt. of West Bengal.
3. Dent, T. A. (1948). Seed storage with particular reference to the storage of seeds of Indian forest plants. *Indian Forest Records (N.S) Silviculture* 7 (1). Government of India, Delhi. part 2, p. 68.
4. Gamble, J. S. (1881). *A manual of Indian timbers*. (rep. ed. 1972) Dehra Dun. p. 199—202.
5. Gamble J. S. (1908). *Acer osmostonii*. In *Decades Kewenses Decas LI. Bull. Misc. Inform.* 1908 : 446.
6. Ghose, B. N. (1958). A catalogue of plants of the Sikkim Himalayas. *Bengal Nat. Hist. Soc.* 29 (4): 161-167.
7. Mehra, P. N., P. K. Khosla & T. S. Sarin (1972). Cytological studies of Himalayan Aceraceae, Hippocastanaceae, Sapindaceae and Staphylaceae. *Silvae Genet.* 21:96-102.
8. Mehra, P. N., K. S. Bawa, P. K. Khosla & A. S. Hans (1983). Floristic account of some forest types of the Eastern Himalayas. *Bull. Bot. Surv. India* 25 (1-4) : 1-18.
9. Nayar, M. P. & Anukul Datta (1982). Aceraceae. *Fasc. Fl. India* 9: 1-22. Botanical Survey of India, Howrah.

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



Acer osmastonii Gamble
Fruiting twig.

STATUS : Endangered. The taxon has not been seen in the wild since William Griffith's collection of it during his Assam exploration in the thirties of the last century (2). Causes for its decline or possible extinction may be due to its restricted occurrence in small pockets of Arunachal Pradesh which have become vulnerable due to exploitation of forests and deforestation for Jhum cultivation by the local Mishmee tribes (1).

DISTRIBUTION : India; endemic to Mishmee hills, Lohit district, Arunachal Pradesh. The taxon had been collected only once by Griffith possibly in 1837-38 (2) (Griffith 936) from Mishmee Hills and was determined by Pax in 1886 (5) as a variety of *A. sikkimense*. Since then no new collection has been reported from the area or elsewhere (4).

HABITAT AND ECOLOGY : In subtropical pine forests dominated by *Pinus insularis* in association of *Quercus griffithii*, *Q. fenestrata*, *Magnolia campbellii*, *Prunus acuminata*, *Betula alnoides*, *Schima wallichiana*, *Castanopsis* and *Rhus* spp.

CONSERVATION MEASURES TAKEN : None. Since Griffith's collection in 1838 it has never been collected again. The area having been the most remotest northeastern part of Arunachal Pradesh largely remained under-explored (1), and it has not been possible to exactly locate its place of occurrence and survey its population.

CONSERVATION MEASURES PROPOSED : (a) To survey extensively the Mishmee hills area to locate the taxon, (b) if rediscovered in the wild, to declare the area as a protected reserve by the State Government, (c) to ensure that no collection of the taxon is made from the wild, (d) to attempt to introduce it to other areas which have similar natural habitat and ecological environment, and to preserve and maintain its germ-plasm in modern seed banks.

BIOLOGY AND POTENTIAL VALUE : The variety is taxonomically distinct from the species in respect of serrulation of leaf margin which in the species is entire to subentire.

CULTIVATION : Not known.

DESCRIPTION : Tall trees, andro-monoecious or dioecious; branches green to reddish-brown or grey. Leaves 9-17 × 7-9 cm, ovate, subcoriaceous, glabrous, dark green above, paler beneath, apex caudate to cuspidate, base subcordate to cordate, 5-nerved. Inflorescence appearing with leaves, bracteate, densely spicate. Flowers 5-merous, yellowish-green. Sepals lanceolate, 2 mm long. Petals short, 1.5-2.0 mm long. Stamens 8, filament 2.5-3.0 mm long. Ovary glabrous. Fruit a samara, 1.5-1.8 cm long, nuts globular, wings divergent, nearly straight, base narrowed.

REFERENCES :

1. Anon. (1908) Mishmi Hills. *The Imperial Gazetteer of India*. 17. New Edition. Oxford, Clarendon Press, 1908. p. 377-378.
2. Griffith, W. (1848). *Posthumous papers*. 2. Itinerary Notes. Calcutta.

3. Joseph, J. & Chauhan, A. S. (1983). Namdapha Wild Life Sanctuary, Tirap, Arunachal Pradesh. *In*: Jain, S. K. & Sastry, A. R. K. (Com.) *Botany of some Tiger habitats in India*. Botanical Survey of India. Howrah.
4. Nayar, M. P. & Anukul Datta (1982). *Acceraceae*. *Fasc. Fl. India* 9: 1-22. Botanical Survey of India, Howrah.
5. Pax, F. (1886). *Monographie der Gattung Acer*. *In*: Engler, A., *Bot. Jahrb.* 7:177—263.

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



Acer sikkimense Miquel var. *serrulatum* Pax
Fruiting twig.

STATUS : Rare; there is no recollection of this species since its type collection.

DISTRIBUTION : India; Satara Distt., Lingmala, Mahabaleshwar, Maharashtra.

HABITAT AND ECOLOGY : Open hill sides and on both sides of the river before Yenna falls, Lingmala, Mahabaleshwar.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : Intensive search for the species and if the plants are collected from type locality, should be introduced and cultivated in the experimental gardens. Neighbouring areas may be searched.

BIOLOGY AND POTENTIAL VALUE : Flowers strongly scented; plants worth introduction in the gardens.

CULTIVATION : None on record.

DESCRIPTION : Scapigerous, bulbous herbs, bulbs ovoid or spherical upto 20×13 cm, narrowed into stout neck; leaves appearing after flowers, ensiform, upto 60×5 cm, apex obtuse, dark green, glabrous. Scape lateral, 50 cm long, cylindrical, green, tinged with purple. Flowers white, strongly scented, upto 20 in umbel, nodding, bracts broadly lanceolate, inflexed, green, tinged purple; perianth funnel-shaped, tube 6.5 cm long, cylindrical at base, lobes lanceolate, upto 7.5 cm long, inner sometimes oblanceolate, cuspidate, filaments from throat of perianth tube, free. Fruits not seen.

REFERENCE :

1. Blatter, E. & McCann, C. (1928). Some new species of plants from the Western ghats. *J. Bombay Nat. Hist. Soc.* 32(4): 733-34.

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



Crinum eleonorae Blatt. & McC. Leafy stem & flowering scape.

STATUS: Endangered. The original material was collected by R. H. Beddome in 1871 from the Anamalais; lastly observed in the same locality by C. A. Barber in the year 1903. No subsequent record of its occurrence is available. This endemic species might have been lost due to habitat loss.

DISTRIBUTION: India, Tamil Nadu, Coimbatore Dt.: Anamalais, Kerala, Idukki Dt.: Peermade. Endemic.

HABITAT AND ECOLOGY: This species grows in evergreen forests at an altitude of about 1000 m. The soil in these regions is porous and rich in organic matter.

CONSERVATION MEASURES TAKEN: The Anamalai Wildlife Sanctuary having an area of about 960 sq. km includes similar habitats.

CONSERVATION MEASURES PROPOSED: The first priority is to find out if it still survives in type locality/adjoining evergreen forests; if relocated steps should be taken to include the area in the existing Wildlife Sanctuary.

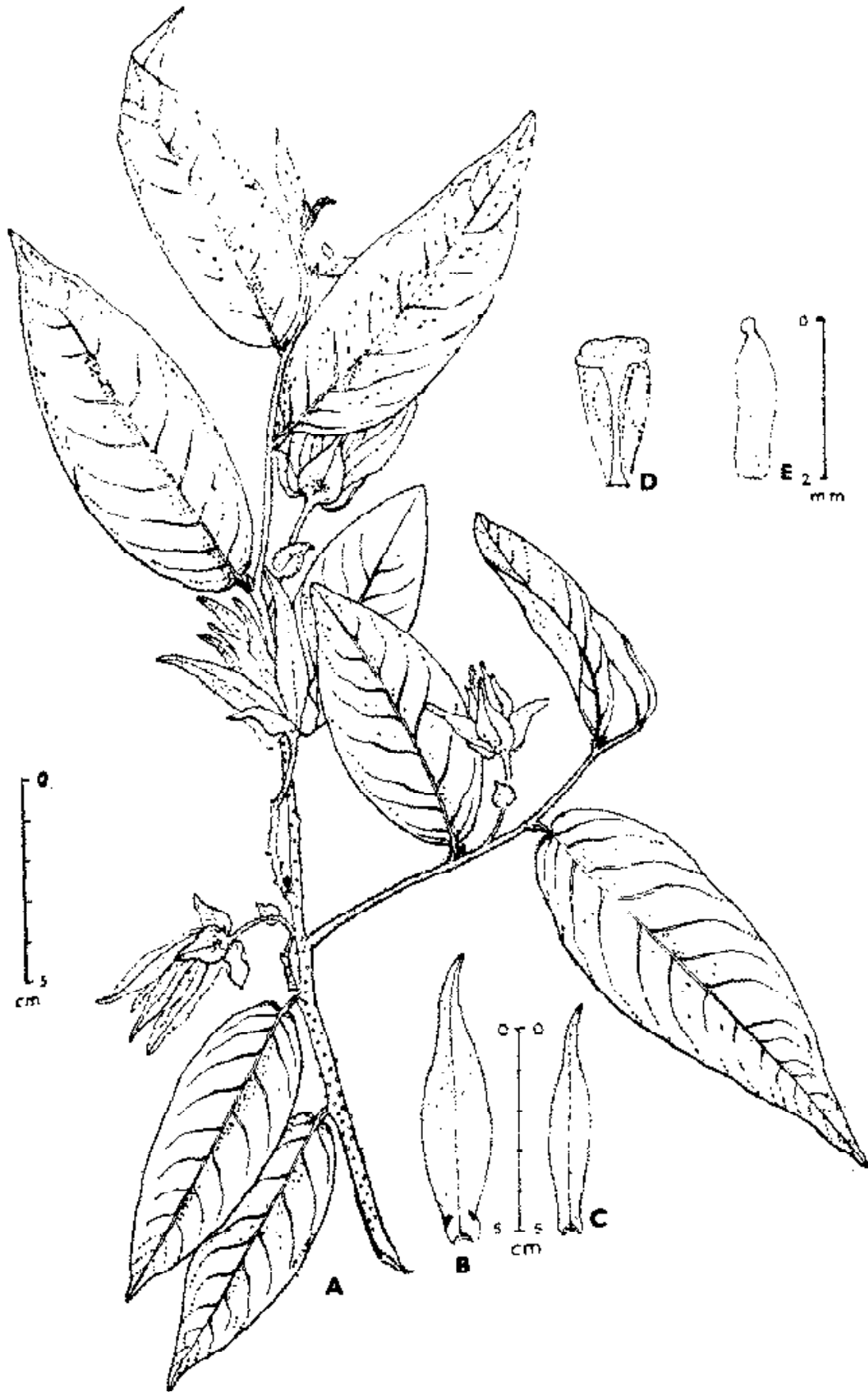
BIOLOGY AND POTENTIAL VALUE: This species is isolated only in one hill range of the southern Western Ghats and hence of distributional interest.

DESCRIPTION: Gigantic climbers. Young shoots rufous. Leaves 8-13 × 3.5-4.5 cm, ovate-lanceolate, acuminate at apex, rounded or somewhat cordate at the base, membranous. Flowers bright green or straw-coloured, solitary, axillary or supra-axillary; pedicels pubescent. Sepals ca 2 × 1.5 cm, ovate, subcordate at base. Outer petals 6.5-7.5 × 1.5-2.5 cm; inner petals a little shorter and narrower, all silky pubescent.

REFERENCES :

1. Beddome, R. H. (1968-1974). *Icon. Pl. Ind. Or.* p. 34, t. 158.
2. Debika Mitra (nee Das) (1963). *Bull. Bot. Surv. India* 5: 42.
3. Fischer, C. E. C. (1921). *Rec. Bot. Surv. India* 9: 21.
4. Gamble, J. S. (1915). *Fl. Pres. Madras*, p. 15.
5. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978) *J. Bombay Nat. Hist. Soc.* 75: 685.
6. King, G. (1894). *Ann. Roy. Bot. Gard. Calcutta* 4: 56. t. 75.
7. Rama Rao, M. (1914). *Flowering Plants of Travancore*, p. 6.
8. Vajravelu, E. (1983). *Plant Conservation Bulletin* 4: 15.
9. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a catalogue of threatened plants of India.* p. 8. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. N. Henry and V. Chitra, Botanical Survey of India, Coimbatore.



Desmos viridiflorus (Beard.) Safford A. Flowering twig. B—D. Floral parts. E. Carpel.

STATUS: Rare; an endemic species restricted to the southern end of the Western Ghats in evergreen forests, scattered in a few localities. Of late, a few trees were observed near Bonaccord (4) and Walayar Estates. The greatest source of danger to this species is the destruction of habitat for cultivation of plantation crops and habitat loss.

DISTRIBUTION: India. Tamil Nadu, Tirunelveli Dt.: Courtallam, Papanasam hills, Kannikatti and Valayar Estate area. Kerala, Trivandrum Dt.: near Bonaccord Estate.

HABITAT AND ECOLOGY: In dense forests from 500-1600 m. At low elevations the soils consist of red ferruginous sandy loam of very little depth, with loose boulders. On hill slopes the soil has a characteristic yellow or red colour. The soil is rich in humus (3).

CONSERVATION MEASURES TAKEN: A few distributional localities of the species fall within the jurisdiction of Mundanthorai Wildlife Sanctuary.

CONSERVATION MEASURES PROPOSED: Most of the localities where the plants occur are included in the proposed biosphere reserve (3).

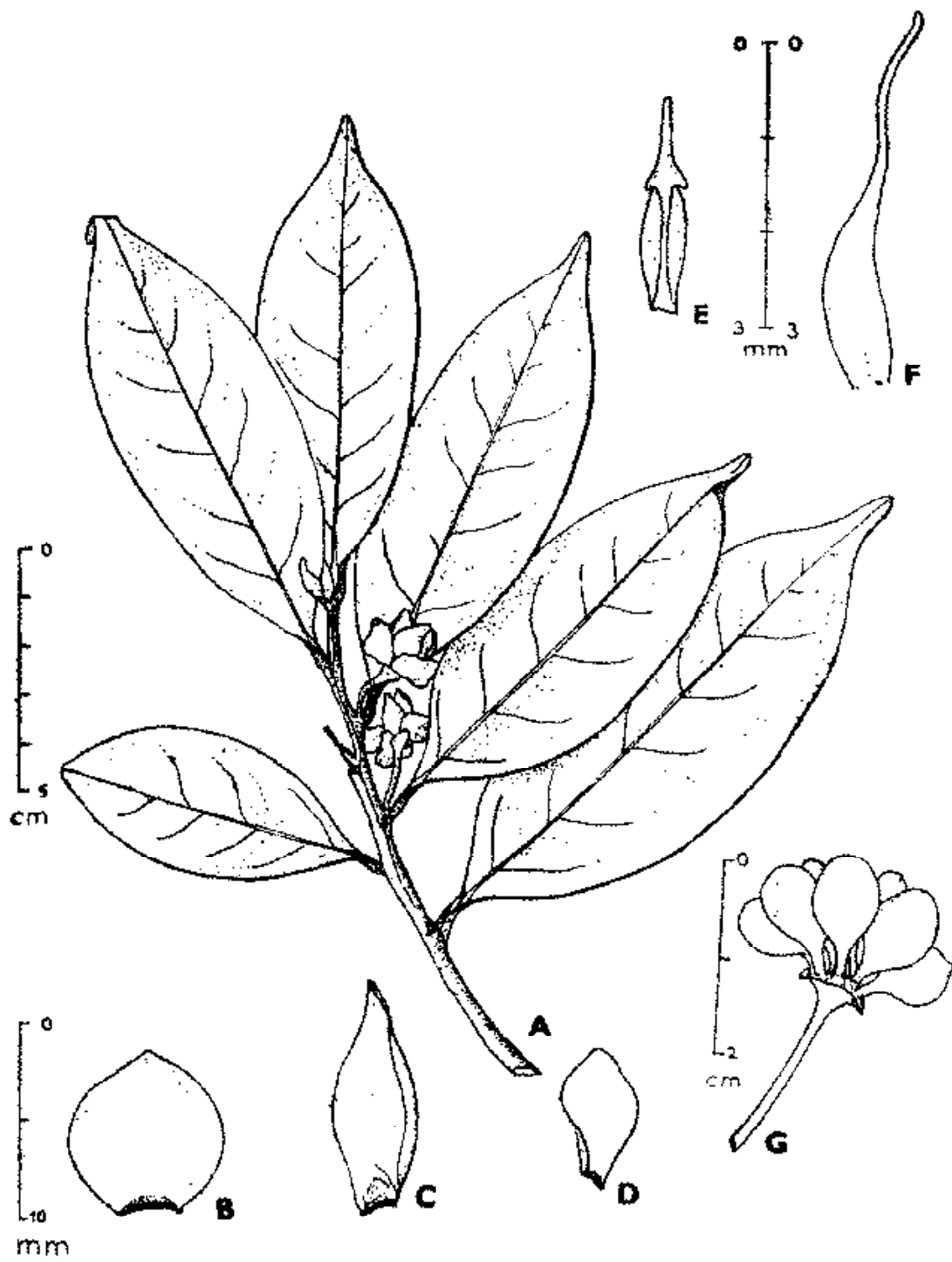
BIOLOGY AND POTENTIAL VALUE: This plant is of scientific interest on account of its restricted distribution. The area harbours a number of endemic species of plants that are unique to Peninsular India (3).

DESCRIPTION: Trees up to 20 m tall. Bark blackish. Leaves 5.3-16.5 × 1.7-6.6 cm, oblong-lanceolate, acute-acuminate at apex, attenuate at the base. Flowers solitary, light yellow. Sepals 3, each ca 8 × 8 mm, rounded, acute. Outer petals ca 12 × 5.5 mm, thick, flat, inner smaller, shortly clawed, cohering in a vaulted cap over the stamens and ovary. Stamens many; anthers beaked. Carpels many.

REFERENCES:

1. Debika Mitra (nee Das) (1963). *Bull. Bot. Surv. India* 5: 44.
2. Gamble, J. S. (1915). *Fl. Pres. Madras*, p. 19.
3. Henry, A. N., Chandrabose, M., Swaminathan, M. S. & Nair, N. C. (1984). *J. Bombay Nat. Hist. Soc.* 81: 282-290.
4. Joseph, J. & Chandrasekaran, V. (1982). *Indian J. Bot.* 5: 147.

The material for this sheet was supplied by A. N. Henry and V. Chitra, Botanical Survey of India, Coimbatore.



Goniothalamus rhyncantherus Dunn A. Flowering twig. B—D. Floral parts. E. Stamen. F. Carpel. G. Ripe Carpels.

STATUS: Rare; endemic to the higher slopes of wet evergreen forests at the southern end of Western Ghats, represented by a few trees. These forests are little disturbed (6); the only danger would be from the pilgrims who cut plants for making paths to reach the conical Agastyamalai Peak.

DISTRIBUTION: India, Tamil Nadu, Tirunelveli Dt.: Kannikatti and Agastyamalai. Kerala, Trivandrum Dt.: Attyramalai and Agastyarkudam.

HABITAT AND ECOLOGY: Tropical wet evergreen forests at 1000-1500 m in difficult terrains and steep, inhospitable slopes. The soil in the slopes has a characteristic yellow or red colour. Over the crest and along the higher slopes the ground is rocky and the soil is shallow and hard. The forest soils are rich in humus (6).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Agastyamalai and its environs are proposed as a potential area for a biosphere reserve (6). Introduction of the species in Botanic gardens.

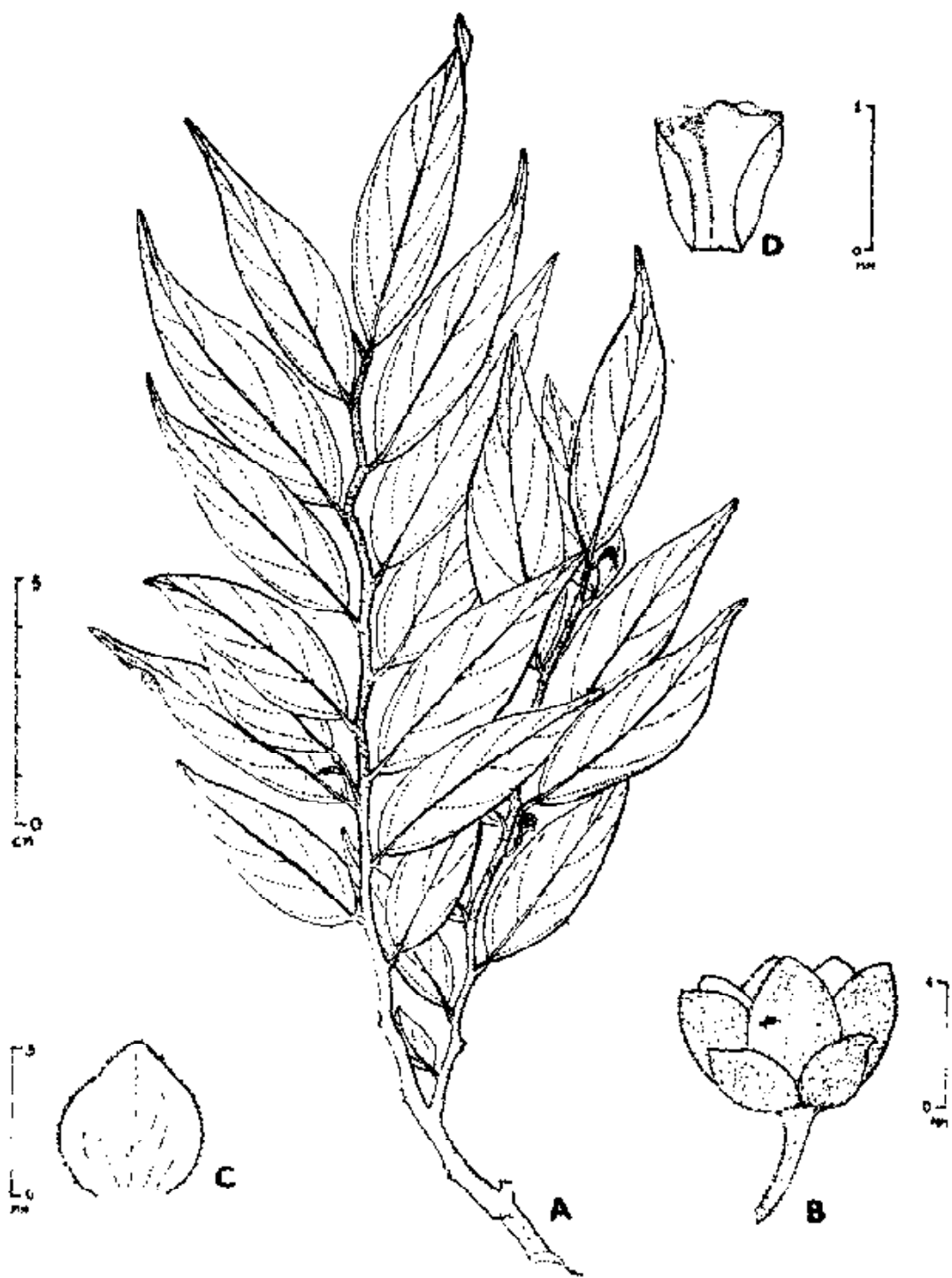
BIOLOGY AND POTENTIAL VALUE: A large tropical genus with a single species in Peninsular India and hence of distributional interest. The species grows in an area rich in rare and endemic flora.

DESCRIPTION: Shrubs or small trees. Leaves 5.5-9 × 3.8 cm, ovate or oblong, acuminate at apex, rounded or subcordate or attenuate at the base. Flowers small, solitary, leaf-opposed. Sepals ovate. Petals tomentose without; outer petals much larger than the inner; inner petals ovate, thick, concave, inflexed at the apex. Anther locules hidden beneath the connectives, connective truncate-capitate.

REFERENCES:

1. Beddome, R. H. (1868-1874). *Ic. Pl. Ind. Or.* 1:75.
2. Bourdillon, T. F. (1908). *The Forest Trees of Travancore*, p. 7.
3. Debika Mitra (nee Das) (1963). *Bull. Bot. Surv. India* 5: 43.
4. Gamble, J. S. (1915). *Fl. Pres. Madras*, p. 17.
5. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). *J. Bombay Nat. Hist. Soc.* 75: 685.
6. Henry, A. N., Chandrabose, M., Swaminathan, M. S. & Nair, N. C. (1984). *J. Bombay Nat. Hist. Soc.* 81: 282-290.
7. King, G. (1894). *Ann. Roy. Bot. Gard. Calcutta* 4: 119. t.160 B.
8. Rama Rao, M. (1914). *Flowering Plants of Travancore*, p. 7.
9. Vajravelu, E. (1983). *Plant Conservation Bulletin* 4: 16.
10. Vajravelu, E. & Daniel, P. (1983). In: Jain S. K. & Sastry, A.R.K. (ed.). *Materials for a catalogue of threatened plants of India*. BSI., Howrah.

Material for this sheet was supplied by A. N. Henry and V. Chitra, Botanical Survey of India, Coimbatore.



Popowia beddomeana Hook. f. & Thoms. A. Flowering twig. B. Flower. C. Sepal. D. Stamen.

STATUS: Endangered or possibly Extinct. An endemic species yet to be located after its discovery; the type material was collected on 2nd December 1894 by T. F. Bourdillon from the evergreen forests; "might have been lost forever due to rapid destruction of low level evergreen forests" (4) for habitation and cultivation of commercial/plantation crops.

DISTRIBUTION: India, Kerala, Quilon Dt.; perhaps confined to one locality on southern Western Ghats (Konni Forest, 100 m).

HABITAT AND ECOLOGY: Tropical semi-evergreen forests of Konni Division at low elevation. These forests are characterised by both evergreen and deciduous trees where the evergreen elements predominate (3). Most of the tropical evergreen forests are now becoming semi-evergreen or moist deciduous types along Konni (4). Loamy soil with admixture of humus predominates the area. Most of the dense forests of Konni with endemic species have since disappeared.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The first priority is clearly to find out if it still survives in the type locality/adjoining natural forests. The remnant of natural vegetation on Konni and Ranni forests should be given full protection from anthropogenic activities; this should take into account the other rare and endemic species of the region. This species is included in the list of rare and threatened plants (5) and (6).

BIOLOGY AND POTENTIAL VALUE: A species of scientific interest on account of its geographical isolation. Also an imperfectly known plant, closely related to *S. laurifolia* (Grah.) Blatter which is also endemic to the Western Ghats (1).

DESCRIPTION: Handsome trees upto 20 m tall. Leaves 20-30 × 5-7 cm, oblong or elliptic, short-acuminate, rounded at base, glabrous. Flowers clustered in axillary tubercles. Sepals 2-3 mm long, connate at base, ciliate. Petals rotundate, ciliate, outer 1.5 cm long, inner slightly larger. Stamens 12. Carpels 3-5.

REFERENCES:

1. Debika Mitra (nee Das). (1982). *Fasc. Fl. India* 10: 7. Botanical Surv. India, Howrah.
2. Gamble, J. S. (1915). *Fl. Pres. Madras*, p. 12.
3. Mohanan, C. N. (1981). *Bull. Bot. Surv. India* 23: 62.
4. Mohanan, C. N. (1984). *Studies on the Flora of Quilon District, Kerala. Madras Univ. Ph.D. Thesis*, Coimbatore.
5. Vajravelu, E. (1983). *Plant Conservation Bulletin* 4: 16.
6. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a catalogue of threatened plants of India*, p. 9. Botanical Survey of India, Howrah.

The material for this sheet was supplied by A. N. Henry and V. Chitra, Botanical Survey of India, Coimbatore.

STATUS: Endangered and endemic to Meghalaya. Reported only from a few places. The species is already on the decline to a greater extent, due to its slow regeneration and loss of habitat. It has not been collected since 1917: recent efforts to relocate the species have not been successful.

DISTRIBUTION: India, endemic to Meghalaya.

HABITAT AND ECOLOGY: It grows in moist, shady areas.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: (a) Steps have to be taken to locate this species for *in situ* conservation; (b) exploration in all previous known localities to obtain seeds for seed banks or for introduction in the botanical gardens.

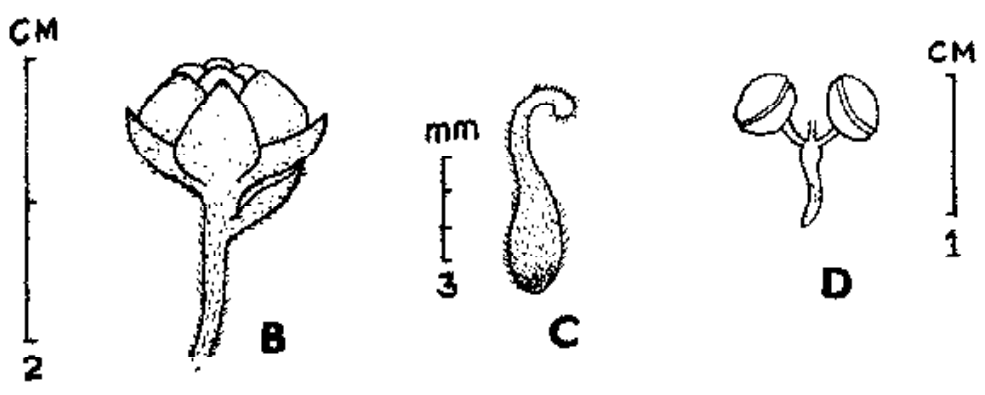
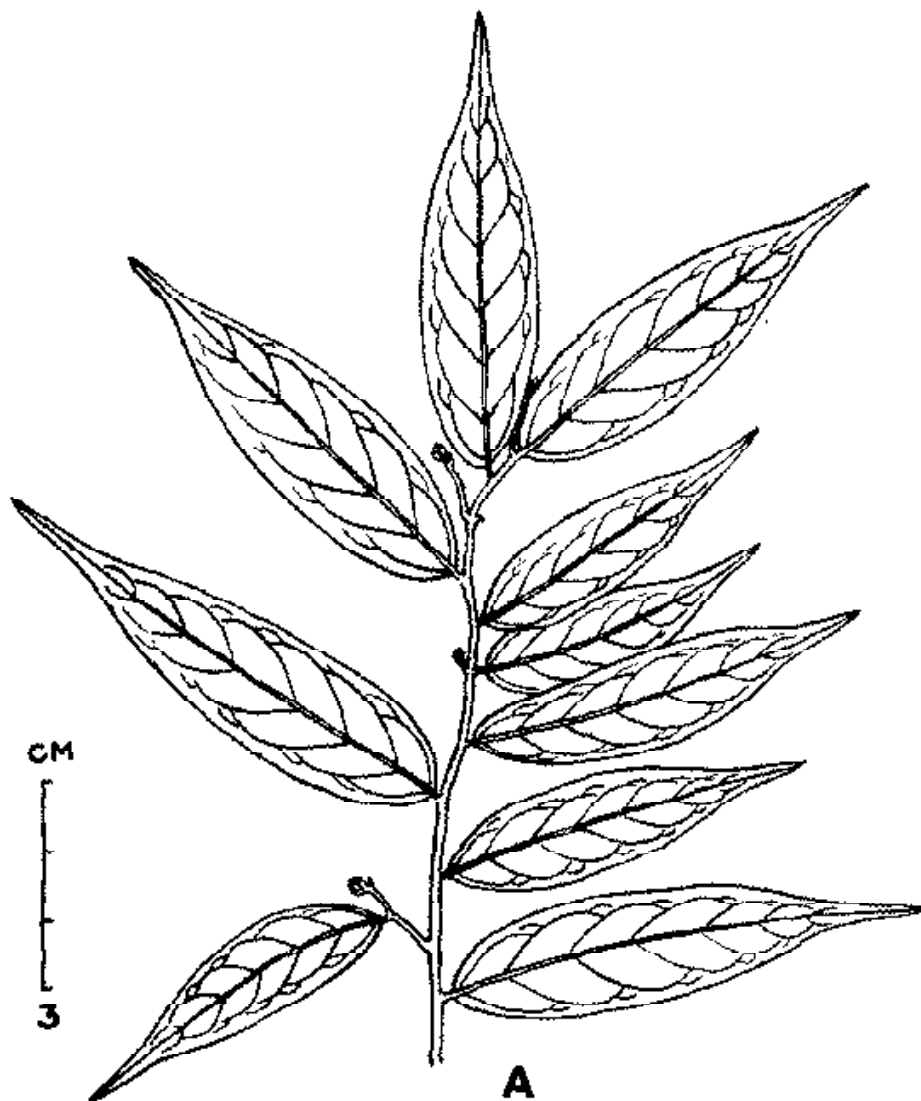
BIOLOGY AND POTENTIAL VALUE: A little known shrub of unknown economic uses. Flowers pale green or yellow, not very showy, appearing during October-November in wild. It may be a potential garden plant.

DESCRIPTION: A shrub, 2-4 m high; leaves lanceolate, subacute or rounded at base, long acuminate, glabrous, 12-15 x 3.5-4 cm, lateral nerves 8-9 pairs, with 2-3 mm long petiole; flowers bisexual, pedicellate, solitary, axillary or terminal, pale green or yellow, 5-6 mm across. Stamens numerous, ca 1 mm long. Ovary many carpellary, superior with 1-ovule in each loculus; style curved with capitate stigma. Fruit sub-globose, red with solitary seed. Flowering: October-February.

REFERENCES:

1. Balakrishnan, N. P. (1981). *Fl. Jowai* 1: 65. Botanical Survey of India, Howrah.
2. Das, D. (1968). *Bull. Bot. Surv. India* 10: 263.

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



Trivalvaria kanjilalli Das A. Flowering twig. B. Flower. C. ovary. D. Young fruit.

STATUS: Possibly Extinct (?) in the wild. It has not been collected since Haines reported it from his own collections made probably prior to 1922; however, the area of its occurrence needs an extensive search.

DISTRIBUTION: India: endemic to a small locality in Bihar, on the sandstone hills of Ramnagar, North Champaran.

HABITAT AND ECOLOGY: Apparently perennial from a rather woody rootstock (2). Other details not known.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (i) To search intensively and extensively in the area of its reported occurrence and the adjoining foothills of Nepal for its possible existence; (ii) to study the ecology and reproductive biology, if it is found; (iii) *in situ* and *ex situ* multiplication and (iv) to conserve it by protecting its area.

BIOLOGY AND POTENTIAL VALUE: No study available. It is likely that similar to many other Umbellifers, it may possess some medicinal properties. Though its position in the genus *Carum* is doubtful, yet members of *Carum* or the allied *Trachyspermum* do have some of the important spice yielding and medicinal plants.

DESCRIPTION: Plants 1 m tall, very leafy below. Leaves ovate-deltoid, ternately decomposed, leaflets pinnatipartite, ultimate segments elliptic-lobed, hairy on both the sides. Inflorescence compound umbels, on long stalk, primary rays to 25 in number and pedicels 25-30. Bracts about 10 (6), linear, hairy. Bracteoles about 10, linear, with long white hairs. Calyx teeth nil. Outer petals radiant and the inner ones subequal, thinly pilose, tips inflexed. Ovary pubescent (and hence its position in *Carum* is doubted, the likely genus to which it may go is *Trachyspermum*). Mature fruits unknown.

REFERENCES:

1. Haines, H. H. (1919). Some new species of plants from Bihar and Orissa. *J. Asiat. Soc. Bengal* 15 (7): t.9.
2. Haines, H. H. (1922). *The Botany of Bihar and Orissa*, p. 408.

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

STATUS: Indeterminate; known only from type material collected by Jacquemont between 1830-32 from North West Himalaya (no precise locality mentioned). The only specimen is at Herb. P.

DISTRIBUTION: India; endemic in North West Himalaya.

HABITAT AND ECOLOGY: Not known.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Efforts to relocate the taxon, study of its taxonomy and biology and to evaluate the prospects of its conservation through *in situ* or/and *ex situ* methods.

BIOLOGY AND POTENTIAL VALUE: Not studied; botanical interest.

DESCRIPTION: Few branched, slender, erect villous herbs, 3-7 dm tall. Leaves ovate, 5-8 cm long, pinnate or tripartite, the 3 leaflets ovate, 2-3 cm long and *ca* 2 cm broad, acute or obtuse, sessile, serrate or lobed; upper cauline leaves reduced. Peduncles terminal or lateral, slender. Bracts inconspicuous. Rays 7-12, slender, unequal, 1.5-5 cm long. Pedicels 10-12, 10-15 mm long, slender. Bracteoles 4-8, linear, 5-8 mm long. Flowers white, marginal petals radiant, emarginate. Fruit orbicular, *ca* 5 mm long and 3 mm broad, minutely pubescent, dorsal ribs filiform, laterals winged, wings much narrower than the body; vittae solitary at the valliculae extending nearly the length of the body, 4 on the commissure.

REFERENCES:

1. Clarke, C. B. (1879). Umbelliferae. *In*: Hooker, J. D., *Fl. Brit. India* 2: 712.
2. Hajra, P. K. (1984). *In*: Jain, S. K. & Sastry, A. R. K. (ed. & compil.) *The Indian Plant Red Data Book—1*. Botanical Survey of India, Howrah. p. 21.

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

STATUS: Possibly Extinct. The last collection available in herbaria are of H. F. Mooney made in 1940 and in fact are the second lot of collections after the type collections were made probably prior to 1919.

DISTRIBUTION: India; endemic to the hills of Chotanagpur, Netarhat plateau in Ranchi District and Samripat, Sarguja in Raigarh District.

HABITAT AND ECOLOGY: In wet places with a large rootsock, at an altitude of about 900 metres.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Extensive search for relocating the plant; (b) if found, preserving the area (s) of its populations or else *ex situ* propagation in the nearby sanctuary area of Betla.

BIOLOGY AND POTENTIAL VALUE: No report available; possibility of some medicinal value can not be ruled out.

CULTIVATION: None reported and presently not feasible unless it is relocated.

DESCRIPTION: 1 to 1.5 m tall herb. Lower leaves with long petioles, as long as the pinna itself; pinnae oblong-lanceolate, 2-pinnate, with ultimate segments (5-7 pairs) pinnatifid or incis-serrate, large membranous sheaths, ultimate segments lanceolate or lobed. Umbels compound, with about 12 rays. Rays hispidulous above, to 4 cm long, unequal. Bracts absent or 2, linear. Bracteoles 7-10, unequal, linear. Calyx teeth obsolete. Petals white, obovate, inflexed at the tip. Fruit dorsally subcompressed, elliptic, glabrous, about 4mm long and 2.5-3mm broad, ribs subequally winged; vittae 2-3 at the valliculae, 4-6 at the commissure. Carpophore bipartite.

REFERENCES:

1. Haines, H. H. (1919). Some new species of plants from Bihar and Orissa. *J. Asiat. Soc. Bengal* 15: 314.
2. Haines, H. H. (1922). *The Botany of Bihar and Orissa*. London.

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

STATUS: Possibly Extinct. Known only from type specimen collected in 1885 and since then no collection is on record. The area (Naga hills) is however botanically less explored and chances in relocating the plants can not be negated, although Jakpho mountain and adjoining hills are under heavy pressure of Jhum cultivation.

DISTRIBUTION: India; endemic in Naga hills (Jakpho).

HABITAT AND ECOLOGY: Details not known.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive exploration for relocating this and also to evaluate the prospects of *in situ* or/and *ex situ* conservation in case the search for the living plants is successful.

BIOLOGY AND POTENTIAL VALUE: Not studied; botanical interest.

DESCRIPTION: About 50 cm tall glabrous erect herbs from a napiform rhizome. Leaves long petioled, ovate, ternate-pinnate; leaflets pinnatisect to simple trilobed, petiolulate or decurrent, 1-1.5 cm. Umbels terminal or axillary, peduncles long. Bracts absent or 1- few, lanceolate. Rays to 8, subequal, glabrous, 1.5-2.5 cm long; bracteoles 4, *ca* 2.5 mm, linear. Pedicles 5-10, *ca* 6 mm, subequal. Fruits urceolate, didymous, *ca* 3 × 1.5 mm, glabrous, ribs obsolete; vittae 2-3 at the valliculae, 2 at the commissure; commissure face plane; carpophore bipartite.

REFERENCE:

1. Clarke, C. B. (1889). On the plants of Kohima and Munneypoore. *J. Linn. Soc. Bot.* 25: 27, t. 14.

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

STATUS: Possibly Extinct. The place from where (Kodaikanal) the species was reported is well explored and in spite of that no other collections except by Bourne made in 1878 and in 1891 are available in the herbaria. Henry *et al* (2) and Vajravelu (3) are of opinion that this species is presumably in danger of extinction. However, its affinity with *P. leschenaultii* DC. is not well established.

DISTRIBUTION: S. India; endemic in the Pulney mountains.

HABITAT AND ECOLOGY: In damp cool places in the Sholas, flowering in August-September (Fyson, 1932).

CONSERVATION MEASURES TAKEN: None at present.

CONSERVATION MEASURES PROPOSED: Explorations for relocating the species in the areas of its previous report, along with in the least disturbed shola areas; protection of some of the shola areas, if rediscovered.

BIOLOGY AND POTENTIAL VALUE: Not reported; botanical interest.

DESCRIPTION: 30-60 cm tall erect glabrous to pubescent herbs. Basal leaves with petioles upto 32 cm long, simple, orbicular, cordate with broad sinus, cartilaginous, crenate-serrate at the margins, pubescent on the nerves above, palmately 7-9 nerved, 3-6 × 3.5-5 cm. Upper leaves palmately 3- fid, segments linear. Umbels long peduncled, terminal or leaf-opposed. Bracts absent. Rays 7-12, 2-3 cm long, subequal. Bracteoles 3-5, linear, ca 2.5mm. Pedicels 8-10, 3-4 mm, pubescent. Petals white with involute apex. Fruits ovate, narrowed upwards, slender, glabrous or somewhat rugose; vittae 3 at the valliculae, 2 at the commissure; commissure face plane.

REFERENCES:

1. Fyson, P. F. (1932). *The flora of the South Indian hill stations, etc.* 1: 253; 2: 201 (for figure).
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
3. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India. -I. *Plant Conserv. Bull.* 4: 30.

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

STATUS: Endangered, if not extinct already. There are only a few specimens in the herbaria, which were collected between 1857 and 1868, thereafter no collection is recorded. The area of its report being well botanised, lack of its representation after 1868 is of much concern.

DISTRIBUTION: India; endemic to Singaleela range in the Darjeeling-Sikkim Himalaya.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Exploration to relocate populations of the species and to evaluate the prospects of *ex situ* and *in situ* conservation.

HABITAT AND ECOLOGY: Data not available.

BIOLOGY AND POTENTIAL VALUE: Not screened.

DESCRIPTION: Upto 1 m tall herbs with stems branched, hollow at internodes and striate. Basal leaves long petioled, trifoliolate, upper leaflet often trilobed, ovate in general outline; petioles to 8 cm long, crenate-dentate at margins, broadly cordate at base. Umbels terminal or axillary, peduncle to 10 cm long. Bracts absent. Rays 8-12, subequal, rigid, pilose, 1-3 cm. Bracteoles 3-5, ca 3 mm, linear. Pedicles 8-10, pilose, 3-6 mm. Calyx teeth triangular, minute. Petals white, obovate, inflexed at the apex. Fruits glabrous, urceolate, ribs obscure, ca 2 × 1.5 mm, vittae 2-3 at the valliculae, 2 at the commissure, commissure face plane; carpophore bipartite.

REFERENCE :

1. Mukherjee, P. K. (1970). On the identification and typification of *Pimpinella urceolata* Watt ex Banerji (Apiaceae). *Bull. Bot. Sur. Ind.* 12:77-79. t. 2.

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

STATUS: Endangered; since its first collection by C. B. Clarke in 1870 which incidentally formed the Types, no other collection was reported except perhaps by Banerji (1) but this report is doubtful.

DISTRIBUTION: Sikkim in southern districts; Nepal(?). The types were collected from Heeloo and Hee in Sikkim, at an altitude of about 1450 m.

CONSERVATION MEASURES TAKEN: None at present.

CONSERVATION MEASURES PROPOSED: Efforts to relocate populations of this species and study of biology and ecology; to evaluate possibilities of *ex situ* and/or *in situ* conservation.

BIOLOGY AND POTENTIAL VALUE: None reported; botanical interest.

DESCRIPTION: Erect, 30 to 150 cm tall herbs, glabrous, corymbosely branched above. Leaves ovate, ternately decomposed, ultimate segments pinnatifid or 3-fid, narrowly lanceolate, 1-5 mm long, 1 mm broad. Bracts absent. Rays 6-12, very unequal, upto 1.5 cm long, rigid. Bracteoles 2-4, linear, ca 2 mm, or absent. Pedicles to 12 in number, 2.5 mm long. Fruit ellipsoid, laterally sub-compressed, glabrous, ca 1.5 × 2 mm, ribs prominent, subpentagonal in c.s., vittae 2-3 at the valliculae, 4 at the commissure, commissure face plane; carpophore bipartite.

REFERENCES:

1. Banerji, M. L. (1966). Contributions to the flora of east Nepal. *Rec. Bot. Surv. Ind.* 19: 49.
2. Clarke, C. B. (1879). Umbelliferae. In: Hooker, J. D., *Fl. Brit. India* 2: 685.

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

STATUS: Indeterminate, not collected since 1892. Though the area has subsequently been visited by botanists, probably none has gone in the season it was collected (August) and it is likely that some populations may still be found if an intensive search in the proper time of the year (August-September) is made in the locality of its reported occurrence. A visit in the area by the author (P. K. M.) in 1984 in late September could not locate one.

DISTRIBUTION: India; endemic in north Sikkim at Yumtong and Sebu valley, at an altitude of about 3,500 m.

HABITAT AND ECOLOGY: Not known but probably it is to be found as an epiphyte on moss laden tree trunks- on *Rhododendrons*, *Abies* or *Tsuga* which abound in these localities.

CONSERVATION MEASURES TAKEN: None really necessary in the area presently as no threat of any consequence exists.

CONSERVATION MEASURES PROPOSED: To explore extensively and intensively for populations still occurring in the area, to study the biology and ecology of the plants and to restrict such areas to visitors.

BIOLOGY AND POTENTIAL VALUE: Not studied.

DESCRIPTION: Slender, unbranched plants, to 30 cm tall, glabrous to scarcely hairy. Leaves petiolate, ovate or ovate-deltoid, ternate pinnate, 2.5-3.5 cm long and 2.5-4 cm broad. Leaflets ovate or ovate-lanceolate, 1-2 cm long and .8-1.2 cm broad, serrate or deeply incised. Upper leaves pinnately dissected. Umbels terminal and lateral. Rays 6-8, 1.2-3 cm long, subequal, spreading and ascending, filiform. Bracts nil. Bracteoles 1-2, setiform, to 1.5 mm long. Flowers not known. Pedicels 2-4, unequal, 0-3 mm. Fruit oblong-ovoid, 2 x 1 mm, terete in c.s., ribs obscure to filiform, glabrous, vittae solitary at the valleculae and 2 at the commissure; carpophore bipartite.

REFERENCE:

1. Mukherjee, P. K. (1971). A note on the correct identity of *Pimpinella radiata* W. W. Sm. *Ind. For.* 97 (1): 55.

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

STATUS: Vulnerable, surviving in Mavashi plateau, Satara district, Maharashtra, the single location from where it is known.

DISTRIBUTION: Endemic to Satara district in Maharashtra and is confined to the type locality only.

HABITAT AND ECOLOGY: It is seen in temporary, shallow, stagnant puddles along Mavashi plateau associated with species of *Eriocaulon*, *Cyperus*, *Utricularia*, *Drosera* and *Myriophyllum*. The depth never exceeds 60 cm and the tubers are rooted in mud along the periphery where the depth is less than 20 cm. The male plants outnumber the female by 10:1. Flowers appear during monsoon in May-June and by August, the plants set seeds completing the life-cycle in a span of 4-5 months, withering off leaving the tubers buried in soil till the advent of the next monsoon when the dormant tubers sprout again.

Though similar habitats occur along the Sahyadris, the species has not been collected elsewhere. The Panchgani plateau (also in Satara district) is akin to Mavashi plateau but this species could not be located inspite of a careful search.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: It has been proposed to fence the plateau encircling the few puddles where this species occurs. It is an open almost flat plateau where only cattle graze but any disturbance to the habitat will eventually lead to the extinction of the species.

BIOLOGY AND POTENTIAL VALUE: *Aponogeton satarensis* is the first report of a dioecious species from Asia, let alone India. It is closely allied to *A. decaryii* Jumella from Madagascar. The Indian species is unique in that both sexes are similar in shape and size. This is also the first report of Indian *Aponogeton* with forked inflorescence, unusual in any Asiatic species.

CULTIVATION: The tubers were grown in the experimental garden at Pune. Though they flowered freely and set fruits, the tubers did not survive the cold and dry seasons during September—May, finally decaying in May. Efforts are being made to grow them again at Pune in the light of past experience gained in their growth. The tubers were successfully raised at the Royal Botanic Gardens, Kew and Heemskerk, Netherlands but they were not thriving well and suffered from algal and fungal infections.

DESCRIPTION: Scapigerous, partly submerged, annual herbs, 16-22 cm tall, dioecious, plants of both sexes similar in shape and size. Tubers 14-16 cm across, globose or ellipsoid. Leaves all floating, lanceolate, 3.5-8.2 × 0.5-1.4 cm, lateral nerves 2(3) pairs, base cuneate to rounded. Spathe conical, 8-12 × 2.5-3 mm. Spikes once forked, purplish, turning white, inodorous, dioecious. Male inflorescence 5-7 cm long; tepals 2, obovate to suborbicular, 1.6 × 1.3 mm, 1(3)-nerved. Stamens 6, ca 2 mm long; filaments purple, subulate; pistillodes 3, purple, conical.

Female inflorescence 2.5-3.5 cm long; tepals and staminodes wanting. Carpels 3, 1.8 × 0.9 cm, purple; ovules 2 per carpel. Fruiting peduncles upto 12 cm long. Follicles ca 6 × 4 mm, beak terminal. Seeds 1-2, ca 5 × 3 mm, testa simple, plumule absent.

REFERENCE:

1. Sundararaghavan, R., Kulkarni, A. R. & Yadav, S. R. (1982). *Aponogeton satarensis* (Aponogetonaceae)—a new species from India. *Kew Bull.* 36(4): 687-689. t. A—K.

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

STATUS: Vulnerable. Endemic.

DISTRIBUTION: North Kanara (Karnataka); and Shindhudurg, Kankavli taluk, Osargaon, Maharashtra.

HABITAT AND ECOLOGY: Amidst rocks, in streams.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Protection of its distribution localities, since the plant has peculiar habitat. It will be difficult to grow in the experimental gardens.

BIOLOGY AND POTENTIAL VALUE: Not known; some species of the genus are grown in aquaria.

DESCRIPTION: Rhizomatous aquatic herbs, roots thick, cylindrical; leaves radical, oblong-lanceolate, 8-18 × 2.0-4.5 cm, glabrous on both sides, apex acute to acuminate, subcordate or base narrowed into a petiole, midrib of 3-prominent nerves from base to apex, 6-8 lateral nerves ending towards upper margin; petioles 9-15 cm long, base sheathing. Peduncles 2.0-2.5 cm long. Spathes 10-14 cm long, basal portion 0.5-0.6 cm broad, linear-lanceolate; spadix 4.2 cm long, female inflorescence 0.3 cm long at the base, male inflorescence 0.4 cm long, a conelike clump at the tip of spadix; central portion of spadix neutral, smooth.

REFERENCE:

1. Blatter, E. & McCann, C. (1931). Revision of the flora of the Bombay Presidency. *J. Bombay Nat. Hist. Soc.* 35(1): 17.

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

STATUS: Endangered. The species has not been recollected after its type collection.

DISTRIBUTION: Satara Dist., restricted to a single locality in Mahabaleshwar, Maharashtra; endemic.

HABITAT AND ECOLOGY: Along the edges of ditches (1500 m alt.).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The type locality and neighbouring areas should be thoroughly searched for this species. If located, the area may be declared as 'protected area'.

BIOLOGY AND POTENTIAL VALUE: Not known. However, *Cryptocorynes* are interesting and some of the species are used as aquarium plants.

CULTIVATION: None.

DESCRIPTION: Rhizomatous, tufted herbs, rhizome 1.5 cm thick; leaves including petioles upto 85 cm long; petioles about 25 cm long, fleshy, spongy; lamina upto 40 × 6 cm, linear-lanceolate or linear-oblongate, apex acute or acuminate, sometimes obtuse, base narrowed into petiole, margins undulate. Peduncles 8 cm long, cylindrical, slightly compressed. Spathes upto 25 cm long, tube white or purple tinged, cylindrical, 3 angled; lamina fleshy-coriaceous, brittle, stiff, lanceolate, 23 × 8 cm, dark purple on sides, spirally twisted; spadix 3.3 cm long, female flowers at base, male flowers at tip, naked portion 2 cm long, creamy.

REFERENCE:

1. Blatter, E. & McCann, C. (1931). Revision of the Flora of the Bombay Presidency. *J. Bombay Nat. Hist. Soc.* 35(1): 16. t. 1.

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

STATUS: Very rare, and is likely to become extinct as the type locality in suburb of Bombay is being rapidly converted into residential or industrial areas; not collected after type; endemic.

DISTRIBUTION: Bombay-Sion; Maharashtra.

HABITAT AND ECOLOGY: In moist situations along hill slopes.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Type locality and neighbouring areas should be searched for this species; if located, the plants should be collected and propagated in the experimental gardens and reintroduced into its original habitats.

BIOLOGY AND POTENTIAL VALUE: Not known.

CULTIVATION: None on record.

DESCRIPTION: Tuberous herbs; tubers depressed-globose, 3 cm across; leaves petiolate, oblong, sagittate or hastate, 5.0 × 2.5 cm, pale above, glaucous beneath; petioles 20 cm long, canaliculate; peduncles 5-7 cm long; tube of spathe 2 cm long, ovoid, glabrous, constricted at the mouth; lamina 8 cm long, ovate, apex acuminate, saccate near male inflorescence, incurved, 5-nerved at base, converging into long tailed apex; spadix about 5 cm long, female inflorescence 0.6 cm long, white, cylindric at base; male inflorescence 0.5 cm long, cylindric, yellow; appendage of spadix elongate, 2.5 cm long, constricted below. Berries oblong or obovoid. Seeds oblong, rugulose.

REFERENCE:

1. Blatter, E. & McCann, C. (1931). Revision of the Flora of the Bombay Presidency. *J. Bombay Nat. Hist. Soc.* 35(1): 22. t. 4.

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

STATUS: Vulnerable. It is restricted to evergreen forests of Karnataka occurring in Coorg and South Kanara districts. The cause for its decline in nature is due to the demand of all species of *Calamus* for cane furniture, walking sticks etc. The ghat crest region and valleys abounding in several species of *Calamus* are systematically depleted and these are gradually becoming rare due to human exploitation.

DISTRIBUTION: Endemic to Karnataka. The fruiting specimen was first collected by Belliappa in 1926 from Coorg district and labelled as '*Calamus* sp.'. In 1960, A. C. Dey had collected female flowers to be followed by Fernandez collecting male flowers in 1967. It is distinguished by its non-cirriforous, distinctly spiny leaf sheath and long whipped leaves.

HABITAT AND ECOLOGY: Along water courses in not readily accessible valleys of evergreen forests, associated with other species of *Calamus*, *Pinanga*, *Arenga* etc., at low elevations of 450—600 m and preferring rainfall of 500—600 cm per annum.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: It is infrequent occurring in scattered patches. Commercially the cane is noted for its stiff, rigid, mottled stem with black patches and much valued for making walking sticks. Though it was fairly common 10 years back, it is becoming scarcer now; one or two clumps are protected by forest department. Efforts should be made to raise seedlings from seeds and introduce them in natural habitats. The Subramanya range in South Kanara, where this species also occurs, harbours many virgin patches and abounds in rare evergreen species, hence this region should be left undisturbed. This will ensure the conservation of the habitat and help in preserving endangered species.

BIOLOGY AND POTENTIAL VALUE: The beautiful black rigid mottled stem is much in demand for making walking sticks.

CULTIVATION: None at present. However, the species can be raised from seeds but has to be nurtured in its natural habitat. The Forest department may play a positive role in propagating the species in forest nurseries and in its large scale cultivation.

DESCRIPTION: Lofty climbers. Stem 25 m or more long, 2.5-3 cm thick, mottled with black patches near base. Basal leaves clustered, non-cirriforous, upper leaves 2.5 m or more long, the rachis produced into a whip like flagellum, 2.5 m long and armed with 7-8-nate claws. Spines 2-3.2 × 0.4-0.5 cm, reflexed from thickened base, linear-triangular, lacerated or laterally confluent, ultimately arranged in comb like groups, bristles acicular, bent upwards. Leaflets numerous, linear-ensiform, 14-30 cm long, 1.5-1.8 cm broad, apex abruptly filiform, margins spinulose, midcosta and nerves with bulbose based bristles. Flowers borne in non-flagelliferous spiny spadices, spines claw-like. Spikelets 2-flowered, upper floret male or female, the lower sterile. Male spadix ca 30 cm long, recurved, spikes ca 5 cm long, many flowered. Florets 4 mm long; sepals and petals subequal, Stamens 6.

Sterile floret 2.5 mm long. Female spadix 70 cm long, spikes upto 15 cm long. Florets 6 mm long; sepals oblong, petals ovate-lanceolate. Fruit ovoid-oblong 1-1.5 × 0.9 cm, scaly, 1-seeded, the scales wedge shaped. Seeds oblong, planoconvex, 9 × 6 mm, rugose with ruminant endosperm.

REFERENCE:

1. Fernández, R. R. & Dey, A. C. (1970). A new species of *Calamus* from Western ghats. *Ind. For.* 96(3): 223-225, plate 1 & 2.

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

STATUS: Rare. A clustering caryotoid palm discovered by Joseph (2) in 1972 from Lohit District, Arunachal Pradesh. It is reported from three localities forming small colonies. Due to monocarpic habit of the plant, each stem dies after completion of flowering and fruiting.

DISTRIBUTION: Haylung, Wakroo near Glow Village in Lohit District, Arunachal Pradesh.

HABITAT AND ECOLOGY: Grows on humus rich soils amidst thick undergrowth of aroids and other herbaceous plants in 900-1000 m alt.

CONSERVATION MEASURES TAKEN: None at present.

CONSERVATION MEASURES PROPOSED: This palm species appears to be sensitive to exposure; habitat protection will ensure its natural regeneration, otherwise its flowering and fruiting behaviour may lead to its extinction. Its introduction in the botanical gardens for *ex situ* conservation and collection of viable seeds from the natural population are also suggested.

BIOLOGY AND POTENTIAL VALUE: A palm of immense botanical interest. Can be grown as a very good ornamental plant in Palm houses and conservatories, etc.

CULTIVATION: None at present.

DESCRIPTION: A clustering monocarpic palm, each stem covered with thick dark brown fibres; naked stem cane-like. Leaves unequally pinnatisect; leaflets trapezoid, silvery-white beneath. Staminate and pistillate inflorescences separately borne on the same plant. Male flowers with 3 distinct stamens. Fruit oblong to ellipsoid, 13×9 mm, deep red to dark purple when ripe.

REFERENCES:

1. Basu, S. K. (1976). A note on *Asraoa triandra* (Palmae). *Principes* 20:119.
2. Joseph, J. (1975). *Asraoa triandra* (Arecaceae)—A new genus and species of palm from Lohit District, Arunachal Pradesh. *Bull. Bot. Surv. India* 14: 144, figs. 1-5.

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

STATUS: Rare. Consumption of its tubers is the apparent cause for its rarity.

DISTRIBUTION: Endemic to Western ghats; so far reported from the districts of Thane, Raigadh and Pune (Maharashtra) and one collection from North Kanara (Karnataka). Its occasional collections suggest depleted state of populations.

HABITAT AND ECOLOGY: Grows on exposed rocky areas on hill tops and gentle slopes among grasses and other herbs, in well-drained soils.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Should be conserved *in situ* or grown in protected areas under similar natural conditions, (b) consumption of tubers and uprooting the plants be banned, (c) propagation through seeds be tried.

BIOLOGY AND POTENTIAL VALUE: An interesting species with large showy flowers blooming during July-August and fruiting in August-September.

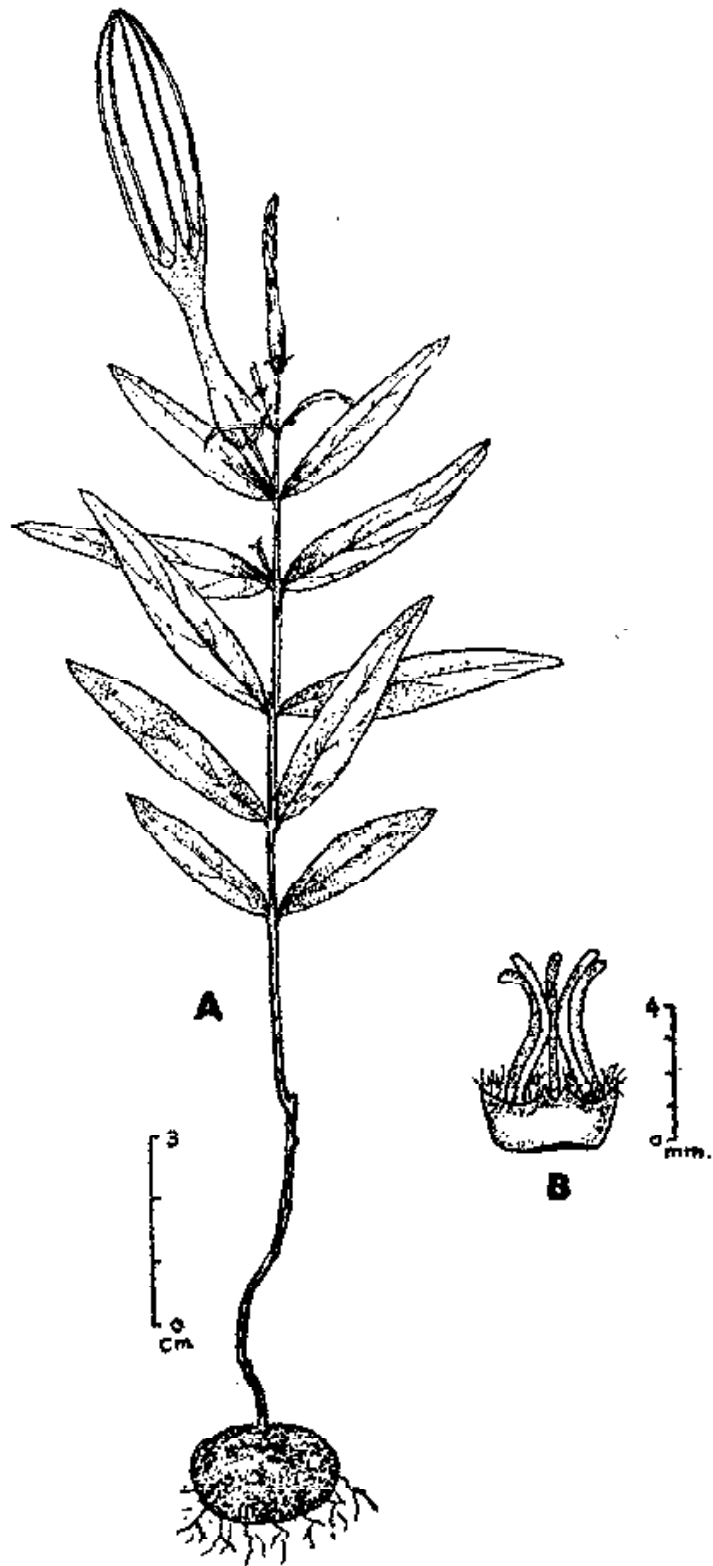
CULTIVATION: Introduced in the experimental garden of Botanical Survey of India, Pune for study where it did not survive for long.

DESCRIPTION: Tall herbs with stems pubescent above. Leaves linear or linear-lanceolate, subsessile. Cymes 1-2 flowered, shortly pedunculate. Corolla 5.0-7.5 cm long; tube upto 3.8 cm long, slightly inflated near base, narrowed in the middle and enlarging near the mouth; lobes upto 3.7 cm long, mostly linear above, partly pubescent within. Outer corona of 5 bifid ciliate lobes; inner linear, erecto-divergent.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 9. t. 3(9); f. 2. Botanical Survey of India, Howrah.
2. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4:67.
3. Hooker, W. J. (1852). *Ic. Pl. Ser.* 2:5 t. 867.
4. Santapau, H. & Irani, N. A. (1958). The genus *Ceropegia* in Bombay. *Bull. Bot. Soc. Beng.* 12 (1 & 2): 7. t.1, A; t.2, A.

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



Ceropogia attenuata Hook. A. Entire plant. B. Corona.

STATUS : Endangered. No specific causes for its present status are known, though habitat destruction may be one of them to account for its extreme rarity.

DISTRIBUTION : Endemic to South India ; first collected in 1885 from Pykara falls in the Nilgiris and another collection is known from South Kanara (MH). *Barnes'* collections (K) of 1940 from Ochterlong Valley, Nilgiris, were the basis of its first report in 1948 as a new species. Since then the species has not been collected again although Nilgiris and other areas in South India have been fairly well-explored. Its rarity in the known areas is, therefore, of concern.

HABITAT AND ECOLOGY : It is known to occur in Wet Sholas and evergreen forests at about 2000 m altitude.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) Possible uprooting of the plants should be prohibited, wherever located in the wild, (b) should be conserved *in situ* or grown in protected areas under similar ecological conditions, (c) propagation through seeds and other techniques be tried for its multiplication.

BIOLOGY AND POTENTIAL VALUE : A distinct species flowering in May-June and fruiting subsequently.

DESCRIPTION : Twiners with glabrous stems. Leaves variable, 6-24 × 2-6 cm in size, ovate or ovate-oblong, sparsely hairy above. Cymes few-flowered. Corolla 3.6 - 4.4 cm long; tube upto 3.2 cm, glabrous within except a thin ring of hairs at the mouth of inflated base; lobes 1.2 cm long, ovate-deltoid, as broad as long, hairy inside and along the margins near the tips only. Outer corona of 5 entire or sub-truncate lobes; inner of 5 erect, sub-clavate processes.

REFERENCES :

1. Ansari, M. Y. (1984). *Asclepiadaceae: Genus—Ceropegia*. *Fasc. Fl. Ind.* 16:10. Botanical Survey of India, Howrah.
2. Chatterjee, D. (1948). *New Plants from India and Burma*. *Kew Bull.* 1948: 62.

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



Ceropegia barnesii Bruce et Chatterjee A. Flowering twiner. B. Flower.

STATUS: Endangered; evidently due to habitat destruction. So far appears to be very localised and sparse in occurrence.

DISTRIBUTION: Endemic to Kerala State. First reported from Trivandrum ghats, based on *Beddome's* collection (K) in 1883, followed by *Barnes* (K) in 1944 from Ponmudi in Kerala. *Vivekananthan* 46665 (MH) from Idukki district (Kerala) in 1975 is the recent collection and the only one available in Indian herbaria.

HABITAT AND ECOLOGY: Reported growing in open areas of the forest among bushes at an altitude of \pm 1000 m.

CONSERVATION MEASURES TAKEN: None known.

CONSERVATION MEASURES PROPOSED: (a) Uprooting of the plants be prohibited, (b) if located, it should be conserved *in situ* or in protected areas with similar ecological conditions, (c) propagation and multiplication through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE: A distinct species reported flowering in November and fruiting subsequently.

CULTIVATION: Not known.

DESCRIPTION: Hairy twiners with linear to narrowly lanceolate leaves. Cymes few-flowered, pedunculate. Corolla upto 7.8 cm long, dark purple; tube 3.5 cm long, glabrous within except throat; lobes 4.3 cm long, elongate-triangular, hairy in the middle in a line within and along margins. Outer corona of 5 deltoid bifid hairy lobes; erecto-divergent.

REFERENCES:

1. Ansari, M. Y. (1984). *Asclepiadaceae: Genus-Ceropegia. Fasc. Fl. Ind.* 16:10, f. 3. Botanical Survey of India, Howrah.
2. Gamble, J. S. (1923). *Fl. Pres. Madr.* 6:859.
3. Henry, A. N. *et al* (1978). Rare and threatened flowering plants of South India. *J. Bomb. Nat. Hist. Soc.* 75(3): 691
4. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4: 75.

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

STATUS: Vulnerable. Consumption of its tubers appears to be one of the causes of threat to its wild populations.

DISTRIBUTION: Endemic to Maharashtra State; so far known only from Khandala and neighbouring Sakarpathar—Ambavane range of Pune district. Since 1964, it has not been collected again though the areas have been frequently visited by botanists; it is localised in distribution and populations are much depleted.

HABITAT AND ECOLOGY: Reported to be growing in low mixed deciduous forests on slopes among *Carvia callosa* Bremek., and other shrubs.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) If re-spotted, no further collection should be made and the plants be protected and conserved *in situ*; (b) consumption of its tubers should be discouraged; (c) propagation through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE: A twiner with showy flowers, blooming during July and fruiting subsequently. The tubers are eaten by local people.

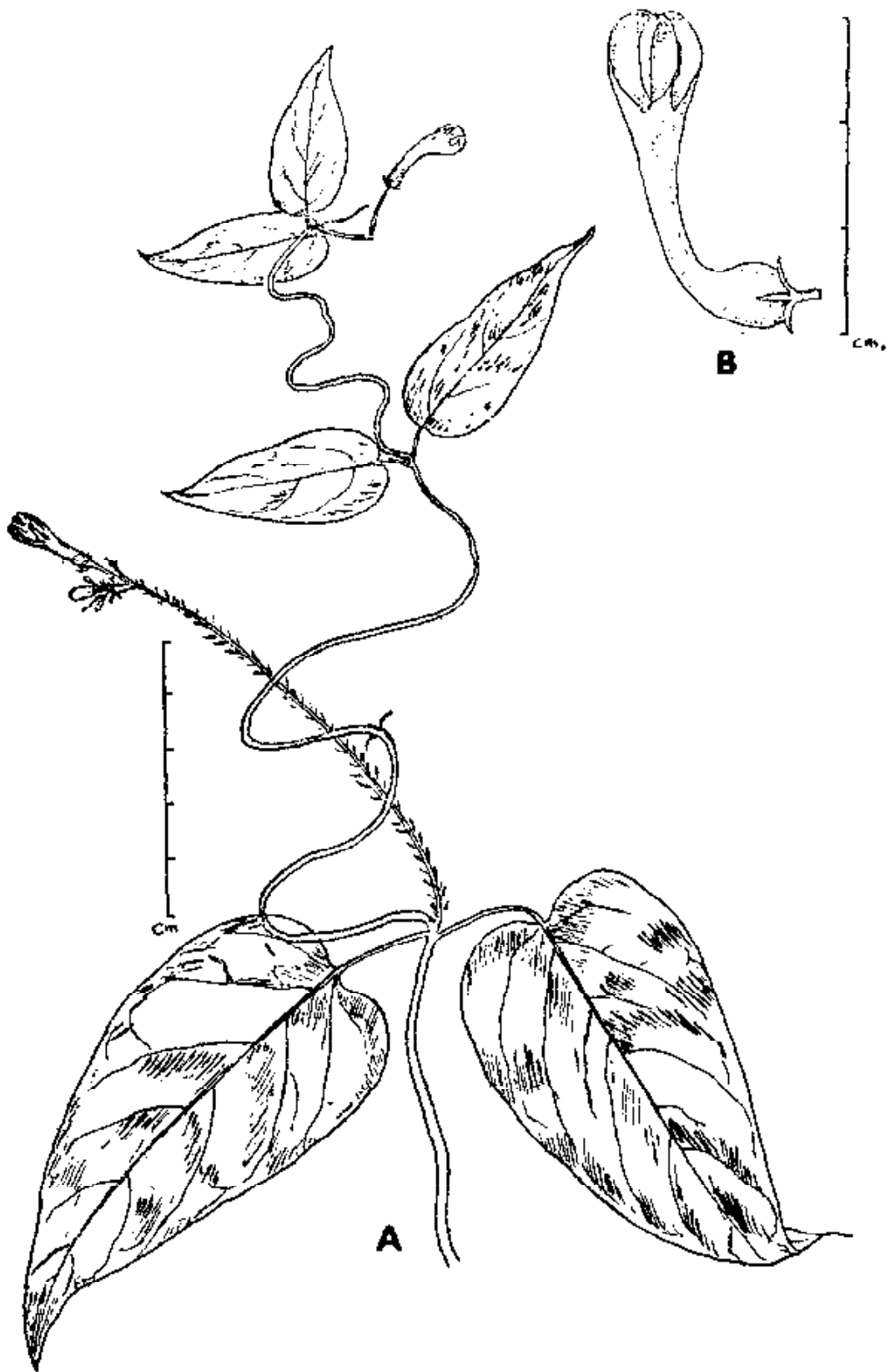
CULTIVATION: Two tubers were introduced in the experimental plot of Botanical Survey of India, Pune, for detailed study where the plants flowered for two years.

DESCRIPTION: Twiners with ovate to ovate-lanceolate leaves. Cymes few-flowered on hairy peduncles. Corolla ca 4 cm long; tube ca 28 mm long, base inflated, narrowed in the middle, expanding towards the mouth; lobes 10-12 × 8-9 mm, folded on back. Outer corona of 5 deltoid-bifid hairy lobes; inner linear, erect.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 15, t. 3(10). Botanical Survey of India, Howrah.
2. McCann, C. (1945). New species of *Ceropegia* and the synonymy of the Indian species. *J. Bomb. Nat. Hist. Soc.* 45: 209.
3. Santapau, H. & Irani, N. A. (1958). The genus *Ceropegia* in Bombay. *Bull. Bot. Soc. Beng.* 12 (1 & 2): 11. t.1, D., t.2., C.

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



Ceropogia evansii McCann A. Twiner. B. Flower.

STATUS: Endangered or possibly Extinct.

DISTRIBUTION: Endemic to Western India; first reported from Sulgeri (N. Kanara) in 1921, and was recollected in 1963 from Goa. Since then, it could not be collected again inspite of all efforts to locate it in the region. The specimen from Goa is the only collection available (BSI) in India.

HABITAT AND ECOLOGY: In open semi-evergreen forests among bushes on lateritic soil.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) If re-spotted, it should be conserved *in situ* or in protected areas; (b) propagation by means of seeds and other techniques should be tried; (c) uprooting of plants be prohibited.

BIOLOGY AND POTENTIAL VALUE: A curious species, at once distinguishable by its calyx which is longer than the flowers, a unique feature not known at least in Indian *Ceropegias*. It flowers during August and fruits subsequently.

CULTIVATION: Not known.

DESCRIPTION: Twiners with ovate to lanceolate, petiolate leaves. Cymes 4-7 flowered on hairy peduncle. Calyx ca 4 cm long. Corolla 2.5 cm long, dark purple; tube 2 cm long, subcylindric, slightly funnel-shaped above, ciliate inside in the upper half; lobes 5 × 3.5 mm, ovate-oblong, ciliate within and on margins. Outer corona of 5 bifid glabrous lobes; inner subclavate, erecto-divergent.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 15. Botanical Survey of India, Howrah.
2. Kanodia, K. C. & Reddi, B. V. (1964). *Ceropegia fantastica* Sedgw. (Asclepiadaceae)—an imperfectly known species. *Bull. Bot. Surv. Ind.* 6: 311-312, t. 1; f. 1-5.
3. Santapau, H. & Irani, N. A. (1958). The genus *Ceropegia* in Bombay. *Bull. Bot. Soc. Beng.* 12: 13.
4. Sedgwick, L. J. (1921). New Bombay species. *J. Ind. Bot. Soc.* 2: 124-125.

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

STATUS: Vulnerable. Tubers of almost all the species of *Ceropegia* are reportedly eaten by people in several parts, rendering them threatened.

DISTRIBUTION: Endemic to South India; so far known from Karnataka and Tamil Nadu States. Hardly few old collections are available in Indian herbaria; a few collections were made during 1970 to 1980. It appears to be sporadic with few populations.

HABITAT AND ECOLOGY: Reported to be growing on exposed areas on rocky beds among grasses, in the altitude, 1500-2000 m.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) If recollected, it should be conserved *in situ*; (b) uprooting of the plants be prohibited; (c) propagation through seeds be tried in similar ecological conditions.

BIOLOGY AND POTENTIAL VALUE: An erect species with green flowers having purple fimbrii projecting out from the base of the corolla lobes. It blooms during July-August.

CULTIVATION: None.

DESCRIPTION: Erect herbs; stem pubescent. Leaves linear, sessile. Cymes few-flowered; peduncles very short, pedicels longer. Corolla *ca* 4.5 cm long; tube *ca* 2.5 cm long, base slightly inflated, narrowed in the middle, gently enlarged above; lobes *ca* 2 cm long, linear-clavate, glabrous above from ovate base. Outer corona of 5 bifid deltoid lobes; inner erect, linear-subspathulate.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 16. t. 2. (7). Botanical Survey of India, Howrah.
2. Beddome, R. H. (1874). *Ic. Pl. Ind. Or.* 1:38. t. 172.
3. Gamble, J. S. (1923). *Fl. Pres. Madras* 5: 856.
4. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4:66.

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

STATUS : Vulnerable. Destruction of its habitats due to natural and other causes appears to be the reason for its rarity and depleted populations.

DISTRIBUTION : Endemic to Maharashtra State. An old misidentified collection of *Sheyade* s.n. (BSI) from Amba ghat, Ratnagiri district, in 1909, was the basis of its first report as a new species in 1967; collected again from the same area. Represented by a few more subsequent collections from the vicinity only; appears to be very restricted and sparse in distribution.

HABITAT AND ECOLOGY: Grows at an altitude of \pm 1000 m on precipitous rocky/gravelly slopes of the ghats in well-drained soil, requiring cool, misty climate. This habitat is prone to frequent landslides during monsoon season.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) A few plants of the species should be introduced from such disturbed habitat to much safer and protected areas having similar ecological conditions, (b) uprooting of the plants, for other than conservation, should be prohibited, (c) propagation and multiplication through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE: A twiner with white, somewhat umbrella-shaped flowers, blooming from August to September and fruiting subsequently.

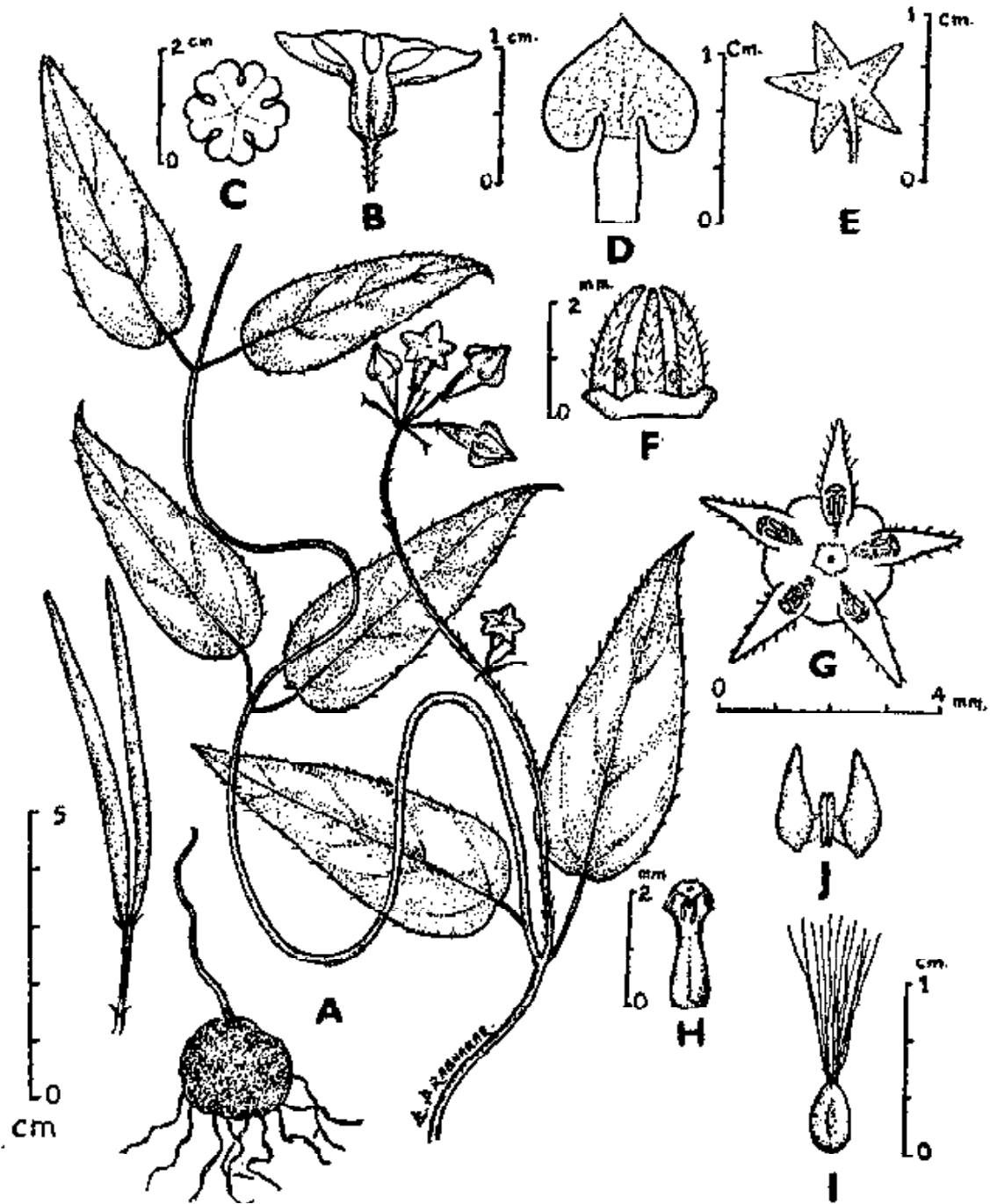
CULTIVATION: A tuber was introduced into the Experimental garden, Botanical Survey of India, Pune for critical study where it survived for only one season.

DESCRIPTION: Twiners, at times with branching stem. Leaves ovate to lanceolate. Cymes many-flowered on long peduncles. Corolla 1.2 cm long; tube 5 mm long, slightly inflated near base, narrowed upwards; lobes 7×10 mm, glabrous, forming a circular flattened head. Outer corona entire, 5-lobed, glabrous; inner conical, elongated, hairy, convergent at apex.

REFERENCES:

1. Ansari, M. Y. (1968). A new species of *Ceropegia* L. (Asclepiadaceae) from Western ghats, Maharashtra. *Bull. Bot. Surv. Ind.* 10 (2): 219-221. f. 1-10.
2. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 17. t. 3(12).

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



Ceropogia hubertii Ansari A. Habit. B—H. Flower & parts. I. Seed. J. Pollinia with corpusculum.

STATUS : Endangered. Like other *Ceropegias*, its tubers are likely to be consumed by the natives which might account for its extreme rarity in the wild. Known from a few recent collections only.

DISTRIBUTION : Endemic to Maharashtra State. First reported in 1883 from Konkan and recollected nearly after a century (1970) from Harishchandragad hill in Maharashtra.

HABITAT AND ECOLOGY: On hill tops and slopes at an altitude of \pm 1000 m in exposed gravelly soil areas among grasses.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Uprooting of the plants be prohibited, (b) to be conserved *in situ* or in protected areas with similar ecological conditions, (c) propagation and multiplication by seeds and other techniques be attempted, (d) consumption of its tubers be discouraged.

BIOLOGY AND POTENTIAL VALUE: The other distinctly erect *Ceropegias* were wrongly attributed to this species so far. It is a very distinct species from its habit and it flowers during August-September.

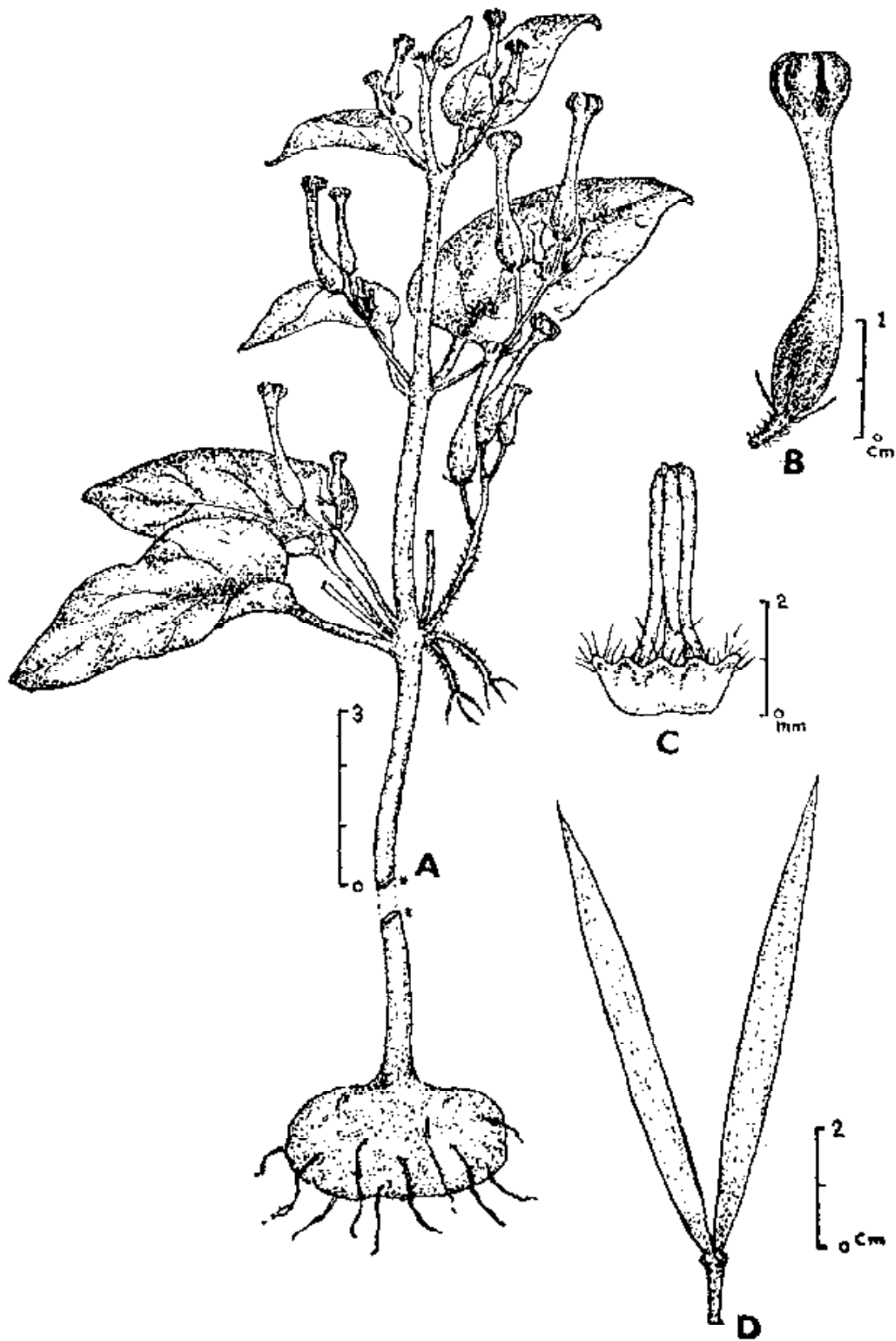
CULTIVATION: 2-3 tubers of the species were introduced in the experimental plot of Botanical Survey of India, Pune for critical study, but survived for only one season under Pune climate.

DESCRIPTION: Tall erect herbs with ovate or ovate-lanceolate leaves. Cymes many flowered on peduncles. Corolla 3.0-3.5 cm long; tube 2.8 cm long, inside a ring of hairs at the bottom of the inflated base only; lobes 6-7 mm long, ovate-cordate, hairy or glabrous within. Outer corona of 10 obtuse lobes, hairy; inner linear, erect, 3-4 times as long as the outer.

REFERENCES:

1. Ansari, M. Y. (1984). *Asclepiadaceae: Genus Ceropegia. Fasc. Fl. Ind.* 16: 19 t. 3(15); f. 10. Botanical Survey of India, Howrah.
2. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4:67.

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



Ceropogia lawii Hook. f. A. Habit. B. Flower. C. Corona. D. Follicles.

STATUS : Rare. Causes of its decline seem to be forest clearing as also its tubers being eaten by natives.

DISTRIBUTION : Endemic to Maharashtra State. So far known to occur in Pune, Ratnagiri and Raigad districts.

HABITAT AND ECOLOGY : It occurs on slopes of open deciduous forest and scrub jungles among its under growth.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) To be conserved *in situ* or be grown in protected reserves with similar climatic and edaphic conditions, (b) to ban unrestricted collection of the species, particularly with tubers, (c) to try and multiply the species through seeds and other known techniques.

BIOLOGY AND POTENTIAL VALUE : Flowers are very striking. It blooms during July—August and fruits in September—October.

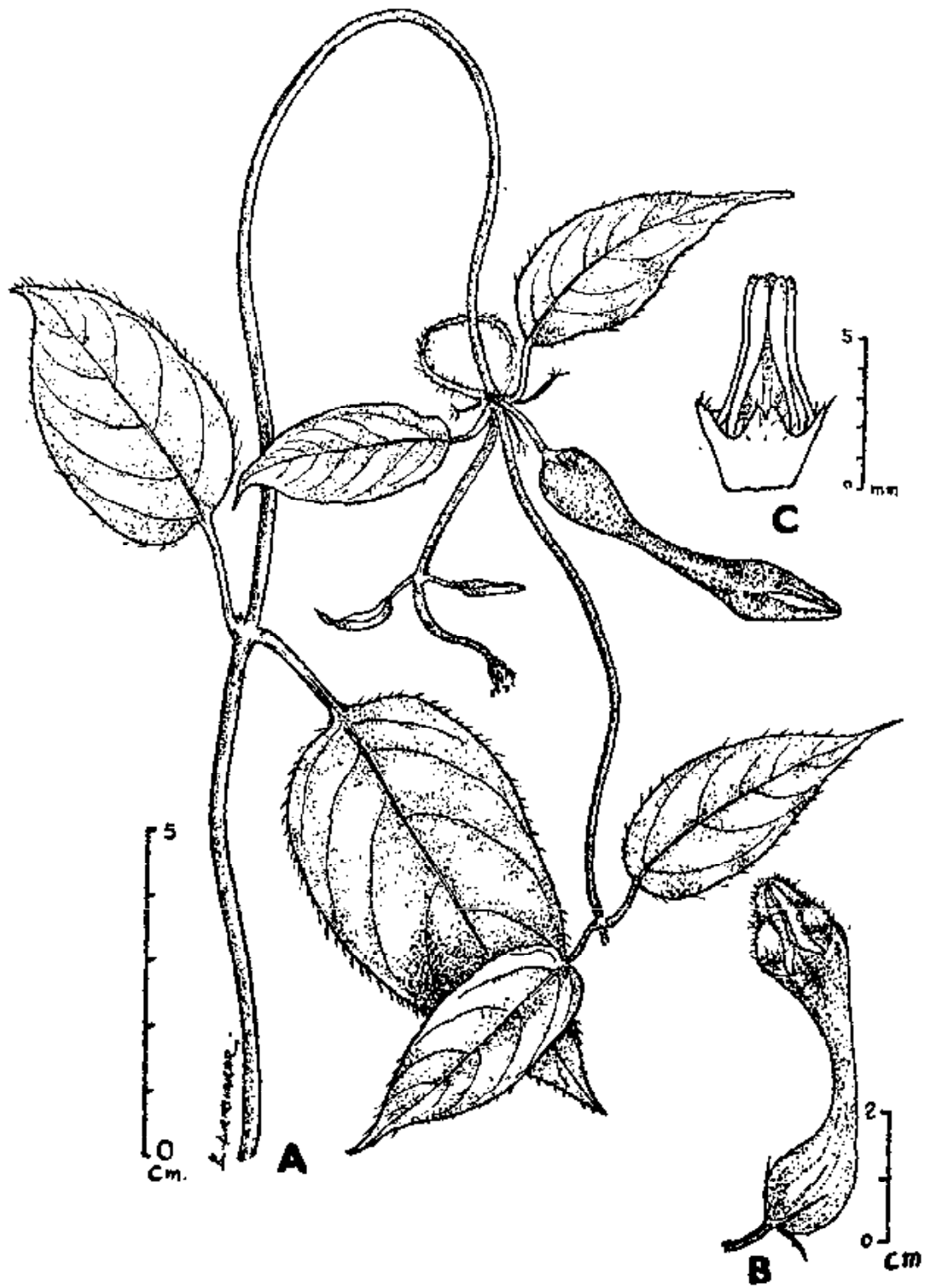
CULTIVATION A few tubers, introduced in experimental garden at Pune for study, survived for two years only, perhaps due to unsuitable climatic and soil conditions.

DESCRIPTION : Twiners with broadly ovate or ovate-oblong leaves. Cymes few-flowered with hairy peduncles. Corolla 6.5 cm long; tube 5 cm long, base inflated, narrowed in the middle, mouth funnel-shaped; lobes 1.5 cm long, linear-oblong above from ovate base, connate at apex to form a beak. Outer corona of 5 bifid lobes; inner erect, linear-clavate.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 26. t. 4(20). Botanical Survey of India, Howrah.
2. Cooke, T. (1904). *Fl. Pres. Bomb.* 2:177.
3. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4: 72.
4. Hooker, W. J. (1844). *Bot. Mag.* t. 4093.
5. Santapau, H. & Irani, N. A. (1958). The genus *Ceropegia* in Bombay : *Bull. Bot. Soc. Beng.* 12 (1 & 2): 12. t. 1, f. J.

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



Ceropogia oculata Hook. A. Part of the plant. B. Flower. C. Corona.

STATUS : Endangered.

DISTRIBUTION : Endemic to Western India. Very few specimens are available in India from 'Bombay' and Mt. Abu (Rajasthan) which date back to 19th Century till it was recollected from Pavagadh hill, Gujarat in 1971 and Melghat, Maharashtra in 1979, where hardly few individuals were counted again. This region is fairly explored and its extreme rarity causes concern.

HABITAT AND ECOLOGY : In open areas in forests and on steep hilly slopes among bushes, on gravelly soil.

CONSERVATION MEASURES TAKEN : None. Melghat area is now a Tiger Reserve.

CONSERVATION MEASURES PROPOSED : (a) It should be conserved *in situ* or in protected areas, (b) propagation through seeds be tried, (c) uprooting of plants be prohibited.

BIOLOGY AND POTENTIAL VALUE : A twiner with yellow flowers, blooming during August to September. Perhaps the only species with fragrant flowers in the genus in India.

DESCRIPTION : Slender twiner with linear-lanceolate leaves with few to many flowered pedunculate cymes. Corolla 3-4 cm long, fragrant; tube 1.8-2.0 cm long, hairy near the inflated basal part; lobes 1.2-2.0 cm long, linear, glabrous. Outer corona of 5 entire lobes; inner linear, or elongate-triangular, erect, divergent at apex.

REFERENCES :

1. Ansari, M. Y. (1982). The fragrant *Ceropegia* of nineteenth Century. *Bull. Bot. Surv. India* 24 (1-4): 190-192. t. 1.
2. Ansari, M. Y. (1984). Asclepiadaceae: Genus-*Ceropegia*. *Fasc. Fl. Ind.* 16: 26-27. t. 4(21). Botanical Survey of India, Howrah.
3. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4: 75.
4. Sabnis, S. D. & Bedi, S. J. (1971). *Ceropegia odorata* Hook. f. (Asclepiadaceae)--A little known plant of Western India. *Kew Bull.* 25(1): 57-59. f. 1-6.

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

Ceropegia omissa Huber (*C. intermedia* Wight var. *wightii* Hook. f.) ASCLEPIADACEAE

STATUS : Endangered. Though the causes for its present status are not known, its restricted occurrence and collections made during 1914-1916 from single locality only and the absence of its fresh collections from the areas otherwise fairly explored points to an alarming situation.

DISTRIBUTION : Endemic to Tamil Nadu. Wight first collected it from Travancore, Courtallum; J. D. Hooker (1883) reported it as a variety of *C. intermedia* Wight. Its occurrence is known from Sengalteri, Tirunelvely district only from a few sheets (MH.)

HABITAT AND ECOLOGY : Not known.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) If re-spotted, it should be conserved *in situ*, (b) no uprooting of the plants be allowed, (c) if possible, propagation and multiplication through seeds and other techniques be tried and grown under similar habitat conditions.

BIOLOGY AND POTENTIAL VALUE : It flowers during September.

DESCRIPTION : Glabrous twiners with ovate, lanceolate, acuminate leaves. Cymes few-flowered. Corolla 2.8-3.5 cm long; tube *ca* 2 cm long, base inflated, mouth slightly dilated; lobes *ca* 1 cm long, ovate or suborbicular. Outer corona of 5 bifid, deltoid ciliate lobes; inner erect, linear.

REFERENCES :

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 27. Botanical Survey of India, Howrah.
2. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4:71.
3. Huber, H. (1957). Revision of the genus *Ceropegia*. *Mem. Soc. Broter.* 12: 67, t. 3, f. 34.

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

STATUS : Endangered. Consumption of its tubers by natives should have been the cause of its present status.

DISTRIBUTION : Endemic to Maharashtra State. First reported in 1933 from Panchgani in Satara district. After a lapse of nearly four decades, two specimens were collected near Mahabaleshwar (Satara district) in 1970. There are no specimens of this species, including the type, available in any of the herbaria of the world including India, save one collection of *Irani* 2005 (BLAT) from Mahabaleshwar, collected in 1956, with immature flowers and misidentified, but appears to be this species only. As the area in particular and Western ghats in general have been well-explored, absence of further collections is alarming.

HABITAT AND ECOLOGY : Grows in open areas of the semi-evergreen forest among shrubs at an altitude of over 1000 m.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) If re-spotted, the plants should not be uprooted, (b) should be conserved *in situ* or in protected areas under similar ecological conditions, (c) propagation through seeds and other techniques be tried for its multiplication and reintroduction in its type locality.

BIOLOGY AND POTENTIAL VALUE : This species has often been confused with other erect and related species. It flowers during July-August and fruits subsequently.

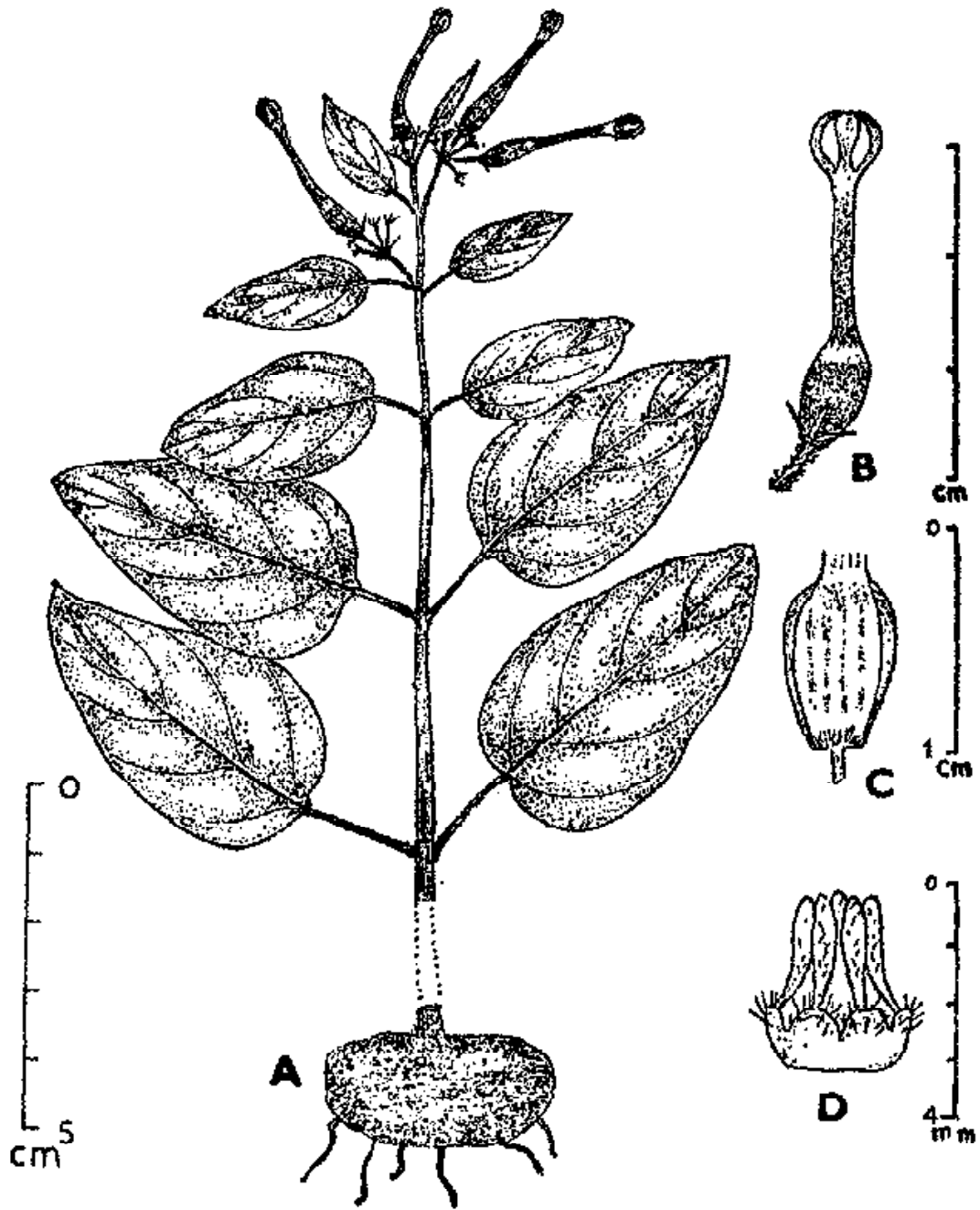
CULTIVATION : It was grown (1970s) in the Botanical Survey of India garden at Pune for critical study, but did not survive for more than 2 seasons.

DESCRIPTION : Tall herbs with pubescent stems. Leaves ovate, puberulous above. Cymes few-flowered on peduncles. Corolla 2.8-3.5 cm long; tube 2.2-2.8 cm long, uniformly narrow, cylindrical, base inflated with a ring of hairs at the bottom inside; lobes *ca* 6 mm long, elliptic ovate or obovate, glabrous. Outer corona of 5 shortly bifid hairy lobes; inner erect, clavate, hairy.

REFERENCES :

1. Ansari, M. Y. (1980). *Ceropegia panchganiensis* Blatter *et* McCann (Asclepiadaceae)—A little known species rediscovered. *Bull. Bot. Surv. Ind.* 22 (1-4): 199-201. f. 1-4.
2. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 27. t. 4(22): f. 16. Botanical Survey of India, Howrah.
3. Blatter, E. & McCann, C. (1933). Revision of the flora of Bombay Presidency. *J. Bomb. Nat. Hist. Soc.* 36 (3): 534-535.

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



Ceropegia panchganiensis Blatt. et Bruce A. Habit. B. Flower. C. Inflated flower base. D. Corona.

STATUS : Rare. At present, no information is available on the causes of its rarity. Its sparse collection is the only criteria left for judgment.

DISTRIBUTION: Endemic to South India. There are hardly a few old sheets available in Indian herbaria from Tamil Nadu. A few recent collections are from Mysore district (Karnataka) and Nilgiris (Tamil Nadu). There is a possibility of its occurrence in Kerala also in its typical habitats at high altitudes.

HABITAT AND ECOLOGY : Reported to be growing in rocky areas among grasses along the banks of nalas/rivulets on hills at an altitude of \pm 2000 m.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) If resighted, it is to be conserved *in situ* or grown in similar habitats in protected areas. (b) no uprooting of specimens be permitted, (c) propagation and multiplication through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE : It is reported to flower during June-August and fruit in September-October. Being a dwarf species, likely to be overlooked among grasses.

DESCRIPTION : Small erect herbs with linear, sessile leaves crowded on the stem. Cymes uni-flowered with minute peduncles and long pedicels. Corolla 2.5-2.8 cm long; tube 1.8-2.0 cm long, subcylindric, base inflated; lobes 7-8 mm long, oblong, glabrous except hairy at apex. Outer corona of 5 bifid, narrowly deltoid lobes, ciliate; inner erect.

REFERENCES :

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 28. Botanical Survey of India, Howrah.
2. Gamble, J. S. (1923). *Fl. Pres. Madras* 5: 856.
3. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4: 66.

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

STATUS : Rare. Consumption of its tubers by the natives and possibly destruction of its habitats appear to be the cause for its rarity. Its wild populations are diminishing.

DISTRIBUTION : Endemic to Maharashtra State. So far known from Khandala, Sinhagadh hill, Ambavane-Sakarpathar range (Pune district) and Amboli ghat (Sindhudurg district). It seems to have vanished from Sinhagadh hill and Khandala from where it was collected during 1902 and 1919 respectively. Botanical Survey in other districts of Maharashtra have failed to locate it.

HABITAT AND ECOLOGY : Grows on hill-tops and slopes in exposed gravelly soil areas in cool misty, moist climate among other herbs and shrubs at an altitude ranging from 1000—1500 m. Specimens from higher rainfall areas (Amboli ghat) are more luxuriant than the others.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : (a) To be conserved *in situ* or grown in Biosphere reserves under similar habitat conditions, (b) consumption of its tubers and uprooting the plants be banned, (c) propagation and multiplication through seeds or other techniques are desirable.

BIOLOGY AND POTENTIAL VALUE : Robust herbs with prominent flowers, blooming during August-September and fruiting in September-October.

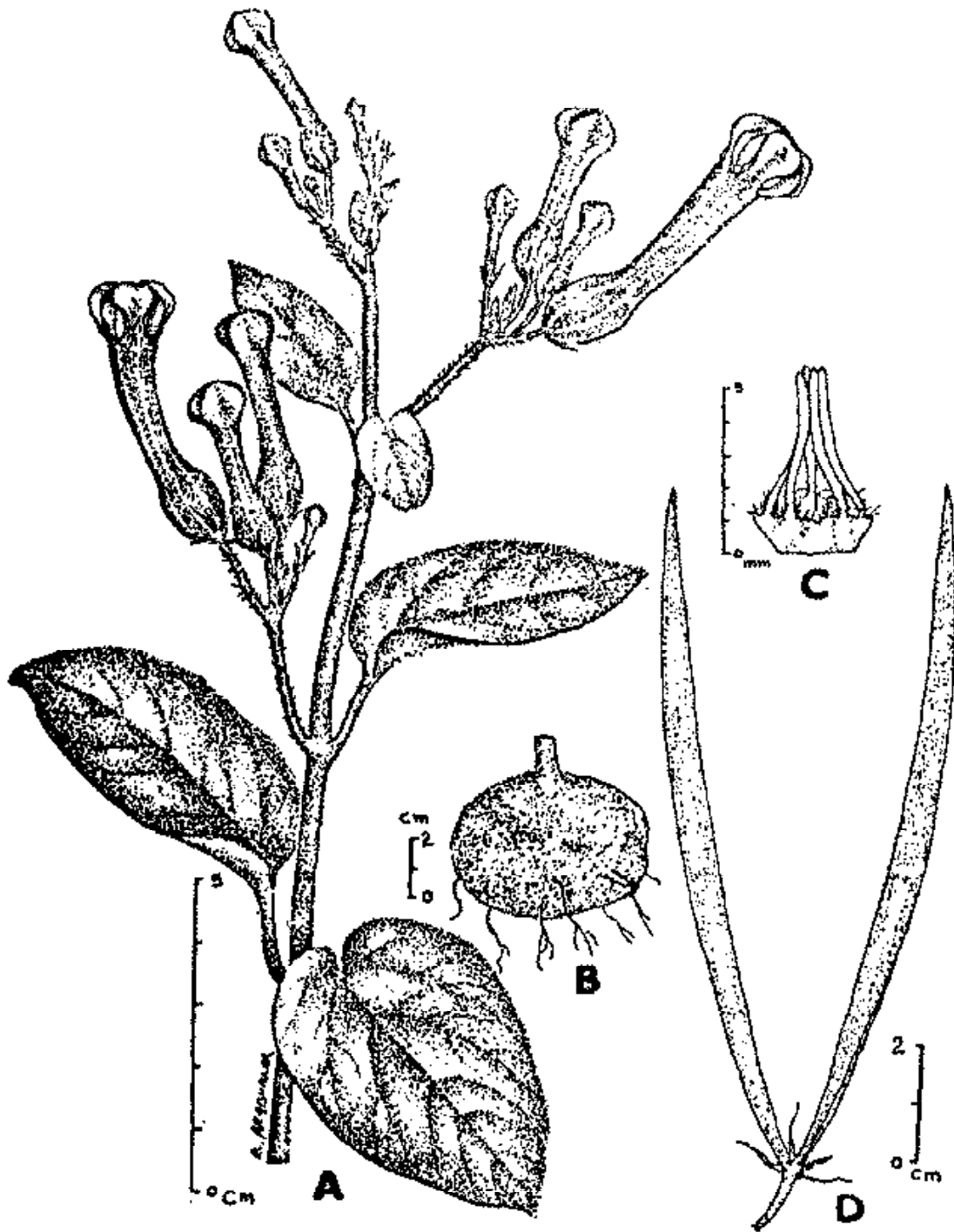
CULTIVATION : Cultivated through its tuber for study in the experimental plots, Botanical Survey of India at Pune where it survived for two seasons only.

DESCRIPTION : Erect herbs with ovate-cordate leaves. Cymes few to many-flowered with hairy peduncels and pedicles. Corolla 3.5-5.5 cm long; tube upto 4.4 cm long, broad, base inflated prominently with a ring of hairs at the bottom inside; lobes upto 11×8 mm, ovate, sub-cordate, glabrous. Outer corona of 5 short, entire or notched lobes, hairy; inner erect, sparsely hairy at base.

REFERENCES :

1. Ansari, M. Y. & Kulkarni, B. G. (1971). *Ceropegia sahyadrica* Ansari *et* Kulkarni—A new species. *Ind. For.* 97(12): 688-690. t. 1, f. 1-4, t. 2, f. A (1, 2).
2. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 29. t. 4(24). Botanical Survey of India, Howrah.

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



Ceropogon sahyadrica Ansari et Kulkarni A. Flowering plant. B. Tuber. C. Corona. D. Follicles.

STATUS: Vulnerable. Though precise reason for its present status is not known, consumption of its tubers may be one of the factors. Few old collections are available in India and equally few recent collections from its known localities merit immediate attention.

DISTRIBUTION: Endemic to peninsular India. Its occurrence in the States of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu is based on a few old collections made in nineteenth century. Very few recent collections between 1960-1980 are made from Kerala and Karnataka States.

HABITAT AND ECOLOGY: It is reported to be growing at an altitude \pm 2500 m. Presumably, it grows on rocky gravelly habitat with moist and misty climate.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Should be conserved *in situ* or in Biosphere reserves under similar habitat and climatic conditions, (b) further uprooting of the plants should be prohibited, (c) propagation and multiplication through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE: Reported to flower during August-October and fruit from November onwards. Reported to develop twining habit occasionally.

CULTIVATION: Not known.

DESCRIPTION: Erect tuberous herbs with linear sessile leaves. Cymes uni-flowered. Corolla 4-5 cm long; tube 2.0-2.5 cm long, subcylindric, hairy inside except at inflated base; lobes 2.0-2.5 cm long, linear, hairy within above from ovate or orbicular base, generally spirally twisted. Outer corona of 5 bifid, deltoid lobes, glabrous; inner linear, erect.

REFERENCES:

1. Ansari, M. Y. (1984). Asclepiadaceae: Genus—*Ceropegia*. *Fasc. Fl. Ind.* 16: 30. Botanical Survey of India, Howrah.
2. Gamble, J. S. (1923). *Fl. Pres. Madras* 4:66.
3. Hooker, J. D. (1883). *Fl. Brit. Ind.* 4:66.
4. Wight, R. (1848). *Ic. Pl. Ind. Or.* 4: t. 1267.

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

STATUS: Endangered. Cooke (1) mentions about this species, "A rare plant, originally found by Dalzell on a hill near Junnar in the Poona district" This species presently occurs only in the Purandhar Hill Fort area and survives by very limited number of plants. It has not been seen in other similar habitats in the adjoining hilly areas which are being denuded and eroded.

DISTRIBUTION: Junnar and Purandhar Hills, Pune district, Maharashtra. An endemic restricted to a very limited area.

HABITAT AND ECOLOGY: The species grows on exposed bare rocks of hill slopes and on cliffs on Western face of Junnar hill fort forming large patches at an alt. of 1000 m (2). The soil is gravelly, forming a thin mantle.

CONSERVATION MEASURES TAKEN: None for the wild populations. However, the habitat of the species is incidentally free from any biotic operations as the Purandhar Hill Fort is a prohibited area for civilians. But exceptional care should be taken to ensure continued care and protection of the habitat and population within the Fort area, lest the species is likely to become extinct. The species has been listed in the threatened plant lists (3, 4) and is also included in the Appendix-I of the CITES which totally restricts its collection and export. It has also been declared as one of the world's 12 endangered species listed by the IUCN.

CONSERVATION MEASURES PROPOSED: Attempts to study the ecology and reproductive biology of the species to understand means of its propagation; *in situ* and *ex situ* conservation measures to save it from possible extinction; multiplication of plants *ex situ* and their reintroduction into its original habitats are suggested.

BIOLOGY AND POTENTIAL VALUE: A very interesting monotypic genus of very narrow endemic distribution. The plants with showy purplish starry flowers having pale-yellow spots on corolla lobes hold promise of being a very pretty succulent horticulture plant for indoor decoration. Flowers during September—October.

CULTIVATION: One or two plants have been introduced into pots in the Experimental Garden, Botanical Survey of India, Pune and are thriving well.

DESCRIPTION: Perennial fleshy glabrous caespitose herbs, 10-15 cm high; branches thick, pale green. Leaves opposite, fleshy, ca 3 cm long, oblong, obtuse or subacute, subsessile. Flowers solitary or in pairs; pedicels arising from between the petioles, very short. Calyx glabrous, 5-partite; lobes deltoid, acute. Corolla rotate, about 2 cm across, divided nearly half-way down; lobes valvate, deltoid, acute, fringed with fine hairs, purplish with triangular pale-yellow spot in the centre; corona purple, the outer cup-like with 5 broad short truncate or sinuate lobes, the inner of 5 linear truncate lobes incurved at the apex and inflexed over the staminal-column. Staminal-column very short; anthers red; pollinia 1 in each cell. Style-apex flat, pearl white. Follicles terete, smooth; seeds comose.

REFERENCES:

1. Cooke, T. (1958). *Fl. Pres. Bombay* 2:243 (repr. ed.)
2. Dalzell, N. A. (1865). A new genus of Asclepiadeae. *Jour. Linn. Soc.* 8:10 t. 3.
3. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art Report.* B.S.I. & M.A.B., New Delhi. p. 41. t.
4. Nayar, M. P. (1982). Endemic flora of Peninsular India and its significance. *Bull. Bot. Surv. India* 22: 12-25.
5. Vajravelu, E. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of threatened plants of India.* Botanical Survey of India, Howrah. p. 28.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Endangered, or possibly Extinct.

DISTRIBUTION: Maharashtra, 25 kms west of Pune, along the ghats. Endemic. This was collected on 21st August 1887 by Krishna and was mistaken to be *O. urceolatus* Benth. (*Heterostemma urceolatum* Dalz.). However, Talbot had described it as a new species. It was reported to be rediscovered from Chatursringhi hills at Pune nearly 30 years back but no authentic specimen is available. A careful search in the vicinity of Pune has been repeatedly made to recollect it but so far has met with failure. The habitat has undergone drastic changes and this might have led to its possible extinction.

HABITAT AND ECOLOGY: Along the ghats, on rocky areas in exposed regions.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Attempts to rediscover the species in adjoining areas and *ex-situ* conservation, if located.

BIOLOGY AND POTENTIAL VALUE: A botanically interesting species about which not much is known since the type description.

CULTIVATION: None on record.

DESCRIPTION: Twining shrub with terete yellowish pubescent branches. Leaves subcoriaceous, ovate to lanceolate, 5-10 × 0.5-5 cm, scabrous but early glabrescent, base cordate, tip acute to acuminate, petioles 5-6 mm, puberulous. Cymes sessile, few flowered. Flowers greenish-yellow, on pedicels 2.5-4.0 mm long. Calyx divided to base; lobes 2 mm long, oblong, obtuse, puberulous, margins membranous. Corolla thick, ovoid urceolate to tubular, 10-13 × 3 mm, lobes triangular, valvate, with intermediate minute teeth; corona 5-lobed, lobes broad, incurved with rounded margins.

REFERENCE:

1. Talbot, W. A. (1911). *For. Fl. Bombay Presid. & Sind* 2: 260.

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

STATUS: Endangered, due to destruction of habitat. Roxburgh described the species in 1832 based on collections of Heyne. Endemic to the N. Circars, Andhra Pradesh.

DISTRIBUTION: Known only from East Godavari and Visakhapatnam Districts of Andhra Pradesh, India.

HABITAT AND ECOLOGY: Climbing shrubs on laterite soil at 500-950 m altitude.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Relocation of the species; *in situ* and *ex situ* conservation.

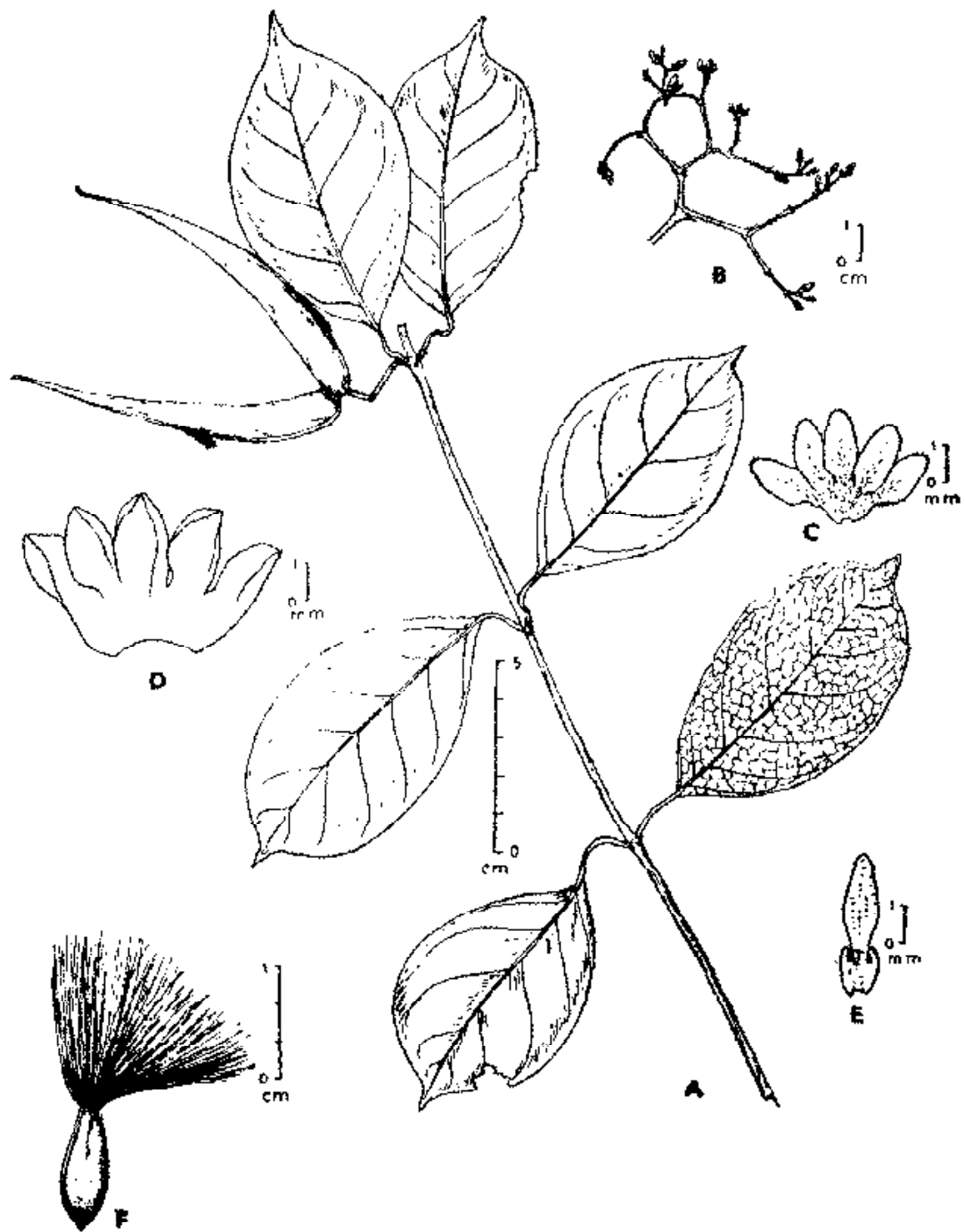
BIOLOGY AND POTENTIAL VALUE: Phytogeographic and academic interest.

DESCRIPTION: Climbing shrubs; stems glabrous, young shoots rusty pubescent. Leaves ovate-elliptic, upto 10.5×7 cm, abruptly acuminate, entire and wavy, rounded or acute at base, glabrous on both sides, glandular at base of midrib on upper side; petioles upto 1.7 cm long, sparsely rusty pubescent, grooved, twisted. Flowers yellow, small, in rusty pubescent dichotomous lax cymes; cymes shorter than leaves; peduncles interpetiolar, upto 1 cm long, rusty pubescent; bracts linear, acute, upto 0.2 cm long, rusty pubescent; pedicels upto 0.1 cm long, terete, rusty pubescent. Calyx rusty pubescent without, divided almost to the base; lobes each upto 0.3×0.1 cm, elliptical, obtuse at apex. Corolla upto 0.4 cm long, glabrous without, minutely hairy at throat within; lobes contorted in bud, each upto 0.2×0.05 cm, lanceolate, obtuse. Corona upto 0.15 cm long. Style upto 0.2 cm long. Follicles 2, divaricate, upto 9.7 cm long, upto 1.2 cm broad towards base, tapering to a point towards apex, rusty pubescent while young, sparsely rusty pubescent when mature. Seeds flat, elliptical, chocolate brown, upto 1×0.3 cm; coma silky, white, upto 2.7 cm long.

REFERENCES:

1. Gamble, J. S. & Fischer, C. E. C. (1923). *Fl. Pres. Madras* 2: 830.
2. Hooker, J. D. (1883). *Fl. Brit. India* 4: 14.
3. Roxburgh, W. (1832). *Flora Indica* 2: 46. (ed. 2).
4. Steudel, E. T. (1841). *Nomenclator Botanicus* 2: 694. (ed. 2).
5. Wight, R. (1834). *Contrib. Bot., India* p. 61.

Material for this sheet was supplied by G. V. Subba Rao and G. R. Kumari, Botanical Survey of India, Coimbatore.



Toxocarpus longistigma (Roxb.) Wt. & Arn. ex Steud. A. Fr. Branch. B. Inflorescence. C. Calyx. D. Corolla. E. Style. F. Seed.

STATUS: Endangered (2, 3). This herb is known only from the type collection made by E. Barnes deposited in (K.)

DISTRIBUTION: High Range, Idukki Dt., Kerala (Former Travancore State) (1). Endemic to Southern Western Ghats.

HABITAT AND ECOLOGY: Probably in high altitude grasslands-(shrub-savannahs).

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: It is recommended that surveys should be undertaken in the High Ranges of Kerala to determine the exact locality, population size and causes of threat to this species.

BIOLOGY AND POTENTIAL VALUE: Allied to *Anaphalis notoniana* DC., another endemic species confined to Nilgiris, Western ghats. Flowering was recorded in the month of September.

CULTIVATION: None on record.

DESCRIPTION: Herbs, 44-75 cm high, woody below, sparsely branched, except near the base, almost concealed by the imbricating leaves. Leaves 1.0-1.3×0.5 cm, sessile, erect and adpressed, lanceolate, subacute, margins folded back, greyish-tomentose on both sides. Inflorescence terminal, corymbose, densely buff-felted. Phyllaries 5-6 seriate, 5-6 mm long; outermost ovate, densely long-silky tomentose, innermost spatulate, intermediate in shape and texture passing from outer to the inner. Corolla 2.5 mm long, yellow, 4-toothed. Achenes 1.5 mm long, narrowly oblong, apex truncate, glabrous, faintly and bluntly 4-angled. Pappus scanty, white, ascendingly barbellate.

REFERENCES:

1. Fischer, C.E.C. (1939). New or little known plants from Southern India-X. *Bull. Misc. Inform.* 1939: 249.
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of India. *J. Bombay Nat. Hist. Soc.* 75: 690.
3. Vajravelu, E. & Daniel, P. (1983). *Materials for a Catalogue of threatened plants of India.* Botanical Survey of India. p. 25.

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

STATUS: Vulnerable. Causes for its decline are indiscriminate quarrying, mining and habitat destruction.

DISTRIBUTION: Endemic to the Siwalik belt and Tehri district of Garhwal Himalayas. Thomson first reported it in 1866. Perusal of herbarium specimens housed in the Indian herbaria (CAL, BSD & DD) shows that it was quite common in the Siwaliks in the recent past and formed an important component of the limestone vegetation. The extension of its distribution in Tehri district is based on a single report (1).

HABITAT AND ECOLOGY: The plant occurs in semi-arid conditions in high altitude calcareous cliffs of Garhwal Himalayas. The plant is seen on steep dry and exposed rocky slopes.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Curtailment or judicious quarrying and mining activities in the region to mitigate large-scale destruction of natural forest cover, (b) *ex situ* introduction and cultivation of the plants in reserves under similar ecological conditions.

BIOLOGY AND POTENTIAL VALUE: The flowering and fruiting period is between March-May. The flowers (in white heads) remain in bloom for a very short period. This chasmophyte is of botanical interest and of indicator value.

CULTIVATION: Not known in cultivation.

DESCRIPTION: Sclerophyllous undershrub, 1.0-1.5 m high. Stems with silky pubescence. Leaves alternate, shortly petiolate, semi-amplexicaul, obovate or obovate-spathulate, 5.0-7.5 × 2.0-3.7 cm, crenate or crenate-serrate. Infl. in heads, ligulate, 7.5 mm long, in terminal corymbs. Involucral bracts few to many seriate, much shorter than flowers. Florets all ligulate, yellow or white. Achenes silky-villous. Pappus hairy, white.

REFERENCES:

1. Bhattacharya, U. C. & Goel, A. K. (1982): *Rep. Rare or unknown Pl. Garh. Himal.*, p. 35. Botanical Survey of India.
2. Jain, S. K. & Sastry, A. R. K. (1980): *Threatened Plants of India. A State-of-the-Art Report.* BSI & MAB, New Delhi. p. 18.
3. Thomson, T. (1866): On two new genera of Compositae, Mutisiaceae from India. *J. Linn. Soc. Bot.* 9 : 343, t.4.

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

STATUS: Rare (1, 4, 5).

DISTRIBUTION: Endemic to southern Western Ghats at Anamalai hills of Tamil Nadu in the high altitudes between 1900-2200 m. It was reported by J. S. Gamble (2, 3) based on the collection of R. H. Beddome probably around the year 1857 from Anamalai hills of Coimbatore district at an altitude of about 2000 m. By intense search, this plant was relocated at high elevations at Konalar-Thanakamalai of Anamalai hills in the year 1980 (1). Type in MH.

HABITAT AND ECOLOGY: In the high altitude grasslands especially near the streams; flowering during the month of February.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: It is recommended that Anamalai Wild Life Sanctuary authorities should take necessary steps to conserve this rare species.

BIOLOGY AND POTENTIAL VALUE: No information.

CULTIVATION: None on record.

DESCRIPTION: Undershrubs 1.0-1.5 m high, covered with very soft spreading floccose wool. Basal leaves in rosettes upto 15 cm long, sessile, 5-ribbed; ribs not impressed; cauline leaves 4.9 x 1.0-2.5 cm, sessile, clasping the woolly stem, lanceolate, acute, rounded at the base, margins recurved, 5-9-ribbed from the base. Heads many, 7 mm across, crowded in terminal corymbs, upto 20 cm across, yellow. Achenes obovoid, scaly with uniseriate pappus hair black.

REFERENCES:

1. Chandrabose, M., Nair, N.C. & Chandrasekaran, V. (1979). Rediscovery of two rare and threatened flowering plants of South India. *Bull. Bot. Surv. India* 21: 236-237.
2. Gamble, J. S. (1920). Decades Kewensis. *Bull. Misc. Inform.* 1920: 341-342.
3. Gamble, J. S. (1957). *Fl. Pres. Madras* 2: 491-492. Botanical Survey of India, Calcutta (repr. ed.).
4. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 690.
5. Vajravelu, E. & Daniel, P. (1983). In: Jain, S.K. & Sastry, A.R.K. (ed.), *Materials for a Catalogue of threatened plants of India*. Botanical Survey of India, Howrah. p. 26.

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

STATUS: Rare and endemic to Khasi hills. The increasing demand of land for agriculture coupled by 'Jhum' practice in the Khasi hills make this species threatened in wild.

DISTRIBUTION: Endemic to Khasi hills of Meghalaya.

HABITAT AND ECOLOGY: It grows in open sunny areas near water sources in association with grasses, etc., and completes its life-cycle before winter approaches.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Efforts have to be made to rehabilitate this species in the reserved forests.

BIOLOGY AND POTENTIAL VALUE: A perennial herb of botanical interest. Flowers in June-July.

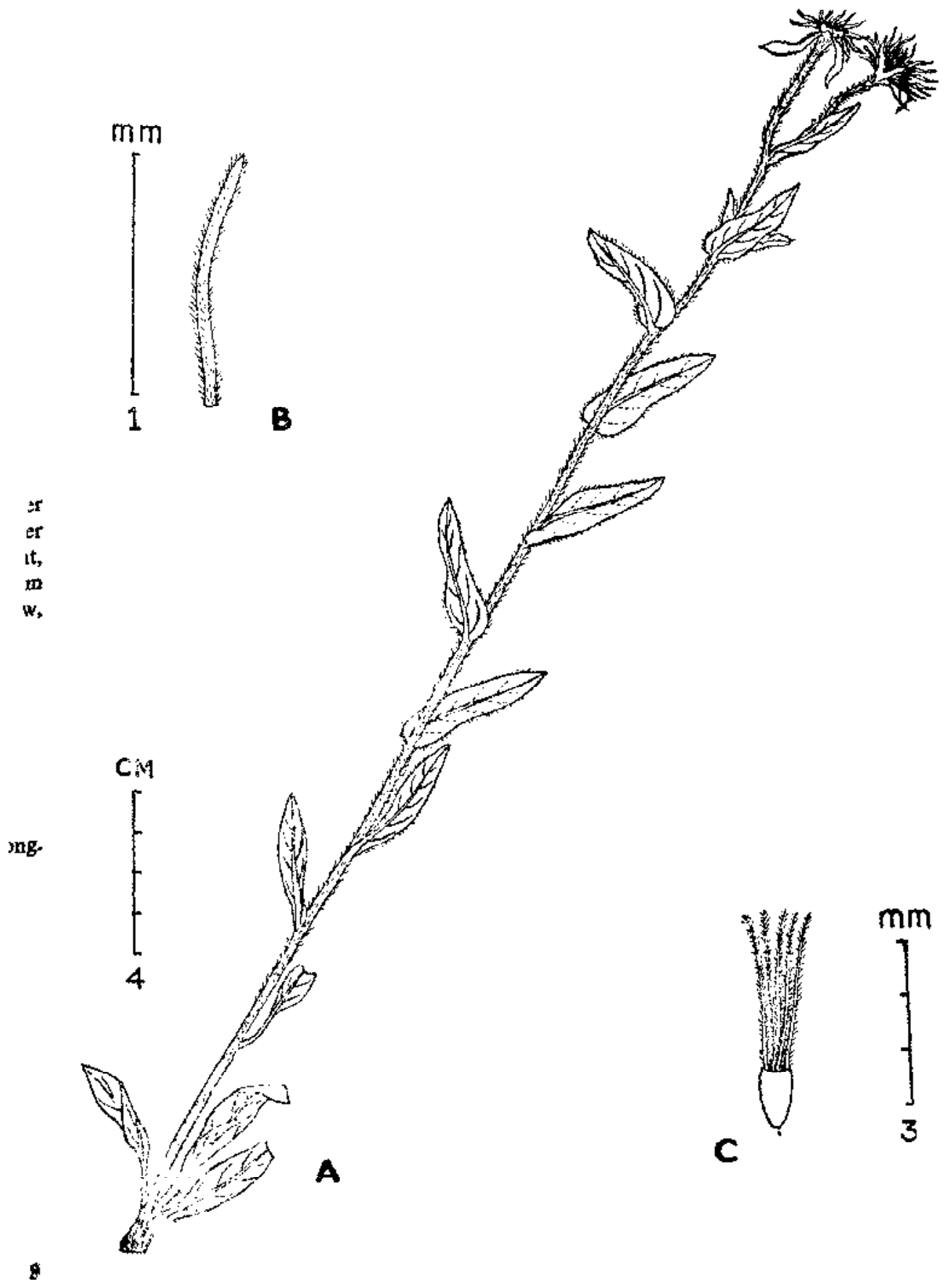
CULTIVATION: Not known in cultivation.

DESCRIPTION: Perennial herb; stem brown, covered with white hairs. Radical and other lower leaves petioled, elliptic-ovate or lanceolate, obtuse to acute, both surfaces hairy, upper leaves cauline, sessile, more or less amplexicaulous, ovate-oblong, obtuse, midvein prominent, lateral veins 5-6, faint; flowers in heads of *ca* 2-2.5 cm across, involucre bracts *ca* 4-4.5 mm long, few, linear, acute, hairy outside. Achenes minute, *ca* 1 mm, glabrous, pappus few, *ca* 3 mm long with small side projections.

REFERENCES:

1. Clarke, C. B. (1876). *Comp. Ind.*, p. 123.
2. Hooker, J. D. (1881). *Fl. Brit. India* 3:295.

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



Inula kalapani Clarke A. Habit. B. Involucre bract. C. Achene.

STATUS: Endangered and endemic, known only from type collection (ca 100 years old).

DISTRIBUTION: India, Kashmir.

HABITAT AND ECOLOGY: In open alpine meadows from 4000 to 5000 m; fls. & frts.: August—September.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive field surveys should be undertaken in the type locality and adjacent areas. After relocating this species, all efforts should be made to protect this plant in its natural habitat.

BIOLOGY AND POTENTIAL VALUE: An endemic species of botanical interest. Its potential values are yet to be assessed.

CULTIVATION: So far not known.

DESCRIPTION: Stem erect, glabrous, minutely pubescent. Flowering branches ca 14-15 cm long, apex dichotomously corymbose. Leaves spatulate, oblong, decurrent to the petiole (narrowed towards petiole), entire or obscurely dentate, somewhat 3-nerved. Heads cylindrical, flowers many, all ligulate, purple. Inner involucrel bracts about 8, oblong; outer involucrel bracts smaller. Pappus in one series, bristly, dirty-white.

Being known only from the type collection, the achene characters are not clearly known. The founding author remarks 'mature achenes have not been examined'.

REFERENCES:

1. Clarke, C. B. (1876). *Comp. Ind.*, p. 273.
2. Hooker, J. D. (1881). *Fl. Brit. India* 3:411.

The material for this sheet was supplied by S. K. Mangain and R. R. Rao, Botanical Survey of India, Dehra Dun.

STATUS: Endangered and endemic, known only from type collection made in September, 1913 from Sikkim.

DISTRIBUTION: Sikkim Himalaya.

HABITAT AND ECOLOGY: Alpine and sub-alpine regions in exposed hill slopes, ca 5000 m alt.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive field surveys should be undertaken in the type locality and other adjacent areas for relocating the species; efforts should be made to protect the species in its natural habitat by declaring the type locality as protected; introduction of the species in the proposed Kanchendzunga Biosphere Reserve in north Sikkim.

BIOLOGY AND POTENTIAL VALUE: Being an endangered and endemic plant, this species is of great botanical interest. Studies on the economic value are not known.

CULTIVATION: Not known so far.

DESCRIPTION: Perennial herbs with long, woody rhizome. Stems absent or very short. Leaves all radical, rosulate, orbicular, glabrescent, entire or minutely remote-denticulate, about 2×2 cm; petioles ca 2 cm long, somewhat broad sheathed at base. Heads about 10-flowered, all ligulate, crowded, short peduncled, cylindrical. Involucral bracts about 6, linear oblong, ca 1.4×2 cm, pale green, membranous at margins, carinate, dorsally pilose, apex minutely white ciliate. Receptacle naked. Ligules yellow. Achenes ca 6 mm long, 9-ribbed, narrowed at base, hispid towards apex, distinctly constricted at beak. Pappus bearing cup-like disc, white, bristly.

REFERENCE:

1. Anthony (1934). Diagnoses specierum novarum. *Notes Roy. Bot. Gard. Edinburgh*, 18: 198.

The material for this sheet was supplied by S. K. Mangain and R. R. Rao, Botanical Survey of India, Dehra Dun.

STATUS: Endangered and endemic, known only from the type collection.

DISTRIBUTION: Uttar Pradesh: Kumaon, Kali Valley, 1820-2430 m alt.

HABITAT AND ECOLOGY: In open grassy meadows. Fls. & Frts.: September.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive field surveys should be undertaken in the type locality as well as similar habitats in adjacent areas for relocating this species; efforts should be made for protecting this species in its natural habitat. If there is any threat of its extinction, the species should be carefully introduced into gardens and after multiplication efforts should be to rehabilitate in its type locality.

BIOLOGY AND POTENTIAL VALUE: An endemic species of botanical interest. The species with fern-like foliage is quite distinct.

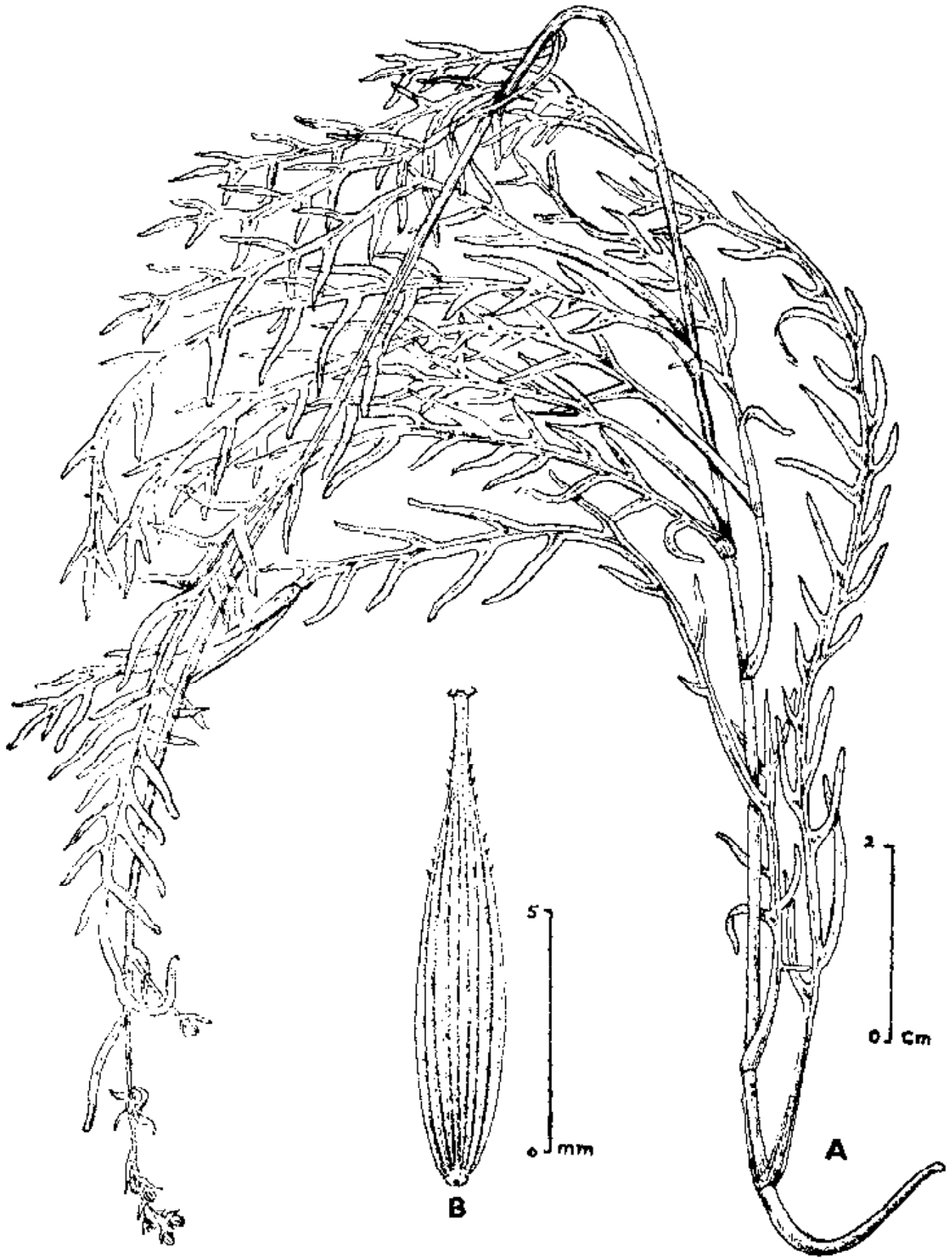
CULTIVATION: Not known so far.

DESCRIPTION: Perennial herbs. Stems ca 60-100 cm tall. Cauline leaves numerous, 15-25 cm long, pinnatifid, segments lanceolate or linear, ca 3.5-5.5 cm long. Inflorescence cymose, paniculate; peduncle slender, bracteate. Involucre 13-14 mm long; bracts imbricate. Achenes blackish, ca 6 - 6.5 × 1 mm, beaked, beak pale, ca 1-1.5 mm long. Pappus bristly, ca 5.5 mm long, snow-white.

REFERENCE:

1. Stebbins, G. L. (1939). Notes on some Indian species of *Lactuca*. *Ind. For. Rec. (N.S.) Bot.* 1: 241.

The material for this sheet was supplied by S. K. Mangain and R. R. Rao, Botanical Survey of India, Dehra Dun.



Lacinea filicina Duthie ex Stebbins A: Habit. B. Achene.

STATUS: Endangered.

DISTRIBUTION: Kashmir.

HABITAT AND ECOLOGY: In open meadows of the high altitudinal areas.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive search for the species in the region and adequate protection to its natural habitat is the only suitable measure.

BIOLOGY AND POTENTIAL VALUE: Apart from its botanical interest, nothing more is known.

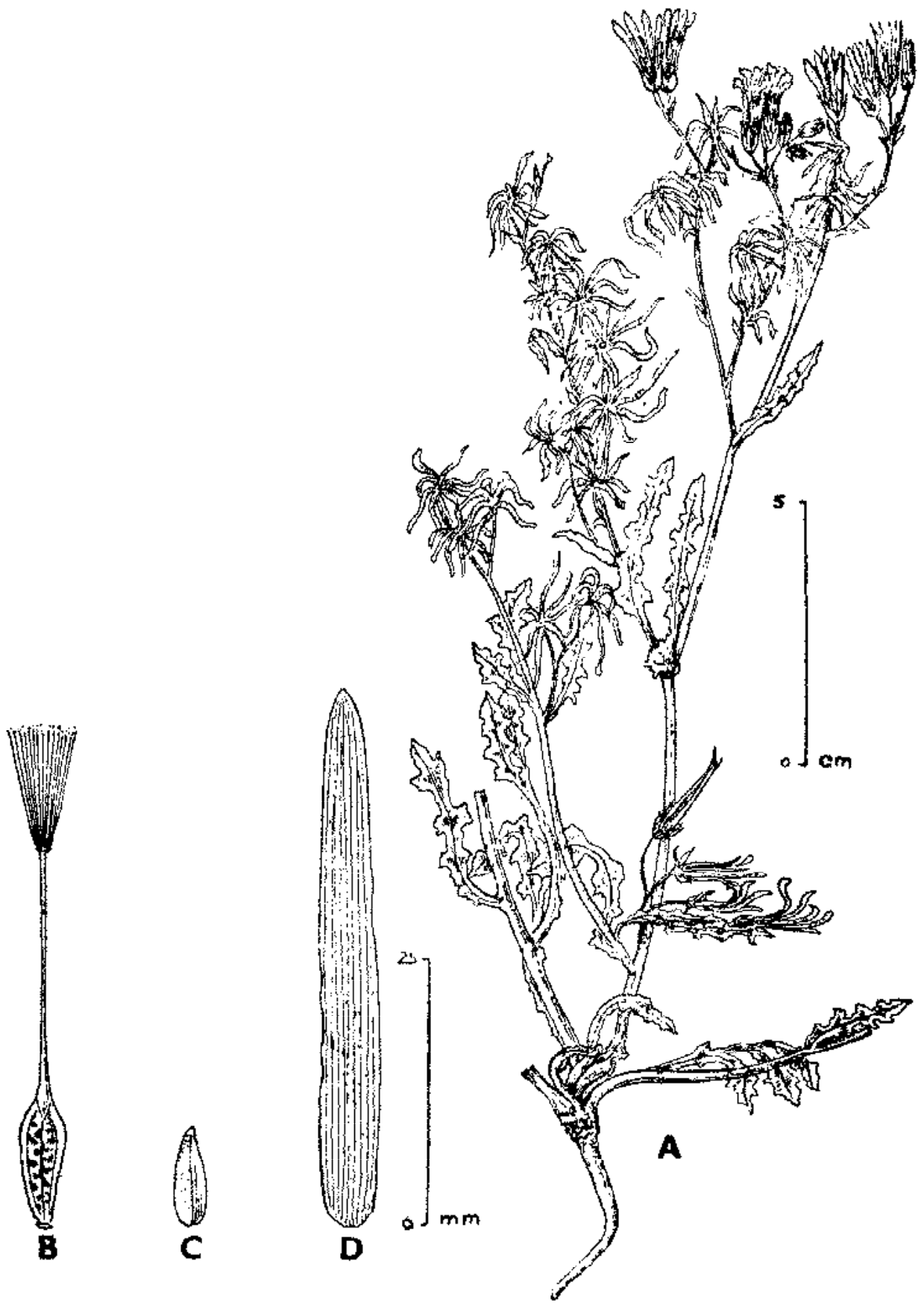
CULTIVATION: So far unknown.

DESCRIPTION: Annual herbs. Stem *ca* 15-35 cm high, glabrous or glaucous, succulent, stout, dichotomously branched from base. Leaves *ca* 1.7×0.5-2 cm, oblong-lanceolate, radical leaves sessile, narrowed at base, pinnatifid, lobes entire or sparingly toothed, cauline sessile, base dilated or auricled. Inflorescence sub-corymbose or terminal on the branches. Heads *ca* 1.7-2.2×0.4-0.5 cm, erect, narrow, cylindric, sub-racemose, 2-3-flowered. Peduncle slender, bracteate; ligule white, pink or bluish. Outer involucral bracts *ca* 3-5×1-1.5 mm, ovate, small, glabrous, gradually passing into inner, inner involucral bracts *ca* 18-20×1.5-2.0 mm, unequal, finely glabrous, obtuse, oblong, much narrowed. Achenes including a long white capillary beak *ca* 13-14 mm, oblanceolate, compressed, transversely rugose, margins thickened, scabrid, glabrous, pale. Pappus *ca* 4-6 mm long, milky white.

REFERENCES:

1. Ledebour, Carl F. von, (1830). *Ic. Fl. Ross.* 2:2 t.129.
2. Ledebour, Carl F. von, (1833). *Flora Altaica* 4:156.

The material for this sheet was supplied by S. K. Mamgain and R. R. Rao, Botanical Survey of India, Dehra Dun.



Lactuca undulata Ledeb. A. Habit. B. Achene. C. Outer invol. bract. D. Inner invol. bract.

STATUS: Endangered (3, 4); it has not been relocated after the type collection; the type in K.

DISTRIBUTION: Endemic to the Nilgiri hills; so far reported only from Kundah range, Nilgiris, Tamil Nadu based on the collection of P. V. Mayuranathan (1, 2).

HABITAT AND ECOLOGY: The species flowers in the month of September and was probably located in the vast stretches of grasslands (shrub-savannas) at high altitudes of Nilgiris.

CONSERVATION MEASURES TAKEN: The proposed Nilgiri biosphere reserve includes the type locality of the species.

CONSERVATION MEASURES PROPOSED: It is recommended that survey should be undertaken to determine its exact distribution localities, population sizes and threats to the habitats of the species.

BIOLOGY AND POTENTIAL VALUE: No information available.

CULTIVATION: None on record.

DESCRIPTION: Glabrous herbs. Leaves alternate, upper cauline, 6-12 × 1.0-2.1 cm, sessile, linear-oblong, apex rounded, base amplexicaul, auricles rounded. Corymbs terminal with few heads. Involucre bracts about 30 in 1 series, with 1-2 shorter at the base, 7.0-7.5 mm long, linear-obtuse or subacute, glabrous except at penicillate tips. Ray florets few in 1 row; ligule yellow; limb elliptic-oblong, shortly 3-toothed. Disk florets numerous, yellow, lobes 5, triangular.

REFERENCES:

1. Fischer, C.E.C. (1940). New or little known plants from Southern India-XII. *Bull. Misc. Inform.* 1940: 45-46.
2. Shetty, B. V. & Vivekananthan, K. (1981). Endemic, primitive, temperate elements and the relict vegetation of Kundah range, Nilgiris, Tamil Nadu. *Bull. Bot. Surv. India*, 23: 257.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 691.
4. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 26.

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

STATUS: Rare. There is no recent collection in Indian Herbaria and the species may have become vulnerable due to over-grazing in the alpine meadows.

DISTRIBUTION: Kashmir Himalayas. Endemic.

HABITAT AND ECOLOGY: On open slopes and meadows, amidst grasses in the alpine regions in the altitude of 4000-4500 m.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive field work to relocate its populations in the high altitude region, and protection of its natural habitat for *in situ* conservation.

BIOLOGY AND POTENTIAL VALUE: Of Botanical interest; flowers during August-September.

CULTIVATION: Not known.

DESCRIPTION: Herbs, 10.0-15.0 cm tall, stout, pubescent. Leaves 10.0-12.5 cm, obovate, sharply toothed, membranous, puberulous above, cottony or glabrate beneath, sessile or with winged petiole. Heads ca 0.8 cm across, in dense terminal cluster. Involucral bracts glabrate or cottony. Receptacle bristles longer than achenes.

REFERENCES:

1. Blatter, E. (1928). *Beautiful flowers of Kashmir* 1: 187.
2. Lipschitz, S. (1979). *Rod. Saussurea*, p. 209.

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

STATUS: Endangered (3, 5). It was described by J. S. Gamble (1) based on the collection of R. H. Beddome made during the year 1880 and has so far been not relocated or seen by recent workers studying the group (4).

DISTRIBUTION: Reported from a single locality in Southern Western ghats at Peermade, Idukki District, Kerala (former Travancore State) at an altitude of 1000 m (1, 2). Endemic.

HABITAT AND ECOLOGY: Probably in low level grasslands. Flowering has been recorded in the month of December.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: A search should be made to relocate the species. In this area the habitat destruction is very intensive due to the raising of plantation crops like coffee, tea, etc.

BIOLOGY AND POTENTIAL VALUE: An endemic species with narrow ecological amplitude (4).

DESCRIPTION: Apparently a shrub. Leaves 20 × 6 cm, lanceolate, acuminate, base attenuate, closely crenulate, villous above, densely white-woolly beneath. Heads many-flowered, in terminal corymbs. Involucre bracts many, lanceolate, acuminate, slightly araneous. Achenes tetragonus, almost winged, glabrous; outer pappus hairs paleaceous, fimbriate, inner deciduous.

REFERENCES:

1. Gamble, J. S. (1920). Decades Kewensis. *Bull. Misc. Inform.* 1920: 340-341.
2. Gamble, J. S. (1957). *Fl. Pres. Madras* 2: 472, 475. Botanical Survey of India, Calcutta (repr. ed.).
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 691.
4. Rau, M. A. & Narayana, B. M. (1983). A review of the tribe Vernonieae (Asteraceae) in South India. *Bull. Bot. Surv. India* 25: 24.
5. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of threatened plants of India*. Botanical Survey of India, Howrah. p. 26.

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

STATUS: Endangered (4, 6); a slender undershrub known only by its type collection made by P. F. Fyson during the year 1916.

DISTRIBUTION: Endemic to Pulney Hills of Southern Western ghats, occurring along the banks of the Pambar river and Shembaganur hillside in Kodaikanal at an altitude of about 2300 m (1, 2, 3).

HABITAT AND ECOLOGY: In open forests along the banks of rivers at high altitudes; flowering reported during the months of March and April (1).

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Further intensive exploration in its known and likely localities are to be made and the natural range of the species has to be assessed for suggesting suitable conservation measures.

BIOLOGY AND POTENTIAL VALUE: A detailed phytogeographical analysis undertaken has revealed that the South Indian species of *Vernonia* with the exception of the weedy and widespread species, have limited amplitude and many of them are restricted to hilly regions. Any further disturbance caused to these habitats by the indiscriminate exploitation of the forests will lead to the elimination of these species (4).

CULTIVATION: None on record.

DESCRIPTION: A slender undershrub, not much branched. Leaves 5-10 x 2-4 cm, ovate, acute, narrowed at base, distantly shortly serrate, membranaceous, sparsely moniliform hairy above, pubescent beneath, main nerves few, distant. Flower-heads medium sized, 12-15-flowered, purple, white cottony, in short, capitulate terminal corymbs. Outer involucre bracts ovate, long mucronate, inner obtuse. Achenes 10-ribbed, glabrous; pappus 5 mm long, white.

REFERENCES:

1. Fyson, P. F. (1932). *The Flora of the South Indian Hill Stations* 1: 310-311; 2: t. 249. Government Press, Madras.
2. Gamble, J. S. (1920). *Decades Kewensis. Bull. Misc. Inform.* 1920: 341.
3. Gamble, J. S. (1957). *Fl. Pres. Madras.* 2:473. Botanical Survey of India, Calcutta. (repr. ed).
4. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of India. *J. Bombay Nat. Hist. Soc.* 75: 691.
5. Rau, M. A. & Narayana, B. M. (1983). A review of the tribe Vernoniae (Asteraceae) in South India. *Bull. Bot. Surv. India* 25: 23.
6. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of threatened plants of India.* Botanical Survey of India, Howrah. p. 26.

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

STATUS: Endangered or possibly Extinct; the species (2, 5), was described by S. Moore (3) based on two collections made by R. H. Beddome around the year 1857 and deposited in the British Museum, London (BM); so far not recollected by recent workers (4).

DISTRIBUTION: Endemic to southern Western Ghats; restricted to Anamalai hills of Tamil Nadu at an altitude of 2,000 m (1, 3).

HABITAT AND ECOLOGY: Probably occurs in high altitude grasslands (shrub-savannas).

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: An intensive search should be made to relocate the species for *in situ* and *ex situ* conservation. Most of the hilly species of *Vernonia* in South India have very restricted distribution (4).

BIOLOGY AND POTENTIAL VALUE: Closely allied to *Vernonia peninsularis* C. B. Clarke, another endemic species confined to southern Western Ghats.

CULTIVATION: Not known.

DESCRIPTION: Apparently a shrub; stems quadrangular, densely brown-pubescent. Leaves 6-9 x 2.5-4.5 cm, ovate or ovate-oblong, crenate-serrulate, mucronate, membranaceous; petioles small. Heads about 40-flowered, in corymbs. Outer involucral bracts long, aristate, recurved. Achenes clavate-turbinate; pappus yellowish.

REFERENCES:

1. Fischer, C. E. C. (1957). *Fl. Pres. Madras* 3: 1301. Botanical Survey of India, Calcutta (repr. ed.).
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 691.
3. Moore, S. (1925). Notes from Beddome's Herbarium (South India). *Indian J. Bot.* 63: 171.
4. Ran, M. A. & Narayana, B. M. (1983). A review of the tribe Vernonieae (Asteraceae) in South India. *Bull. Bot. Surv. India* 25: 24.
5. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of threatened plants of India*. Botanical Survey of India, Howrah. p. 27.

The materials for this sheet was supplied by K. Vivekananthan, Botanical Survey of India, Coimbatore.

STATUS: Endangered (3, 6); it was collected by J. S. Gamble in the last century and has not so far been rediscovered; known only from its type in K.

DISTRIBUTION: Endemic to a single locality in Western Ghats at Sispara, Nilgiri hills at an altitude of about 2,060 m.

HABITAT AND ECOLOGY: There are about 28 endemic flowering plants confined to Sispara and its surrounding areas (Kundah range), Nilgiris, Tamil Nadu, characterised by vast stretches of grasslands (shrub savannas) interrupted by numerous small woods known as *sholas* which are the montane variation of wet evergreen forests (5). Flowering in this species was recorded in the month of November (2).

CONSERVATION MEASURES TAKEN: The Government of India proposes to constitute the Nilgiri Biosphere Reserve as one of the first biosphere reserves of the country (1), which includes the type locality of the species.

CONSERVATION MEASURES PROPOSED: Further search and surveys in known and likely localities of this species are the first pre-requisite. Babcock (2) has drawn the attention of Indian botanists for further collection from Nilgiris and has also suggested intensive exploration in the higher elevations of Cardamom-Palney hill region.

BIOLOGY AND POTENTIAL VALUE: It is a remarkable species of great scientific interest from taxonomic, phylogenic and phyto-geographical aspects. The morphology of this indicates that it is somewhat a primitive species and may represent the ancestral stock from which a section of the genus had evolved. Its occurrence in an isolated highland suggests that it may be a relict endemic (2), and also serves as an example of a genus which is northern in origin but appears to have produced at least a section in South India (4).

CULTIVATION: So far none.

DESCRIPTION: Perennial herbs, 30-47 cm high. Radical leaves 10-16 x 1.5-3.0 cm, oblanceolate, lyrate-pinnatifid, acute, upper surface puberulous, lower surface glabrous; petiole long; cauline leaves: lower ones similar to radical leaves or acuminate; upper ones sessile, lanceolate, acuminate-caudate. Heads 2-4 together, about 13-flowered. Peduncle 1.5 cm long, glabrous. Involucre 8-9 mm long, glabrous, dark green. Flowers yellow. Corolla 9-10 mm long; ligule 2 mm broad, dentate, 1.0-1.5 mm long; tube 2 mm long, acuminate. Anthers 2 mm long; appendages 0.25 mm long, acuminate; filament 1 mm long. Achenes 5 mm long, sub-compressed, apex pale and strongly attenuate, base scarcely attenuate, ribs 12-14, unequal, brown. Pappus 5 mm long, 2-3 serrate, ash-grey.

REFERENCES:

1. Anon. (1980). *In: The Nilgiri Biosphere Reserve. Project Document.* I. Indian National Man and Biosphere Committee, Dept. of Environment, Government of India, New Delhi.
2. Babcock, E. B. (1940). A new species of *Youngia* and its bearing on the distribution and phylogeny of certain species. *Bull. Misc. Inform.* 1939: 662-663.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 691.
4. Razi, B. A. (1955). Some observations on plants of the South Indian hill tops and their distribution. *Proc. Nat. Inst. Sci. India* 21B: 88.
5. Shetty, B. V. & Vivekananthan, K. (1981). Endemic, primitive, temperate elements and the relict vegetation of Kundah range, Nilgiris, Tamil Nadu. *Bull. Bot. Surv. India* 23: 254-264.
6. Vajravelu, E. & Daniel, P. (1983). *In: Jain, S. K. & Sastry, A. R. K. (ed.). Materials for a Catalogue of threatened plants of India.* Botanical Survey of India, Howrah. p. 27.

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

STATUS: Rare.

DISTRIBUTION: Uttar Pradesh (Kumaon). Endemic.

HABITAT AND ECOLOGY: In open slopes forming thickets at ca 2500 m alt.

CONSERVATION MEASURES TAKEN: None so far, not even listed in the threatened plants catalogues so far published.

CONSERVATION MEASURES PROPOSED: Field surveys should be undertaken to relocate this species in its type locality and similar adjacent habitats; the habitat of this species should be conserved; efforts be made for *ex situ* conservation.

BIOLOGY AND POTENTIAL VALUE: Apart from botanical interest, other uses of this are not known; most species of *Berberis* are of medicinal value.

CULTIVATION: Not known in cultivation so far; but efforts should be made to study the ecological requirements of this species.

DESCRIPTION: Shrubs. Stems terete to subangled, pale-yellow. Spines absent or weak, concolorous. Leaves 4-8 x 1.2 cm, narrowly obovate to oblanceolate; apex narrowly acuminate or subacuminate; margins entire or 2-4 spinose. Racemes 1-25 flowered. Flowers yellow. Berries ovoid, stylose.

REFERENCE:

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

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

STATUS: Indeterminate; it is known only from Schneider's description.

DISTRIBUTION: Kashmir. Endemic.

HABITAT AND ECOLOGY: Not known.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive field surveys are necessary to relocate this species from its type locality as well as from adjacent areas. Being an alpine species, conservation in nature will be the best measure.

BIOLOGY AND POTENTIAL VALUE: Not known, but most of the *Berberis* species have medicinal value and the berries are also edible.

CULTIVATION: Not cultivated; but trials should be made, once this species is relocated.

DESCRIPTION: Shrubs; stems angled. Internodes ca 2 cm; spines slender, 1-2 cm, concolorous. Leaves subcoriaceous, petiolate, oblong-obovate, subacute, margins usually with 1-4 spinules towards apex, rarely entire; under surface pruinose grey, papillose. Racemes 3-6 cm long, 10-18 flowered, sometimes compound below, pedicels 5-10 mm long. Petals entire, 6 mm long, yellow. Ovules stipitate; style distinct.

REFERENCES:

1. Ahrendt, L. W. A. (1961). *Berberis & Mahonia: A Taxonomic Revision*. *J. Linn. Soc. London* 57: 1-410.
2. Jafri, S. M. H. (1975). *Fasc. Fl. W. Pakistan* 87: 1-31.

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

STATUS: Rare; endemic.

DISTRIBUTION: Jammu and Kashmir, Mantnar valley near Desu.

HABITAT AND ECOLOGY: Amidst Juniper scrub on south facing slope of the valley at 2500 m altitude.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: The type locality should be carefully surveyed for locating this species. The species should be conserved *in situ* by protecting the habitat and the plants.

BIOLOGY AND POTENTIAL VALUE: Not studied; other species of *Berberis* are of medicinal value.

CULTIVATION: Not so far brought under cultivation.

DESCRIPTION: Shrubs, upto 2-3 m; stems glabrous, terete to subsulcate, yellowish; spines yellow-brown, 3-fid. Leaves 3-6 × 1-1.8 cm, narrowly obovate, apex acute to sub-acuminate, margins 15-25 spinose. Racemes 8-10 flowered; outer sepals 5.5 × 3.5 mm, ovate, acute; inner sepals 6-7 × 5.5-6 mm, obovate; petals 4.5 × 4 mm, broadly elliptic; glands elliptic; stamens 4 mm. Berries oblong-ellipsoid.

REFERENCES:

1. Ahrendt, L. W. A. (1961). *Berberis & Mahonia: A Taxonomic revision*. *J. Linn. Soc. London* 57: 1-410.
2. Jafri, S. M. H. (1975). *Fasc. Fl. W. Pakistan* 87: 1-31.
3. Hajra, P. K. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of threatened plants of India*. Botanical Survey of India, Howrah. p. 50.
4. Hajra, P. K. (1984). In: Jain, S. K. & Sastry, A. R. K. (comp.). *The Indian Plant Red Data Book-I*. Posscef, Botanical Survey of India, Howrah. p. 53.

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

STATUS: Vulnerable or Endangered. The species was described on the basis of Lambert's solitary collection gathered from Kumaon in 1920. Since then this species has not been collected again.

DISTRIBUTION: Uttar Pradesh (Kumaon). Endemic.

HABITAT AND ECOLOGY: In the altitude of *ca* 2600 m, in association with *Berberis chitria*.

CONSERVATION MEASURES TAKEN: None, but listed in Plants of North-Western Himalaya with restricted distribution (2), stating its vulnerability.

CONSERVATION MEASURES PROPOSED: The species should be conserved in nature. The type locality of this species is in between Humidhura and Ratapani. It has been mentioned as growing in association with *Berberis chitria*; hence this locality should be carefully surveyed for relocating this species. Similar habitats, where *Berberis chitria* grows should also be searched.

BIOLOGY AND POTENTIAL VALUE: No studies have been made for this species, however some other species of the genus are of medicinal value.

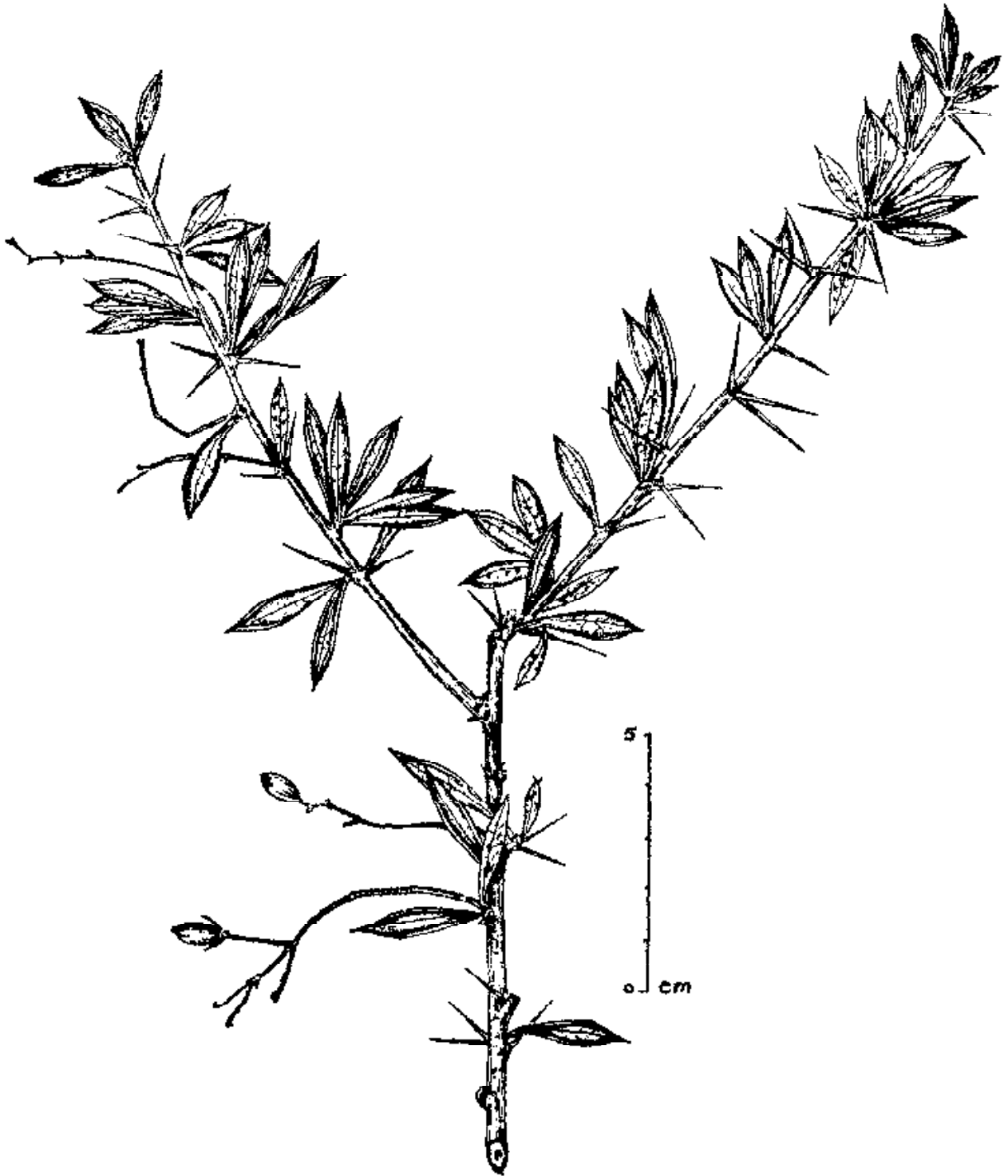
CULTIVATION: Not cultivated.

DESCRIPTION: Shrubs, *ca* 1.5 m high. Stems glabrous, angled and finely sulcate, pale yellow; spines slender, 1-3 fid. Leaves 12-28 × 2.7 mm, oblanceolate, sessile, entire, revolute, mucronate. Inflorescence pseudoumbellate or subracemose, 4-7 flowered, 2.5-7 cm long; pedicels fairly stout, 5-15 mm long. Ovules 3-6. Berries red, oblong-ovoid, estylose.

REFERENCES:

1. Ahrendt, L. W. A. (1961). *Berberis & Mahonia: A Taxonomic Revision*. *J. Linn. London* 57: 1-410.
2. Hajra, P. K. (1983). Plants of North-Western Himalayas with restricted distribution—A census. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 1-22.
3. Hajra, P. K. (1984). In: Jain, S. K. & Sastry, A. R. K. (ed.). *The Indian Plant Red Data Book-I*. Posscef, Botanical Survey of India, Howrah. p. 54.

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



Berberis Lambertii Parker. Fruiting twig.

STATUS: Rare. After Osmaston's collection from Kheta village in 1932, this species has been collected only once.

DISTRIBUTION: Uttar Pradesh, Garhwal, in restricted localities. Endemic.

HABITAT AND ECOLOGY: Open dry, hill slopes at higher altitudes.

CONSERVATION MEASURES TAKEN: None so far, but included in the list: 'Plants of North-Western Himalayas with restricted distribution' (2).

CONSERVATION MEASURES PROPOSED: This species should be searched in the type locality and depending upon the population size, the area may be declared as protected.

BIOLOGY AND POTENTIAL VALUE: Not known as far.

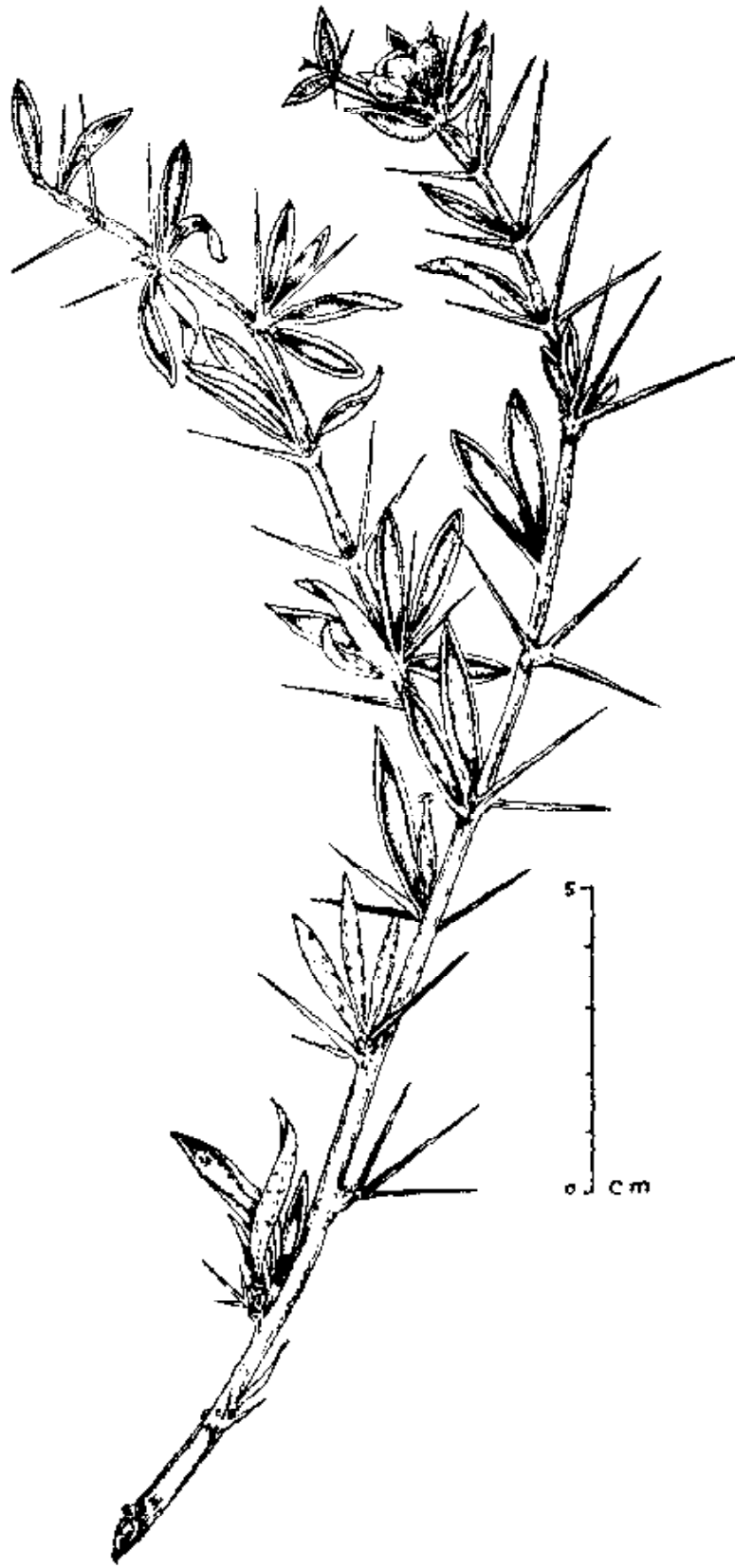
CULTIVATION: Not known.

DESCRIPTION: Subprostrate shrubs. Stems terete or subterete; mature shoots yellow. Spines 3-fid, slender, 1-3 cm. Leaves 10-20 × 2-3 mm, linear-oblong or very narrowly elliptic, margins entire, revolute. Flowers solitary. Outer sepals 3.5 × 1 mm, oblong-lanceolate; inner sepals 7 × 3.5 mm, narrowly obovate. Petals 6 × 2.5 mm, entire; glands orbicular; stamens 5 mm, produced, apiculate. Berries ovoid, stylose.

REFERENCES:

1. Ahrendt, L. W. A. (1961). *Berberis & Mahonia: A Taxonomic Revision*. *J. Linn. Soc. London* 57: 1-410.
2. Hajra, P. K. (1983). Plants of North-Western Himalayas with restricted distribution—a census. In: Jain S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 1-12.

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



Berberis osmastonii Dunn Fruiting branch.

STATUS: Vulnerable. The causes for its decline are forest fires, and denuded forests due to developmental activities. Endemic to peninsular India.

DISTRIBUTION: Confined to peninsular India, essentially in Tirunelveli district in Tamilnadu. Leschenault had reported it from near Pondicherry but possibly he had collected it from Tamilnadu on his way to Pondicherry. Except for one solitary sheet of Calder & Ramaswamy at CAL from Kerala there are no other collections from this State. In Tamilnadu, it has been collected from Anamalais in 1873 by Beddome and from Tanjavur by Pierre in 1861 but presently it is restricted to Tirunelveli district only.

HABITAT AND ECOLOGY: Along dry scrubland or borders of deciduous forests, at low elevations in rocky soil associated with *Cadaba trifoliata* (Roxb.) Wight & Arn. and *Capparis divaricata* Lamk.

CONSERVATION MEASURES TAKEN: Nil. The plants are scattered, rare and often mistaken for *C. divaricata* when in foliage.

CONSERVATION MEASURES PROPOSED: The only remedial step to protect the dwindling populations is to raise them in experimental gardens. In the absence of prompt action, the species is likely to disappear within a decade. As the species is concentrated around Courtallam and vicinity any habitat destruction may be detrimental to its survival in nature.

BIOLOGY AND POTENTIAL VALUE: Nothing much is known. Animals eat the fruits, hence hardly a few fruits ever attain maturity.

CULTIVATION: Not known.

DESCRIPTION: Shrub upto 2 m tall, armed with very few straight or slightly curved slender spines. Leaves lustrous, coriaceous, variable, often dimorphic, if linear-oblong 2.5-3.8 × 0.3-0.6 cm, if elliptic-ovate 5.6-9.0 × 2.0-3.4 cm, lateral nerves 5-7 pairs, reticulation distinct. Flowers showy, reddish-purple to violet, 3.5-4.5 cm across, 3-8 flowers conferted to a subumbel; pedicels puberulous, 6-8 mm long, early glabrescent. Sepals ovate, 7-8 × 3.5-4.0 mm, densely tomentose inside. Petals ovate or obovate, 11-14 × 6.5-8 mm, glabrous except towards base. Stamens 40-60, much exceeding gynophore. Ovary fusiform ca 6 × 2 mm, beaked, glabrous; gynophore 5-9 mm long, bent, upto 11 mm long in fruit, hardly incrassate. Berry ovoid to ellipsoid, 3-3.5 × 2 cm, smooth, apiculate on a thin stipe, pericarp thin. Seeds 8-10, each 6.5-7 × 6 mm.

In its dimorphic leaves, it is sometimes confused with *C. divaricata* Lamk. but the leaves are never so narrowly linear as in the latter species. Twigs, irrespective of broad or narrow leaves bear flowers and sterility is not linked with narrow leaves. The lateral veins are not conferted towards base as in *C. divaricata* and at any rate, easily distinguished from it in flowering or fruiting twigs.

REFERENCES:

1. Gamble, J. S. (1915). *Fl. Pres. Madras* 1: 45. (repr. ed. 1: 33, 1957).
2. Hooker, J. D. (1872). *Fl. Brit. India* 1: 175.
3. Jacobs, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12: 448-449.
4. Wight, R. & Walker-Arnott, G. A. (1834). *Prodr. Fl. Ind. Orient.* 1: 27.
5. Wight, R. (1837). *In: Hooker, J. D., Ic Plant.* t. 181.

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

STATUS: Rare; unless protected or raised in experimental gardens it is likely to become extinct due to forest fires, shifting cultivation and loss of habitat.

DISTRIBUTION: The species is restricted to Kerala and Tamil Nadu. Beddome during the years 1869-1872 had collected two species of *Capparis* from Courtallam in Tirunelveli district and Poolery Pass along Travancore ghats but he mistook both as belonging to *C. parviflora* Hook. f. & Thoms. non Boiss. (now treated as *C. shevaroyensis* Sundararaghavan). The specimens from Courtallam are indeed referable to *C. shevaroyensis* (= *C. parviflora* Hook. f. & Thoms.). The other two collections of Beddome from Travancore were described as a new species, *C. tomentella* by Dunn in 1916. Dunn in 1914 had also described a new species *C. fusifera* based on Barber's collections in April 1903 from Udumanparai, Anamalais in Tamilnadu, unaware that his *C. tomentella* and *C. fusifera* refer to one and the same species. In fact, Beddome's plate in *Icon. Pl. Ind. Or.* t. 276, 1874 truly depicts *C. fusifera* Dunn in floral characters except for the fruit which belongs to *C. parviflora* Hook. f. & Thoms, which had got mixed up.

Though the type locality of *C. fusifera* Dunn is in Anamalais, it has not since been recollected from Anamalais. After a lapse of nearly 100 years since Beddome's collection from Kerala, Joseph & Chandrasekharan in 1973 had rediscovered the species from Bonaccord estate along the Western slopes of Agastyamalai in Kerala. N. C. Nair in October 1979 had collected the same species from Silent valley in Kerala.

HABITAT AND ECOLOGY: In semi-evergreen and evergreen forests between 875-1000 m altitude.

CONSERVATION MEASURES TAKEN: Silent valley is already declared as a National Sanctuary.

CONSERVATION MEASURES PROPOSED: It is essential that efforts be made to raise the plants from seeds in experimental gardens and later reintroduced into original habitats. If the surviving plants are lost, the species is likely to be extinct.

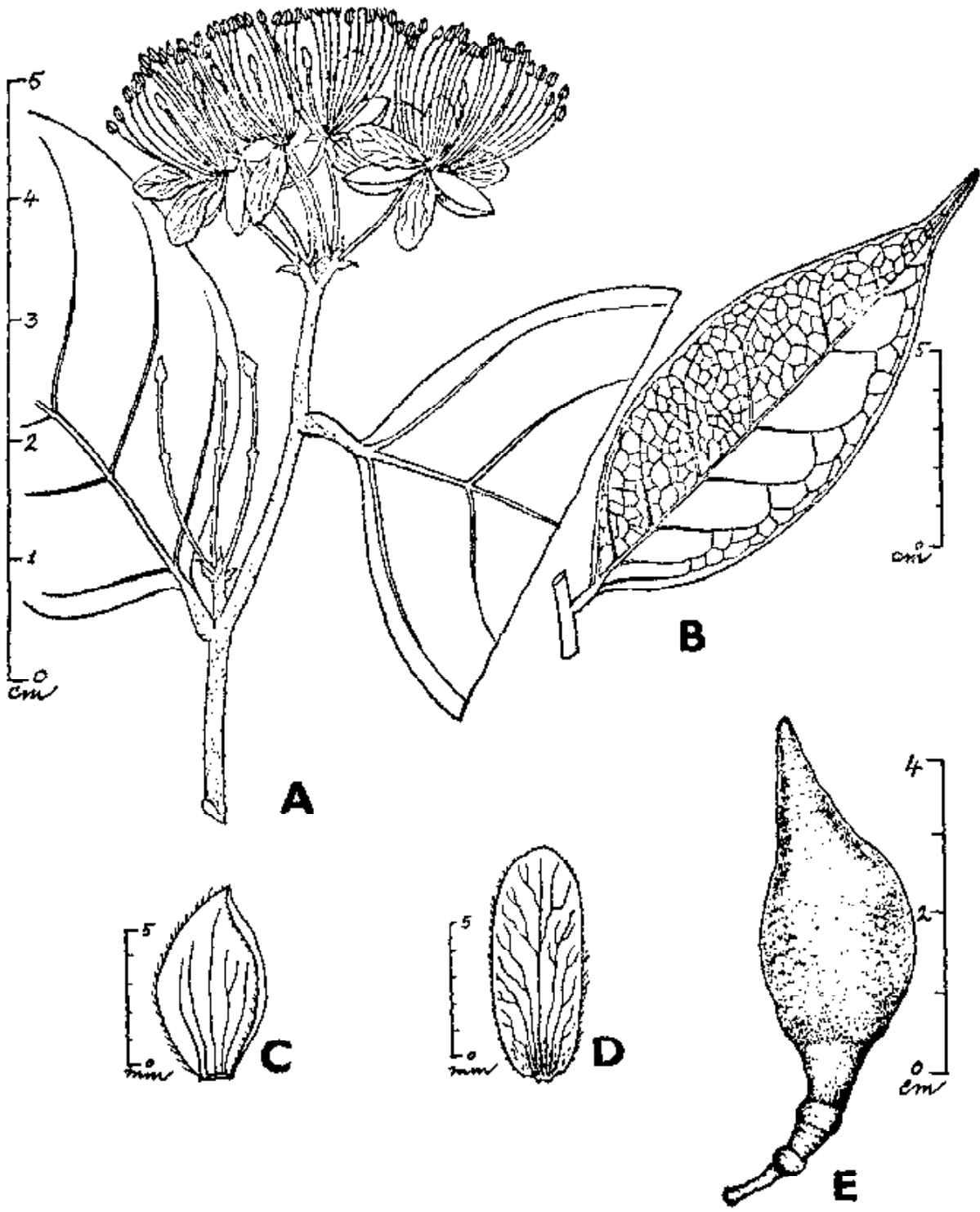
BIOLOGY AND POTENTIAL VALUE: The spindle shaped fruits are striking in this species.

DESCRIPTION: Puberulous, branched shrubs upto 3 m tall, cataphylls seen; stipular thorns 2, erect or curved near tip but mostly wanting. Leaves chartaceous, drying greenish-yellow, elliptic-oblong, 11-16 × 4.5-7.5 cm, base obtuse, apex abruptly acuminate, reticulation distinct, midrib 8-11 pairs. Inflorescence 3-6 flowered, condensed, axillary or subterminal umbel. Flowers odorous, greenish-white, 1.2-1.4 cm across, on filiform pedicels of 1.2-1.6 cm long. Sepals ovate, 6-8 × 3-5.5 mm, thick, glabrous except for puberulous margins. Petals oblong, 8-10 × 3.5-4 mm, sparsely tomentose, apex obtuse. Stamens 40-48, filaments exceeding gynoecium. Ovary 1(2)-locular, ellipsoid or ovoid, glabrous, 1.7-2.2 × 0.6 cm on a short gynophore, 6-7 mm long, much incrassate in fruit. Fruit fusiform to spindle shaped, 4.4-5 × 2.2-2.5 cm, beaked, surface warty; seeds 1-2, 1.8-2 × 0.8-1.2 cm.

REFERENCES:

1. Beddome, R. H. (1874). *Jc. Pl. Ind. Orien.* t. 276. (as *Capparis parviflora* Hook. f. & Thoms.)
2. Dunn, S. T. (1914). *Kew Bull.* 377.
3. Jacobs, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12: 454-455.
4. Joseph, J. & Chandrasekharan, V. (1978). A critical note on *Capparis fusifera* Dunn (Capparaceae). *Bull. Bot. Surv. India* 20 (1-4): 156-168. fig. 1-7.

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



Capparis fusifera Dunn A. Flowering twig. B. Leaf. C. Sepal. D. Petal. E. Fruit.

STATUS: Rare, due to habitat loss for increased acreage of cash crops, extraction of manganese ores and for developmental activities like hydro-electric projects in its distribution range.

DISTRIBUTION: Along Western Ghats, mostly North Kanara southwards to Goa and Kerala. In Tamilnadu it is confined to Tirunelveli district. Endemic to Western Ghats.

HABITAT AND ECOLOGY: At low elevations of 150-700 m in moderate to heavy rainfall areas of moist deciduous to evergreen forests; prefers laterite soil.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: The wildlife sanctuaries and biosphere reserves existing and proposed along Western ghats, will go a long way in protecting this species. Serious efforts should be made to raise it in experimental gardens.

BIOLOGY AND POTENTIAL VALUE: A handsome shrub, whether in foliage or in flowers. It can be introduced as a hedge plant in gardens for its showy, large white, bluish tinged flowers.

CULTIVATION: No record.

DESCRIPTION: Erect shrubs, 2-4 m tall; branches brown pubescent but later glabrescent; shoots armed with short, straight, stipular spines, most often wanting, cataphylls present. Leaves elliptic-ovate to lanceolate, 8-19 × 4-7.5 cm, apex acute, mucronate, lateral nerves in 2-5 pairs, oblique and confluent towards base. Flowers white, bluish tinged, sometimes lilac, showy, 8-12 cm across, mostly axillary solitary, rarely in a much condensed raceme, bracteate. Sepals elliptic, 11-15 × 6-8 mm, densely villous. Petals obovate, 3-5 × 2-3.5 cm, upper pair with a yellowish blotch near throat. Stamens over 80, densely packed, exceeding gyno-phore. Ovary oblong, 5-7 × 1.5 mm, densely tomentose, 4-angled, furrowed, on a gyno-phore, 3.5-4 cm long; placentae 4, ovules many. Fruits oblong to ovoid-fusiform, faintly ribbed, beaked, 5.5-7 × 2-3.5 cm, on a thin stipe, 5-8 × 0.2 cm, 18-22 seeded.

REFERENCES:

1. Gamble, J. S. (1915). *Fl. Pres. Madras* 1: 45. (under *C. heyneana*) (repr. ed. 1: 32, 1957).
2. Jacobs, M. (1965). The genus *Capparis* (Capparaceae) from the Indus to the Pacific. *Blumea* 12: 435-436.
3. Nicolson, Dan H. (1978). The reinstatement of *Capparis rheedii* DC. (Capparaceae). *Bull. Bot. Surv. India* 17: 160-161.
4. Saldanha, C. J. (1984). *Fl. Karnataka* 1: 314.
5. Talbot, W. A. (1909). *For. Bombay Pres. & Sind* 1: 54-55. t. 34.
6. Wight, R. & Walker-Arnott, G. A. (1834). *Prod. Fl. Ind. Orient.* 1: 25.

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

STATUS: Vulnerable. The cause for its decline in nature is due to degradation of the habitats.

DISTRIBUTION: Endemic to Tamilnadu, confined to two districts viz., Ramanathapuram and Tirunelveli only. Wight had originally collected it from Shewageri hills (Sivagiri hills) in Ramanathapuram and subsequently Beddome had recorded it from Anamalais and Tirunelveli during 1864-1879. At MH, there are recent collections from these two districts but herbarium records reveal that it is becoming scarce and gradually on the decline. Without protection or remedial measures, it is likely to be extinct very soon.

HABITAT AND ECOLOGY: In moist forests from 400-800 m associated with *Capparis diversifolia*, *C. spinosa*, etc. It has often been confused with *C. fusifera* Dunn. The narrow greenish-yellow oblong-lanceolate leaves with petioles of 2.5 mm or less, smaller flowers of 6-8 mm across, sepals and petals not exceeding 4 mm in length, slender non-incrassate fruiting stalks and globose or pisiform fruits 8-10 mm in diameter distinguish it from *C. fusifera*. The short straight, stipular spines hardly ca 1 mm long (mostly lacking in tender twigs) and leaf apices neither notched nor retuse readily separates it from *C. sepiaria* even in the vegetative state.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: Courtallum falls (in Tirunelveli district) being of tourist attraction partly accounts for its depleted population in nature. This species could be easily raised in experimental gardens and later reintroduced in the original or similar habitats.

BIOLOGY AND POTENTIAL VALUE: Not known.

DESCRIPTION: Much branched wiry shrub upto 3 m tall, mostly unarmed, if armed thorns few, straight, ca 1 mm pointing upwards. Leaves glabrous, lanceolate or oblanceolate, 5-12 × 1.6-3.8 cm, dull green above, pale greenish-yellow beneath, base narrow, cordate, apex acute or abruptly acuminate, lateral nerves 6-9 pairs. Flowers small, 6-8 mm across, white, odorous, in lax 6-8 (-10) flowered umbels. Sepals 3-3.5 × 1.5-1.8 mm. Petals oblong to obovate, 3-4 × 2 mm. Stamens 20-30 (-40). Ovary on a short, 4-5 mm long, filiform gynophore, that is hardly incrassate in fruit. Berry yellowish, globose or pisiform, 8-10 mm across, one seeded.

REFERENCES:

1. Hooker, J. D. & Thomson, T. (1872). Capparideae. *Fl. Brit. India* 1: 176.
2. Gamble, J. S. (1915). *Fl. Pres. Madras* 1: 46. (repr. ed. 1: 33. 1957).
3. Sundararaghavan, R. (1982). A new name for an Indian *Capparis*. *Kew Bull.* 37: 72.

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

STATUS: Endangered. Not collected after type collection by J. F. Duthie in 1885.

DISTRIBUTION: Garhwal Himalaya, Uttar Pradesh. Endemic.

HABITAT AND ECOLOGY: Rocky slopes at 3350--3650 m, with *Arenaria depauperata* (Edgew.) Hara, and herbaceous species of Primulaceae, Rosaceae, etc.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: If population is re-discovered at or near the type locality, efforts may be made to protect them in the natural habitat.

BIOLOGY AND POTENTIAL VALUE: Produces white flowers in August-September. Potential value is not known.

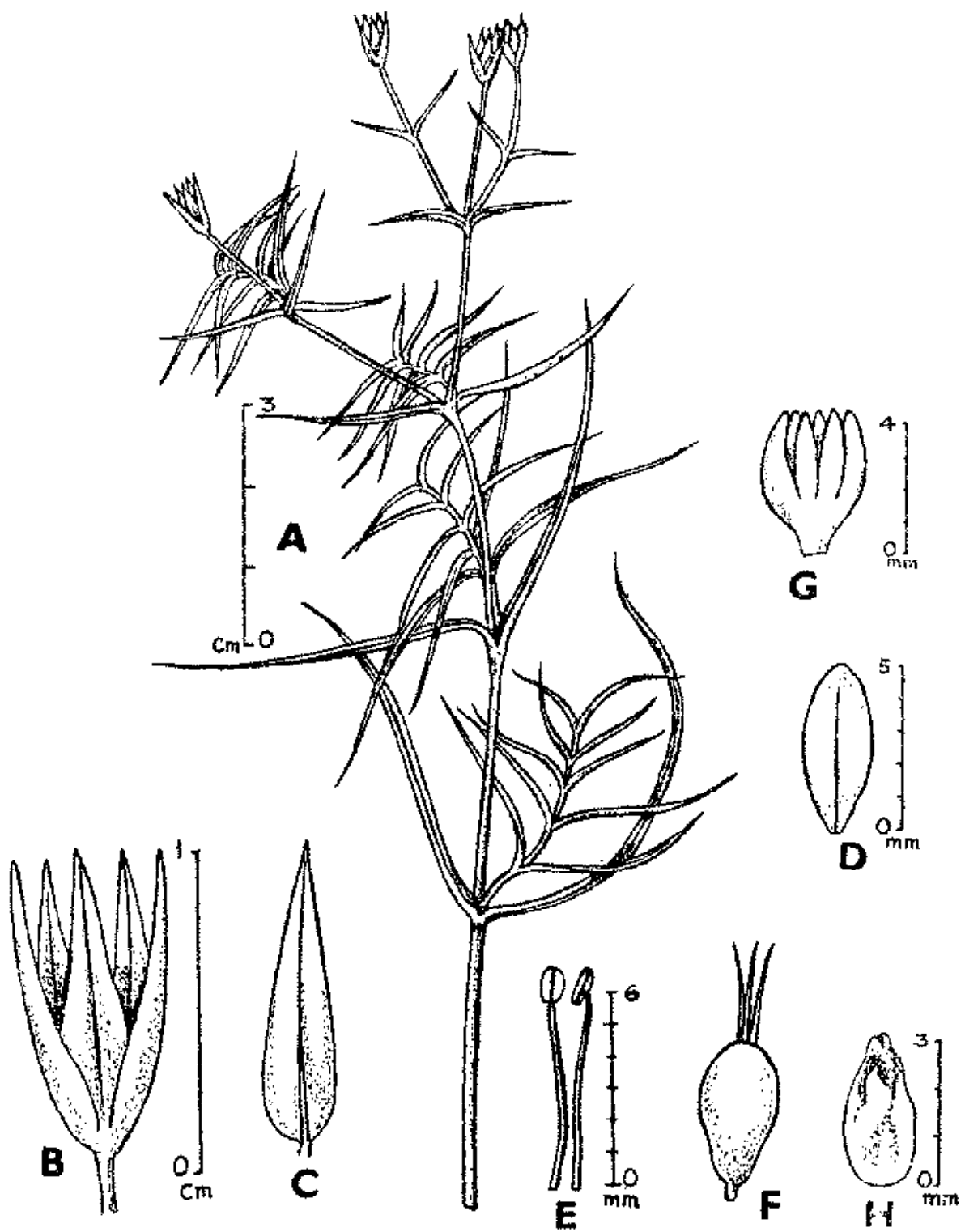
CULTIVATION: Not known to be in cultivation.

DESCRIPTION: Herbs, 30-60 cm tall, branching at upper nodes. Stem cylindrical, minutely puberulent. Leaves linear, subulate or linear-lanceolate, acuminate, scabro-puberulent at base, 25-55 × 1-3 mm, usually curved. Flowers few, in terminal cymes, pedicels upto 32 mm long, bracts 4-6 mm long, foliaceous. Sepals 5, glabrous, ovate-lanceolate, 8-10 mm long. Petals 5, oblong, entire, 5-6 mm long, obtuse. Stamens 4-6 mm long, anthers elliptic. Ovary globose, 1-2 mm in diam., styles 3. Capsules obovate, 4-5 mm long, 6-valved. Seeds ovate-oblong, flat, 3 mm long, rough.

REFERENCE:

1. Majumdar, N. C. (1980). *Blumea* 26: 445-448.

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



Arenaria curvifolia Majumdar A. Habit. B. Flower. C. Sepal. D. Petal. E. Stamens. F. Pistil. G. Capsul-dehisced. H. Seed.

STATUS: Endangered. It has not been collected after J. F. Duthie's collections (1886) from Kali Valley and Dhauli Valley. Grazing seems to be a threat factor.

DISTRIBUTION: Kumaon Himalaya, Uttar Pradesh. Endemic.

HABITAT AND ECOLOGY: Grows amidst rocks in the Himalayan valleys at 2100-3000 m, with *Silene kumaonensis* Williams and other herbaceous species.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Intensive search in the type locality may help to find out some populations of the species. Proper care is needed to promote survival of the species in the original habitats.

BIOLOGY AND POTENTIAL VALUE: Not known.

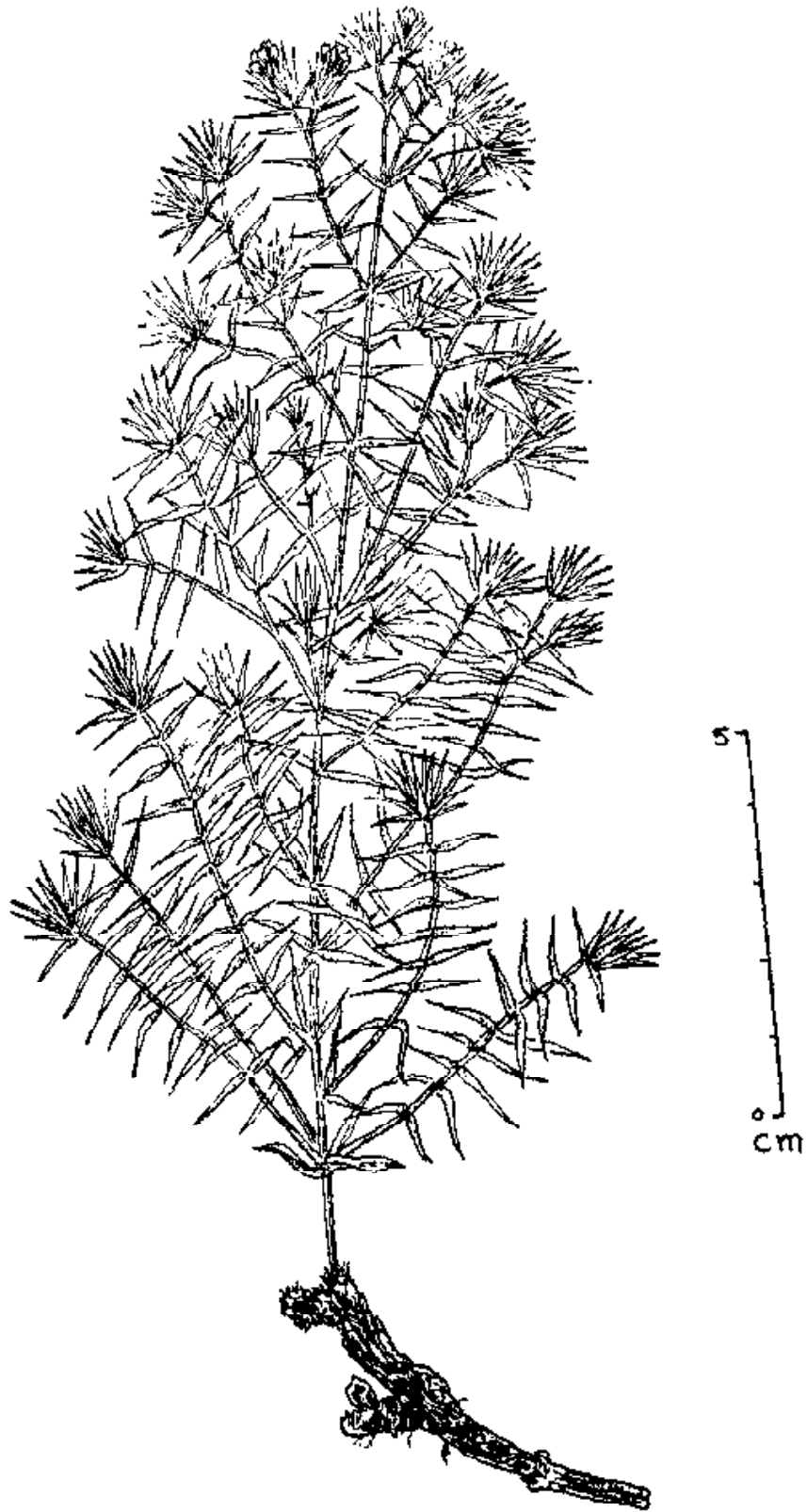
CULTIVATION: Not cultivated.

DESCRIPTION: Laxly caespitose herbs. Stems much branched, pubescent, angular below, branches slender. Leaves linear-subulate, rigid, sometimes recurved, acuminate, 5-9 × 1-1.5 mm. Bracts similar to leaves but smaller. Sepals 5, thick, hard, lanceolate, acuminate, one nerved, broadly scarious margined, 5-6 mm long. Petals ovate-lanceolate, acute, clawed, ca 4 mm long. Stamens ca 4 mm, glandular at base. Style 3 mm. Ovary 1.5 mm in diam., ovoid. Capsule ca 3.8 mm long, 6 valved. Seeds few, flat, pale yellow.

REFERENCES:

1. Strachey, (1918). *Cat. Pl. Kumaon*, p. 20.
2. Williams, F. N. (1898). *J. Linn. Soc. Bot.* 33: 410.

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



Arenaria ferruginea Dubio

STATUS: Vulnerable; not collected after 1912. The areas are subjected to heavy grazing during summer and post-monsoon season.

DISTRIBUTION: Thango (4200 m) and Chugya (4500 m) in Sikkim. Endemic.

HABITAT AND ECOLOGY: Alpine region of Sikkim Himalaya, grows with other species of *Arenaria*, *Primula*, *Rhododendron*, etc.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Explorations should be conducted in the original habitat for rediscovery of the plant. If found out, it may be protected in original habitat.

BIOLOGY AND POTENTIAL VALUE: Not known.

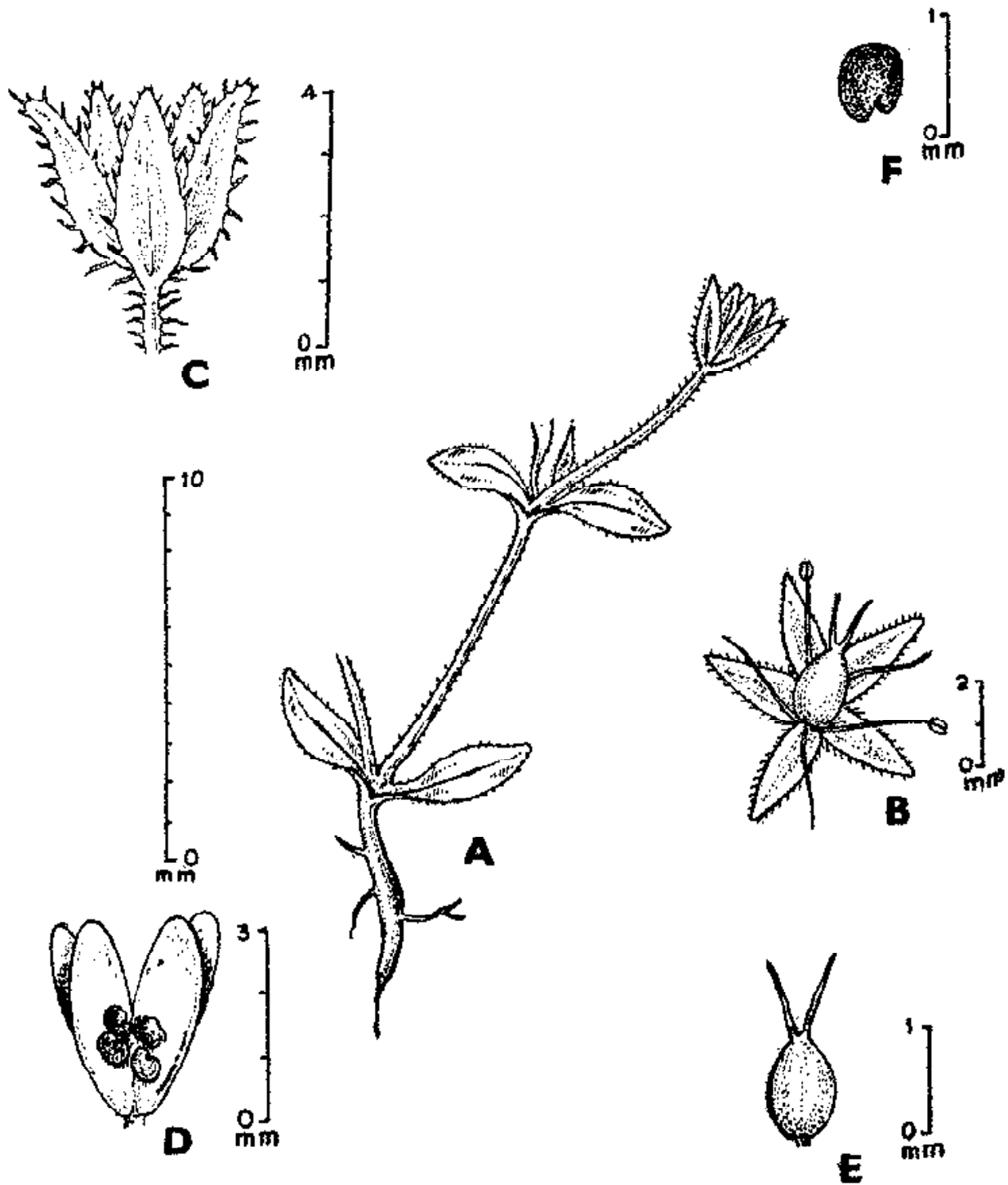
CULTIVATION: Not cultivated.

DESCRIPTION: Small delicate herbs, 2-3 cm tall, viscous pubescent, branched. Stems with whitish to brownish hairs in a line. Leaves 3-4 mm long, broadly lanceolate, 1-nerved, with ciliate margins. Flowers few in cymes, pedicels 3-4 mm long, divaricate, hairy; sepals 5, broadly lanceolate, 1.5-3 mm long, hairy. Petals absent. Stamens 5, 1.2-1.5 mm long; styles 2; ovary 1 mm long. Capsule 4-valved, 3 mm long. Seeds few, subglobose, 0.6-0.8 mm in diam.

REFERENCE:

1. Smith, W. W. (1911). *Rec. Bot. Surv. India* 4: 180.

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



Arenaria thangoensis W. W. Sm. A. Habit. B. Flower. C. Calyx. D. Dehiscent Capsule. E. Ovary with styles. F. Seed.

STATUS: Endangered. Wight described this species in 1846 based on Beddome's collections from Western ghats. There are at present only two collections in the Herbarium (MH). Recently collected from Silent Valley, Palghat District, Kerala State.

DISTRIBUTION: It is reported from Coorg (Karnataka), Nilgiris (Tamil Nadu) and Kerala. Endemic to southern Peninsular India.

HABITAT AND ECOLOGY: Grows in evergreen forests along hill slopes and river banks.

CONSERVATION MEASURES TAKEN: The Silent Valley area has recently been declared as a National Sanctuary.

CONSERVATION MEASURES PROPOSED: Detailed survey of possible areas be undertaken in Kerala, Karnataka and Tamil Nadu so that more such niches can be identified for *in situ* conservation; live plants if located be introduced in botanic gardens as a measure of *ex situ* conservation.

BIOLOGY AND POTENTIAL VALUE: It is a very interesting species considering its endemism.

DESCRIPTION: Small trees; branchlets acutely 4-angled, glabrous. Leaves up to 8-12 × 4-8 cm, oblong-lanceolate to ovate-lanceolate, entire, thickened at margins, very coriaceous, glabrous, deep shining above, paler beneath, apex acuminate, base tapering, veins not conspicuous. Flowers more than 7 together, in lax cymes. Sepals 5, margins entire or fimbriate. Petals 5, orbicular, purplish, free. Stamens 5, alternate with the petals, inserted on the margins of the disk. Disk fleshy, 5-lobed. Ovary sunk on the disk, styles short, thick. Fruits capsular, turbinate, attenuated downwards, apex obtusely winged.

REFERENCES:

1. Blakelock, R. A. (1951). A synopsis of the genus *Euonymus* L. *Kew Bull.* 254.
2. Gamble, J. S. (1918). *Fl. Pres. Madras* 2: 203. (repr. ed. 1: 146. 1957).
3. Wight, R. (1846). *Ic. Pl. Ind. Orient.* t.1053.

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

STATUS: Endangered. It was recorded only from N. Assam in 1928 and no further report of it is available from anywhere.

DISTRIBUTION: Assam. Endemic.

HABITAT AND ECOLOGY: Delei Valley, 28°5' N 96°30' E, 1700 m, in thickets on the sunny side of a steep rocky surface.

CONSERVATION MEASURES TAKEN: So far none.

CONSERVATION MEASURES PROPOSED: Detailed surveys of similar areas are to be undertaken in Assam and adjacent areas so that more such niches may possibly be found.

BIOLOGY AND POTENTIAL VALUE: Of scientific interest and more details are yet to be found.

DESCRIPTION: Small trees; branchlets terete, glabrous. Leaves 6-11.5 × 2.5-6 cm, oblong, elliptic or ovate, margins entire, thinly coriaceous, apex long, acuminate, base rounded or cuneate, nerves reticulate; petioles 8-13 mm long. Flowers in cymes; peduncles 2.5 to 8 cm long; pedicels 2 to 3 cm long. Sepals 5, minute, red-dotted, margins entire. Stamens 5, subsessile; anthers broadly reniform, after dehiscence petaliform. Ovary sunk in the disk; stigma sessile. Fruits capsular, broadly 5-winged.

REFERENCES:

1. Blakelock, R. A. (1948). *Kew Bull.* 242.
2. Blakelock, R. A. (1951). A synopsis of the genus *Euonymus* L. *Ibid.* 283.

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

STATUS: Endangered or possibly Extinct. It is reported only from Nilgiris and Anamalais in Tamil Nadu. Beddome collected it from Nilgiris in 1864. It has not been collected and reported afterwards from the same locality or elsewhere, although the areas are fairly well explored.

DISTRIBUTION: Reported only from Anamalais and Nilgiri hills, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: Recorded from slopes of Western Ghats at an altitude above 900 m.

CONSERVATION MEASURES TAKEN: So far none; the Nilgiris are recently proposed as a Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: Detailed surveys in similar areas need to be undertaken in Western Ghats for possible occurrence of the species, and if found attempts should be made for its *in situ* and *ex situ* conservation.

BIOLOGY AND POTENTIAL VALUE: This taxon is scientifically interesting; possibly could be introduced in gardens as an ornamental shrub.

DESCRIPTION: Small shrubs; branchlets terete. Leaves 8.5-10.5 × 2-4 cm, lanceolate, glabrous, coriaceous, serrate, apex tapering; petioles 8 mm long; flowers 3-7 together, in axillary cymes. Sepals 5, orbicular, imbricate. Petals 5, orbicular, sometimes crisped. Stamens 5, inserted on the fleshy disc. Ovary sunk in the disc; styles short, thick. Fruits capsular, globose; valves obcordate; seeds 1-2, arillate.

REFERENCES:

1. Beddome, R. H. (1864). *For. Man. Bot.* 1: 64.
2. Gamble, J. S. (1918). *Fl. Pres. Madras* 2: 203. (repr. ed. 1: 146. 1957).
3. Lawson, M. A. (1987). *Celastraceae*. In: Hooker, J. D., *Fl. Brit. India* 1: 609.

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

STATUS: Endangered. Kurz (1875) described this species based on the collection made by Jenkins from Assam during 1845; there is no information regarding the availability of this species anywhere since then.

DISTRIBUTION: Assam (precise locality not known).

HABITAT AND ECOLOGY: Not known.

CONSERVATION MEASURES TAKEN: So far none.

CONSERVATION MEASURES PROPOSED: Detailed surveys to be taken in Eastern India specially in Assam areas for rediscovery of the species and to evaluate suitable conservation measures.

BIOLOGY AND POTENTIAL VALUE: This species is scientifically interesting; fruits and seeds are yet to be described.

DESCRIPTION: Climber (?), glabrous. Leaves 12.5-18 × 2.5-7 cm, oblong to elliptic-oblong, crenate, papery, glabrous, apex apiculate, base obtuse to rounded; petioles 5-8 cm long. Flowers in axillary dichotomous cymes or panicles. Sepals broadly ovate, glabrous. Petals obovate, obtuse, linear, glabrous. Stamens 3, filaments subulate, wide, distinct, recurved. Disc urn-shaped.

REFERENCES:

1. Kurz, S. (1875). *J. Asiat. Soc. Bengal* 45: 203.

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

STATUS: Endangered or possibly Extinct. Gamble (1916) described it as a new species based on the collections made from Karnataka and Kerala; it has not been collected and reported afterwards from the same localities or elsewhere so far.

DISTRIBUTION: Coorg (Karnataka) and Travancore Hills (Kerala). Endemic.

HABITAT AND ECOLOGY: Recorded from the slopes of Western ghats.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Detailed surveys of similar areas to be undertaken in Western ghats for possible location of the species; *in situ* and *ex situ* conservation in the event of its rediscovery.

BIOLOGY AND POTENTIAL VALUE: This taxon is scientifically interesting.

DESCRIPTION: Scandent shrubs; branchlets purplish, lenticels distinct. Leaves 8-16 × 4-7 cm, oblong, margins obscure or distinctly serrate, papery, glabrous, apex obtuse, base a little attenuate; nerves 7-10, curved at margins, reticulate, not distinct; petioles 1 cm long, thick. Flowers in axillary fascicles; pedicels 1-1.5 cm long, thin. Sepals minute, 5-lobed, ovate. Petals oblong, glabrous, margins transparent. Disc thick. Stamens 3, arising in between the lobes of the disc, recurved, filaments short. Ovary sunk in the disc; styles conical, minute.

REFERENCES:

1. Gamble, J. S. (1916). *Kew Bull.* 133.
2. Gamble, J. S. (1918). *Fl. Pres. Madras* 2: 215. (repr. ed. 1: 154. 1957).

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

STATUS: Endangered. Earlier known only from two collections made by Beddome and by Barnes from Myhendra Hills and Nadugani, Tinnevely District respectively. It was located by the present author from Shiveli falls, Maramalai, Kanyakumari District at 400 m alt., in 1963 where critically low populations were observed.

DISTRIBUTION: Endemic to southernmost hills of Western Ghats in Tinnevely and Kanyakumari districts of Tamil Nadu. The species was first collected by Beddome around 1860 from Myhendra Hills and was cultivated in the Royal Botanic Gardens, Kew. Hasskarl described the species from the cultivated plants in 1871 and hence the specific epithet *kewensis*.

HABITAT AND ECOLOGY: Grows on rocks and cliffs constantly moistened by rain or dripping water and spray from mountain streams.

CONSERVATION MEASURES TAKEN: The species is reportedly under cultivation in the Royal Botanic Gardens at Kew and Edinburgh. It was reared in the experimental garden, Western Circle of Botanical Survey of India, Pune.

CONSERVATION MEASURES PROPOSED: Efforts should be made for *in situ* conservation of the species in its natural habitats; introduction of the species in other ecologically suitable niches in the adjoining forests in Western Ghats. The natural habitats of the species are also rich in several other endemics and efforts should be made to declare selected pockets/areas as 'protected'. Also efforts should be made to introduce the species into conservatories/botanic gardens as an *ex situ* conservation measure.

BIOLOGY AND POTENTIAL VALUE: An endemic species of phytogeographical significance. Cytological investigations prove the genus *Belosynapsis* to be of evolutionary interest in the family Commelinaceae. The species with bluish-purple flowers and reddish hairy radical leaves and radiating leafy branches is ornamental and should find place in horticulture. Flowers during September to January.

CULTIVATION: It is known to be under cultivation in the Royal Botanic Gardens at Kew and Edinburgh. A few plants of the species were collected and introduced in 1963 and reared in pots in the experimental garden, Botanical Survey of India, Pune. The plants survived in shady moist conditions for about two years and flowered in the year 1964. However, they could not be maintained in living condition for long, particularly due to prolonged dry spells after monsoon season.

DESCRIPTION: Prostrate herbs with reddish-brown hairs all over. Roots fibrous. Primary stem bearing radical leaves; secondary branches lateral, radiating from the base of the radical leaves, 15-30 cm long, rooting at nodes, densely villous. Radical leaves 5-10 × 1.5-2 cm, oblong to lanceolate, acute; leaves of lateral branches 2-4 × 1-2 cm, bifarious, sessile, ovate, acute, base oblique, villous. Flowers axillary and terminal on lateral branches, 3-8 flowered cymes

on densely hairy peduncles; pedicels short; bracts short, leafy, hairy; sepals 3, reddish-brown with rufous hairs; petals 3, bluish-purple, connate below; stamens 6, filaments bearded; anthers yellow. Capsule 1-2 per cyme, 3-celled, oblong, tip villous; cells each 2-seeded. Seed obscurely pitted.

REFERENCES:

1. Kammathy, R. V. (1983). Rare and endemic species of Commelinaceae. *In*: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.
2. Rolla S. Rao, Kammathy, R. V. & Raghavan, R. S. (1968). Cytotaxonomic studies on Indian Commelinaceae: A review. *J. Linn. Soc. (Bot.)* 60: 357-380.

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



Belosynapsis kewensis Hassk. Flowering branch.

STATUS: Vulnerable due to felling and opening up of forests and habitat loss. Dalzell first collected it from Sahyadri Hills at Parva Ghat in Maharashtra. Since then the species has been collected from other evergreen forests of Western Ghats. Blatter described the collections of this species from Gersoppa Ghat as *Cyanotis epiphytica*.

DISTRIBUTION: In evergreen forests of Western Ghats from Sahyadri Hills southwards. Endemic.

HABITAT AND ECOLOGY: Epiphytic on densely moss-covered tree trunks and branches in cool, shady evergreen forests. The species forms small populations mostly on the shady surfaces of tree trunks and branches.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting the forests in its distribution range; *ex situ* conservation in Botanical Gardens/Conservatories.

BIOLOGY AND POTENTIAL VALUE: A curious plant of biological and phytogeographical interest; the cytological investigation revealed that the genus *Belosynopsis* to be of evolutionary significance in the family. Flowers during August to October.

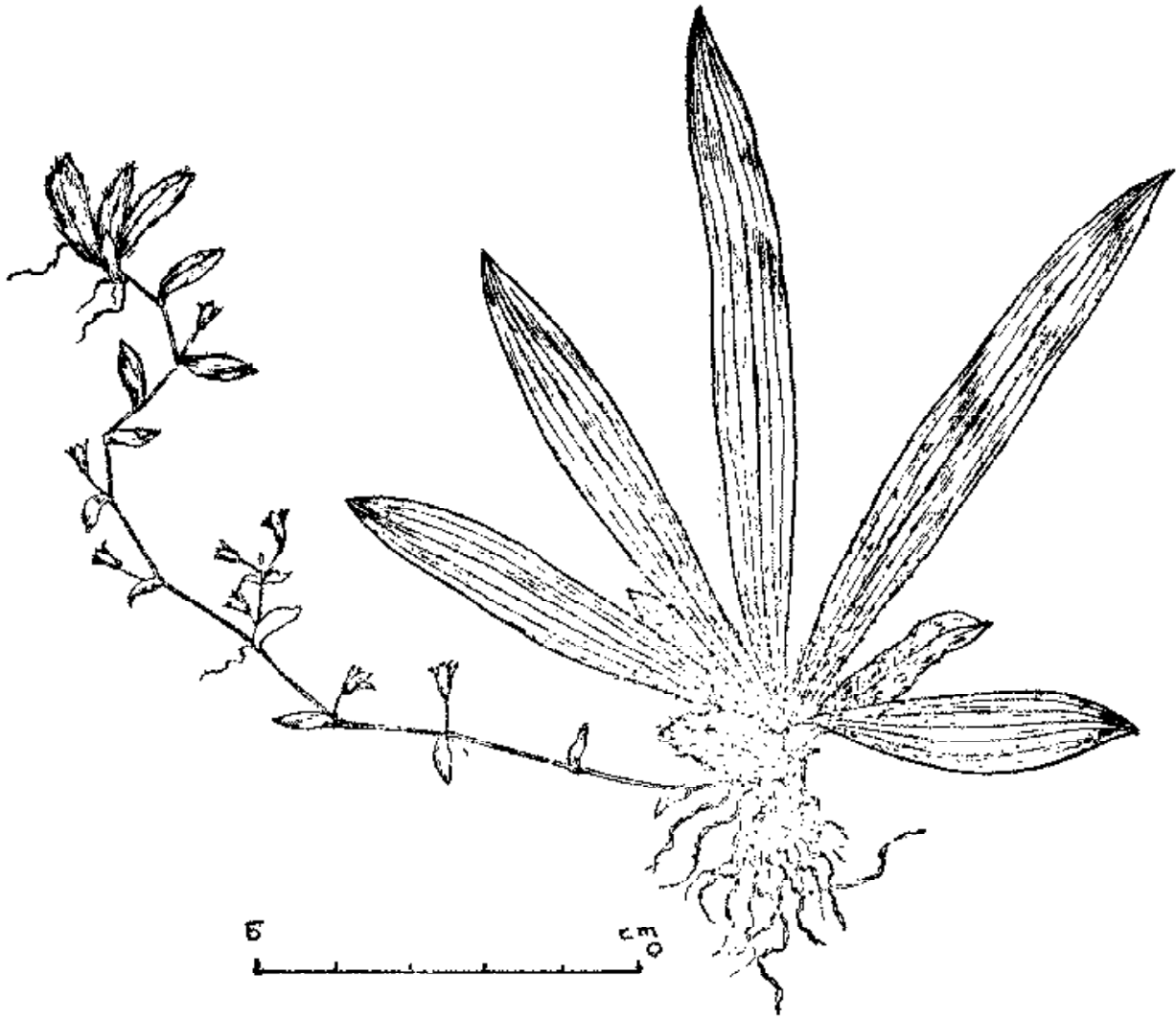
CULTIVATION: Some plants collected from Katlekan forest on way to Gersoppa Ghat were cultivated during the years 1961 to 1963 in the experimental garden of the Botanical Survey of India, Pune, in pots and on moss covered wooden blocks under constant care, but did not survive for long.

DESCRIPTION: Slender, epiphytic creeping herbs with rufous hairs all over, 5-20 cm long; primary stem bearing radical leaves; secondary branches slender, radiating from the base of radical leaves, 5-20 cm long, viviparous (producing new plants at tips), villous; radical leaves 3-8 × 1-2 cm, linear-lanceolate, acute or acuminate, pilose or with rufous hairs; cauline leaves sessile, 1-2 × 2-5 cm, ovate or elliptic, acute, pilose. Flowers in axillary and terminal umbels, 2-5 flowers on slender pilose peduncles; bracteate; sepals 3, 2-3 mm, pilose, connate below; petals 3, white, connate below; stamens 6, filaments bearded. Capsule cylindrical, about 3 mm long, pilose, 3-celled; cells each 2-seeded; seeds cylindrical, obscurely pitted.

REFERENCES:

1. Blatter, E. (1928). New Commelinaceae from Western Ghats. *J. Bombay Nat. Hist. Soc.* 33: 73-77.
2. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.
3. Rolla, S. Rao, Kammathy, R. V. & Raghavan, R. S. (1968). Cytotaxonomic studies in Indian Commelinaceae. *J. Linn. Soc. (Bot.)* 60: 357-380.

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



Belosynapsis vivipara (Daiz.) Sprag. et Fisch. Habit.

STATUS: Rare and has become threatened due to grazing and subsequent clearing of habitats; first collected by Wight in October 1852 from Avalangy, Nilgiris (subsequently the species was recollected from Nilgiris and Pulney hills).

DISTRIBUTION: Endemic to Nilgiris and Pulney hills of southern Peninsula at 2500-3000 m alt.

HABITAT AND ECOLOGY: In open grassy hill slopes.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting the hill slopes in its distribution range; *ex situ* conservation in conservatories/botanical gardens are suggested.

BIOLOGY AND POTENTIAL VALUE: Endemic to hills of South India and is of phytogeographical and evolutionary interest in the genus due to its peculiar capsule development. Flowers during June to November.

CULTIVATION: The root stock of the species from near Naduvattum, Nilgiris was introduced in the experimental garden, Botanical Survey of India, Pune, in 1961, but did not survive.

DESCRIPTION: Erect herbs, profusely branched from base, 20-30 cm high. Leaves 4-7 × 0.75-1 cm, linear to linear-lanceolate, acute or acuminate, green, hirsute or rarely glabrescent. Peduncle of spathe slender, 4-8 cm long; spathes 1-2 per branch, 3-5 cm long, lanceolate-acuminate, complicate, hirsute. Sepals 3, whitish, unequal; petals 3, one small, shortly stalked, 2 clawed, blue (yellow—Wight); stamens 3, fertile, 2 with long filaments, slender. Capsule 3-celled, 2-valved, 2-seeded in 2-cells, 3rd cell one seeded, indehiscent.

REFERENCES:

1. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened plants of India*. Botanical Survey of India. Howrah. pp. 213-221.
2. Wight, R. (1853). *It. Plant. Ind. Orient.* 6: t. 2067.

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



Commelina hirsuta (Wt.) Cl. Flowering branch.

STATUS: Vulnerable, due to clearing and opening of forests. Barnes collected this species from Karadimalai, Gudalur Ghat in Tamil Nadu in August 1940. The species was subsequently recollected by the present author from its type locality in 1963. There are no other collections available in Indian Herbaria.

DISTRIBUTION: Karadimalais, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: Grows on humus covered forest floor under the shade of trees. Root stock remains hidden in between stones during winter and summer and perennates soon after rains.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting the habitat, introduction of the species in other ecologically suitable forest areas in its distribution range and *ex situ* conservation in botanical gardens/conservatories are suggested.

BIOLOGY AND POTENTIAL VALUE: Endemic species with phytogeographical and evolutionary significance. Profuse foliage and large blue coloured flowers of this species promise ornamental potentialities. Flowers during July to October.

CULTIVATION: Root-stock of this species from the type locality was introduced into the experimental garden, Pune, but did not survive.

DESCRIPTION: Erect herbs, branched from base, 40-50 cm high. Root-stock thick with slender fleshy roots. Leaves 5-8 × 0.75-1.3 cm, linear, lanceolate, tapering towards the tip, base semi-amplexicaul, glabrous or with minute scattered hairs. Spathes 2-3 per branch, 3-4 cm long on an equally long or longer stalk, 0.75-1 cm broad, complicate, tapering to an acute tip; sepals 3, unequal; petals 3, unequal, 2 clawed; stamens 3 fertile, 3 staminodal, 2 fertile stamens with long filaments; staminodes short; capsule about 0.75 cm, ovoid-oblong, 3-celled, 2-valved, 2 cells each 2-seeded, 3rd cell one seeded, indehiscent. Seeds smooth.

REFERENCES:

1. Barnes, E. (1946). Some observations on South Indian Commelinaceae: two new species of *Commelina* from South India. *J. Bombay Nat. Hist. Soc.* 46: 70-89.
2. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.

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

STATUS: Vulnerable, due to habitat clearing and grazing. Wight collected the species from Paulghaut-Cherry, Vaulingar in August 1844 and Bolampatty in November 1852. Subsequently some collections were made from the Nilgiris and Pulneys, but the species has not been collected during the last 50 years.

DISTRIBUTION: Nilgiri and Pulney Hills in Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: Grows on grassy hill slopes of Nilgiris, Pulney hills of S. India.

CONSERVATION MEASURES TAKEN: None on record. The Nilgiris are recently declared as a proposed Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting its habitat in selected areas of its distribution range; relocating the species, and *ex situ* conservation in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: Endemic species of phytogeographical, evolutionary and biological significance. Flowers during August to November.

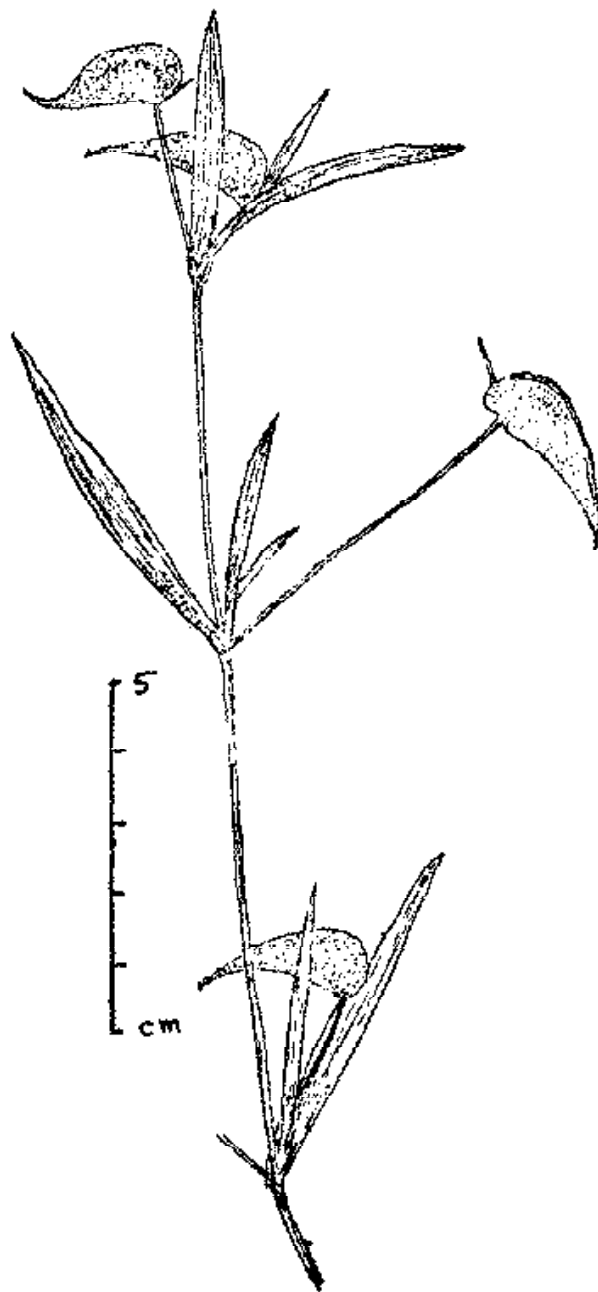
CULTIVATION: No record.

DESCRIPTION: Slender, sparsely branched, spreading or decumbent herb, 20-40 cm long; rooting at lower nodes. Leaves small, sessile, 3-5 × 1-1.5 cm, oblong, obtuse to acute, sheath small, hairy; peduncle slender, 3-8 cm long, sparsely pubescent; spathes 1.5-2.5 cm, ovate-lanceolate, acuminate, base deeply cordate, complicate, nerves arched, margins ciliate; flowers yellow (?); capsule 2-celled, lateral cell linear, empty, dorsal cell globose, indehiscent, membranous; seeds free, globose.

REFERENCES:

1. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.
2. Wight, R. (1853). *Ic. Plant. Ind. Orient.* 6: t. 2067.

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



Commelina wightii Rolla Rao Flowering branch.

STATUS: Rare, due to clearing of forests. This species was first collected by Wight from the western slopes of the Nilgiri Hills and was subsequently collected in several other places along the Western Ghats; but has now become rare due to habitat loss. Blatter described the collections of this species from Devimane and Gersoppa ghats by Hallberg and McCann as *Aneilema hallbergii*.

DISTRIBUTION: Endemic to Western Ghats from Konkan southwards to Thenmalai in Kerala.

HABITAT AND ECOLOGY: Grows along the margins of evergreen forests with other herbaceous plants in moist humus covered soils.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting its habitats in its distribution range or introduction of the species in other ecologically suitable protected places in the adjoining forests in Western Ghats and *ex situ* conservation in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: Endemic to Western Ghats. This species is of phyto-geographical and botanical interest. Flowers during July to October.

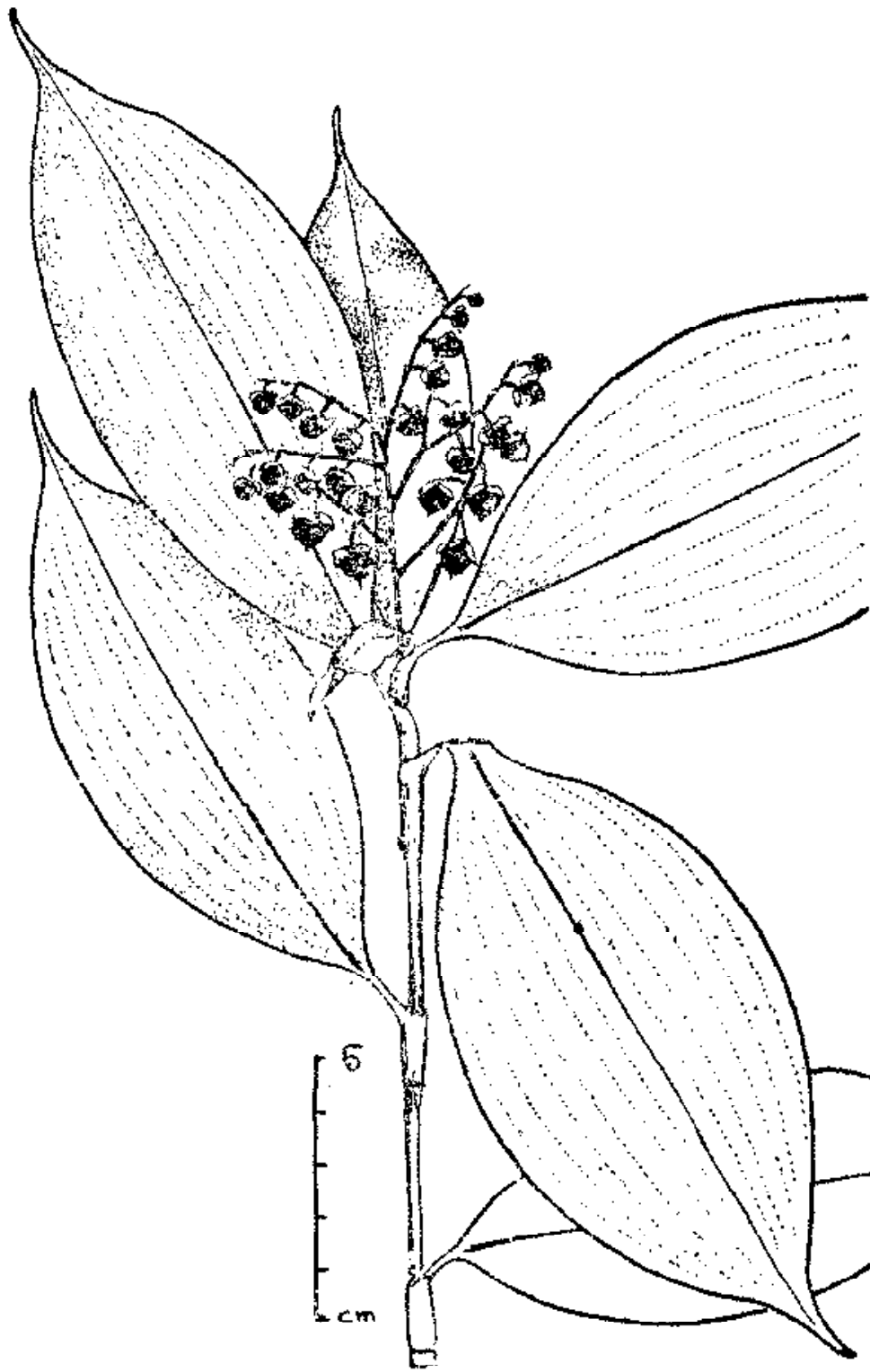
CULTIVATION: Plants of this species collected from Gersoppa Ghats and Tenamalai were under cultivation in pots under shade in the experimental garden, Botanical Survey of India at Pune. The plants survived only for a season.

DESCRIPTION: Erect to scandent herbs upto 50 cm high, rooting at lower nodes, roots sometimes very long. Leaf-sheaths persistent in the lower portions of stems. Leaves mostly at the tips of erect stems, 6-12 × 3-5 cm, broadly elliptic-lanceolate, acuminate or caudate, base narrowed into petiole, puberulous or glabrescent. Flowers in short terminal panicles of 4-8 cm, subsessile, pyramidal, shorter than the upper-leaves. Sepals 3, greenish-white, free; petals 3, white, shortly stalked; stamens 3, fertile with unequal naked filaments; staminodes 0-2, rarely represented by white filaments only. Capsule sub-globose, pedicel decurved, 3-celled, cells each 1-seeded, one cell sometimes abortive. Seed yellowish, pitted.

REFERENCES:

1. Blatter, E. (1928). New Commelinaceae from Western Ghats. *J. Bombay Nat. Hist. Soc.* 33: 73-77.
2. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.
3. Wight, R., (1853). *Ic. Plant. Ind. Orient.* 6: t. 2070.

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



Dictyospermum ovalifolium Wt. Fruiting branch.

STATUS: Vulnerable due to clearing and agricultural practices and consequent changes in habitats. Koenig collected the species from Red hills near Madras. Subsequently, this species was collected only once from Singampatti Valley, (92 m) Tirnevelly Dt., Tamil Nadu (*K. M. Sebastine* 5490) (MH) during the last few decades.

DISTRIBUTION: Endemic to low hills of Kerala and Tamil Nadu.

HABITAT AND ECOLOGY: This species grows in cultivated fields and in moist areas amidst grasses.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: *In situ* conservation by protecting the habitats of the species; introduction in other ecologically suitable areas in its distribution range and *ex situ* conservation in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: The species is endemic to Southern Peninsula and is of phyto-geographical and evolutionary significance. Flowers during March.

CULTIVATION: No record.

DESCRIPTION: Small, slender, erect, tufted herb, 10-20 cm high, branched from the base. Roots fibrous. Leaves sessile, 3-6 × 3-5 cm, linear to linear-lanceolate, obtuse or acute, base rounded. Panicle terminal, dichotomously branched, slender, flexuous. Bracts 1-2 mm, ovate, sub-acute, persistent, ochreate. Sepals 3, subequal, glabrous, reddish-brown; petals 3, free, subequal, blue; stamens 6, 3 fertile, 3 staminodal; filaments all bearded. Capsule 2-3 mm long, linear, oblong, trigonus, 3-equal celled, each cell 10-15 seeded. Seeds minutely tessellate.

REFERENCES:

1. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. *In: Jain, S. K. & Rao, R. R. (ed.). An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. pp. 213-221.
2. Kammathy, R. V. (1983). A new combination in *Murdannia* Royle (Commelinaceae). *Bull. Bot. Surv. India* 24: 206.
3. Wight, R. (1853). *Jc. Plant. Ind. Orient.* 6: t. 2978.

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



Murdannia lanceolata (Wt.) Kammathy Habit.

STATUS: Indeterminate. C. B. Clarke described this species from his collections made at Shillong, Khasia hills (1200 m alt.) on 23.10.1872. He again collected the species in July 1886 and from Kohima, Naga hills in October 1885. There are other collections of this species from Lushai Hills, Assam, etc. The author (RVK) has made intensive search in the type locality for this species from 1959 to 1965 but has not succeeded to locate this species. There are no collections of this species during the last six decades.

DISTRIBUTION: Endemic to N-Eastern India in Khasia hills, Lushai Hills and Naga Hills.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To conduct intensive search to relocate the species for *in situ* conservation; efforts should be made to introduce the species in ecologically suitable areas in its distribution range and *ex situ* conservation in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: Endemic species having great phytogeographical and evolutionary significance. Flowers and fruits during July to October.

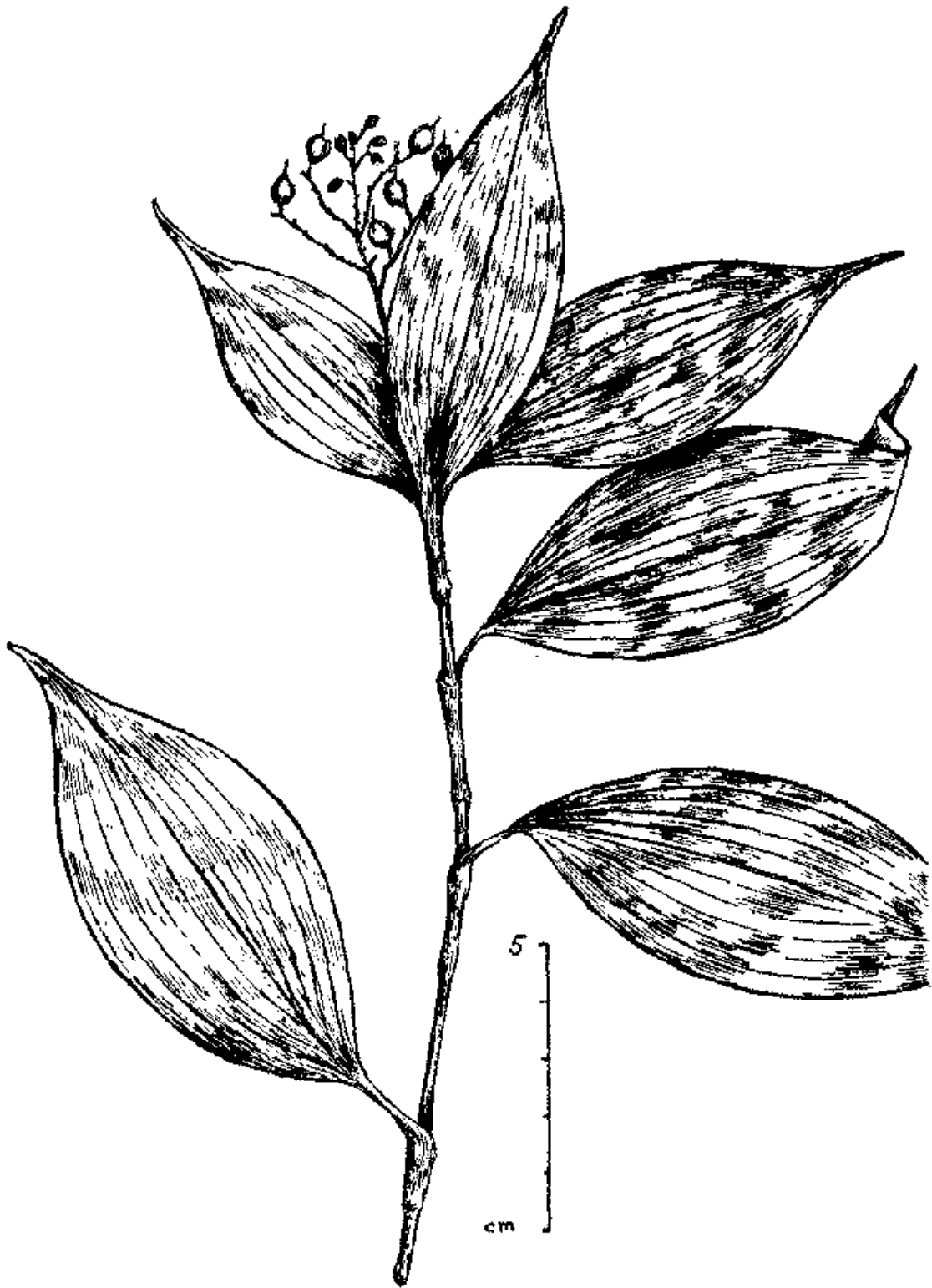
CULTIVATION: Not known.

DESCRIPTION: Erect tufted herbs, 20-40 cm high. Leaf sheath pubescent. Leaves 5-15 × 3-6 cm, shortly petioled, caudate, acuminate, elliptic, acute at both ends, base narrowed into a short petiole, scabrous, gradually becoming smaller upwards. Flowers in terminal panicles, about 10 cm long, pubescent, subumbellate, bracteate; bracteoles ochreate, persistent; sepals 3, free, puberulous, persistent; petals 3, free, white; stamens 6, unequal, 3 fertile, 3 staminodal, filaments all naked, of staminodes smaller, slender. Capsule 4-5 mm, ovoid, long beaked at the tip, smooth, brown, shining, 3-celled; cells 1-2-seeded; seeds brown, rugulose.

REFERENCES:

1. Clarke, C. B. (1881). Commelinaceae. In: DC., *Mon. Phan.* 3: 113-324.
2. Kammathy, R. V. (1983). Rare and endemic species of Indian Commelinaceae. In: Jain, S. K. & Rao, R. R. (ed.). *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. pp. 213-221.

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



Pollia pentasperma Cl. Fruiting branch.

STATUS: Indeterminate; not collected since 1877.

DISTRIBUTION: Endemic to Assam. First described from young plants with immature utricles and nuts, collected by C. B. Clarke in Makum forests, Lakhimpur, Assam, thus misleading Kuekenthal to consider it as doubtfully synonymous to *Carex aristata* subsp. *orthostachys* (C.A. Mey.) Kuekenthal found in U.S.S.R., China and Japan. Fully mature plants collected by G. Mann from Lower Assam in 1877 proved it to be distinct.

HABITAT AND ECOLOGY: In warm humid climate at about 100 m.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Locating the species in the wild, and if found, to protect the area, and also to introduce it in the Botanic Gardens.

BIOLOGY AND POTENTIAL VALUE: A species of botanical interest. The long beaked obovoid nut with curved beak and having a conspicuous nodular swelling at the tip is something not seen in any other *Carex* spp. Flowering and fruiting in March.

DESCRIPTION: Perennial herbs, 40-60 cm high. Stems stout, trigonous. Leaves clustered at the base, much exceeding the stem, acuminate, 5-8 mm broad; margins and costae scabrid. Inflorescence racemose, 20-25 cm long; lower bracts foliaceous, much exceeding the stem. Spikelets 3-8, stramineous, lower distant and peduncled; upper 2-3 male, terminal, 3.5-4.5 cm long, ca 3 mm thick, other males shorter, the remaining all female, 3.5-5.5 cm long, 7-10 mm thick; male glumes 5.5-6.3 mm long with hispidulous mucronulate tip; female glumes 3.2-3.7 mm long, lower awned, upper mucronulate; awns up to 2 mm long, hispidulous. Stamens 3; style ca 1 mm long, stigmas 3, ca 2.2 mm long. Utricles stipitate, divaricate, sub-inflated, ovoid, trigonous, 5-6 × 2.0-2.5 mm, beaked, several-nerved, greenish-fuscous, beak ca 2 mm long, bidentate. Nuts shortly stipitate, obovoid, beaked, stramineous, main body ca 2.3 × 1.7 mm; beak ca 1.5 mm long with a conspicuous nodular swelling at the tip.

REFERENCES:

1. Clarke, C. B. (1894). In: Hooker, J. D., *Fl. Brit. India* 6: 742.
2. Clarke, C. B. (1898). *J. Linn. Soc. (Bot.)* 34: 134.
3. Kuekenthal, G. (1909). In: Engler, A., *Pflanzenr. Heft* 38: 754.
4. Rao, A. S. & Verma, D. M. (1982). *Cyperaceae of north-east India*. Botanical Survey of India, Howrah. p. 83.

The material for this species was supplied by D. M. Verma, Botanical Survey of India, Allahabad.

STATUS: Indeterminate; known only from type *Munro* 2431 (K, Photo!)

DISTRIBUTION: Himachal Pradesh, Kinnaur. Endemic.

HABITAT AND ECOLOGY: Occurs at an alt. of 3505 m.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: The type locality should be thoroughly explored for locating the species for suitable conservation measures.

BIOLOGY AND POTENTIAL VALUE: The species is of botanical importance. This species has been mentioned as a rare and little known taxon by Juyal & Bhattacharyya (3).

CULTIVATION: Not known.

DESCRIPTION: Stems upto 90 cm high, gracile. Leaves shorter than the stem, flat, 3 mm broad. Spikelets 5-6, terminal male with one utricle at base, laterals female, cylindric, 1.5-2.5 cm long, lax-flowered, lowest remote on very long peduncle, female glumes ovate, acute, rarely mucronate, brown, dorsally 3-nerved. Utricles ellipsoid, trigonous, membranaceous, 2.5 mm long, pale, obsolete nerved; beak conic, smooth, bidentate. Stigmas 3.

REFERENCES:

1. Clarke, C. B. (1894). In: Hooker, J. D., *Fl. Brit. India* 6: 699-748.
2. Kuekenenthal, G. (1909). In: Engler, A., *Pflanzenr. Heft* 38:1-628. f. 1-128.
3. Juyal, N. & Bhattacharyya, U. C. (1983). Rare and little known taxa of *Carex* Linn. from N. W. Himalaya. In: Jain, S. K. & Rao, R.R. (ed.). *An Assessment of Threatened plants of India*. Botanical Survey of India, Howrah. pp. 26-27.

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

STATUS: Indeterminate; known only from the type collection (*Herb. Boeck.*)

DISTRIBUTION: Nilgiri hills, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: At alt. 1828 m, along grassy hill slopes.

CONSERVATION MEASURES TAKEN: None so far for the species.

CONSERVATION MEASURES PROPOSED: The type locality should be thoroughly explored and *in situ* conservation for this species is proposed. Declaration of the Nilgiri-Wynad region as a Biosphere Reserve will possibly help in conservation of the species as also several others reported as endangered from this area.

BIOLOGY AND POTENTIAL VALUE: The species is of botanical interest.

DESCRIPTION: Stems 25 cm long, rigid, 2 mm broad, revolute. Spikelets 4-5, remote, terminal male, linear-cylindric, 3 cm only, sometimes one shorter at the base, laterals female or androgynous, cylindric, 2-4 cm long, dense flowered, sessile or shortly peduncled, erect; bracts foliaceous. Female glumes oblong-lanceolate, obtuse, brown, dorsally 3-nerved, divaricate; utricles ovate, subinflated, biconvex, 2 mm long, stramineous, shining, densely punctulate, obscurely nerved, marginate; beak scabrous on margins. Stigmas 2.

REFERENCES:

1. Kuekenh., G. (1909). *In: Engler, A., Pflanzenr. Heft 38: f. 1-824. 1-128.*
2. Fischer, C. E. C. (1931). *In: Gamble, G. S., Fl. Pres. Madras 1620-1687.*

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

STATUS: Presumed Extinct due to forest degradation. Not collected since 1869. Its distribution range has undergone much degradation in the recent decades due to deforestation and Jhum cultivation.

DISTRIBUTION: Endemic to Meghalaya; first collected by J. D. Hooker & T. Thomson from Cherrapunji in 1850. Subsequently several collections were made by C. B. Clarke from Shillong, the last being in 1869.

HABITAT AND ECOLOGY: In hills, warm to fairly cold humid climate, in 1000—1700 m alt.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Locating the species in the wild, and if found, to protect the area, and also to introduce it in protected reserves and in the Botanic Gardens.

BIOLOGY AND POTENTIAL VALUE: A species of botanical interest. Flowering and fruiting in May-June.

DESCRIPTION: Perennial herbs, ca 50 cm high. Rhizome creeping. Stems trigonous. Leaves scattered all along and much exceeding the stem, 2.5-5.0 mm broad, lower sheaths splitting fibrously. Panicles pyramidal, ca 4 cm long; rachis hispidulous. Spikelets androgynous, 6-9 mm long, divaricate; cladophylls utriculiform; male part 2.5-4.0 mm long; glumes ca 3 mm long, aristate, stramineous with pale brown streaks; female part 3-5 mm long; glumes 2.5-3.0 mm long, awned, stramineous with pale brown streaks. Style swollen to the base; stigmas 3. Utricles slightly inflated, trigonous, 3.0×0.7 mm, gradually narrowed into a beak, many-nerved, yellowish green; beak ca 1.2 mm long, smooth or hispidulous, straight or curved. Nuts narrowly obovoid, ca 2 mm long.

REFERENCES:

1. Clarke, C. B. (1894). *In: Hooker, J. D., Fl. Brit. India* 6: 720.
2. Clarke, C. B. (1898). *J. Linn. Soc. (Bot.)* 34: 120.
3. Kuekenthal, G. (1909). *In: Engler, A., Pflanzenr. Heft* 38: 288.
4. Rao, A. S. & Verma, D. M. (1982). *Cyperaceae of north-east India*. Botanical Survey of India, Howrah. p. 75.

The material for this species was supplied by D. M. Verma, Botanical Survey of India, Allahabad.

STATUS: Indeterminate. Known only from the type collection by Schmidt (K, Photo!). Nilgiri region is fairly well explored in the recent years but the species is not collected.

DISTRIBUTION: Nilgiri hills, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: In the hilly regions.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: The species should be searched thoroughly in its type locality and *in situ* conservation by protecting the habitat is proposed. The declaration of the Nilgiri-Wynaad area as a Biosphere Reserve would perhaps help in protecting the habitats and the several endangered species reported from there.

BIOLOGY AND POTENTIAL VALUE: The species is of botanical interest with restricted distribution.

CULTIVATION: Not so far known.

DESCRIPTION: Stems 60 cm, angles acute, scabrous. Spikelets female, cylindrical, 3-4 cm long, dense flowered, lax at base, remote, peduncled, erect. Bracts foliaceous, exceeding the stem, never sheathing. Female glumes elliptic, obtuse, dark purple. Utricles equalling the female glumes, elliptic, 3 mm long, densely granular, dorsally 3-5 costate, margins scabrid above. Stigmas 3 or 2.

1. Boott, F. (1867). *Illustrations of the genus Carex*. IV, pp. 412-600.
2. Clarke, C. B. (1894). *In: Hooker, J. D., Fl. Brit. India* 6: 699-748.
3. Fischer, C. E. C. (1931). *In: Gamble, I. S., Fl. Pres. Madras*, pt. 9: 1620-1687.

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

STATUS: Rare.

DISTRIBUTION: Endemic to north-east India. Earlier collected in nineteenth century from various places in Khasi hills (Meghalaya) by J. D. Hooker and C. B. Clarke, and from Manipur by G. Watt. But now probably confined to Mawphlong (Meghalaya) from where it was last collected by D. M. Verma in 1969.

HABITAT AND ECOLOGY: In partly open moist places along forest margins in rather cold humid climate at about 1800 m.

CONSERVATION MEASURES TAKEN: None. However the Mawphlong forests are protected as 'sacred groves' by the local people due to religious belief.

CONSERVATION MEASURES PROPOSED: Protection of its habitat from forest fires and grazing and introduction of the species in the Botanic Gardens.

BIOLOGY AND POTENTIAL VALUE: A species of botanical interest. This is the only species of *Fimbristylis* Sect. *Fimbristylis* with long creeping rhizomes. Flowering and fruiting in May—June.

DESCRIPTION: Slender perennial herbs, 10-60 cm high. Root-stock with 1-3 slender creeping stolons upto 7 cm, hardening into wiry rhizomes. Leaves ligulate, one-half as long as to equalling the stem, 1.5-2.0 mm broad. Anthela lax, simple or compound, 2-3 cm across, usually bearing 4-16 spikelets but sometimes only one spikelet; bracts 2-3, foliaceous, suberect, shorter or equalling the anthela; rays 3-8, longest 1.5-3.5 cm; spikelets solitary, linear-oblong, terete, 5-8 × 2.0-2.5 mm; glumes spiral, broadly ovate, mucicous, 2.8-3.2 mm long, dark blackish-brown with green nerves; stamens 3; anthers 1.5 mm long; stigmas 2, or rarely 3. Nuts stipitate, broadly obovoid, ca 1.0 × 0.8 mm, stramineous-brownish, trabeculate due to the surface cells being arranged in 12-14 rows on each face.

REFERENCES:

Clarke, C. B. (1893). In: Hooker, J. D., *Fl. Brit. India* 6: 637.

Clarke, C. B. (1898). *J. Linn. Soc. (Bot.)* 34: 59.

Rao, A. S. Verma & Verma, D. M. (1982). *Cyperaceae of north-east India*. Botanical Survey of India, Howrah. p. 32.

The material for this sheet was supplied by D. M. Verma, Botanical Survey of India, Allahabad.

STATUS: Indeterminate. The species is represented by an old collection of Duthie (DD) made on 20.7.1883.

DISTRIBUTION: Uttar Pradesh, Tehri Garhwal, Tehri, Rhudughera, 4572-4876 m. Monotypic and endemic.

HABITAT AND ECOLOGY: The type was collected at 4572-4876 m. alt., in the sub-alpine areas. Not much information is available.

CONSERVATION MEASURES TAKEN: This species is mentioned as a rarely known plant (Juyal & Goel, 1982; Hajra, 1983).

CONSERVATION MEASURES PROPOSED: The species should be searched in its type locality for it has not been collected elsewhere in the Western Himalaya.

BIOLOGY AND POTENTIAL VALUE: The species is of botanical importance. Monotypic with very much localised distribution as is known at present.

DESCRIPTION: Perennial, 2.5-3.0 cm high. Stems with nodes. Inflorescence of 1-3 approximated spikelets. Glumes 6, imbricate on all sides, sub-similar. Hypogynous bristles 2, minute, rudimentary. Style linear-cylindric, smooth, continuous with pistil, stigmas 3. Nuts ellipsoid, trigonous, smooth.

REFERENCES:

1. Clarke, C. B. (1894). *In: Hooker, J. D., Fl. Brit. India* 6: 585-672.
2. Clarke, C. B. (1909). *Illustrations of Cyperaceae*. tt. 1-114.
3. Juyal, N. & Goel, A. K. (1982). Some rarely known sedges from N.W. Himalaya. *J. Econ. Tax. Bot.* 3: 313-314.
4. Hajra, P. K. (1983). Threatened Plants of Western Himalaya with restricted distribution — A. census. *In: Jain, S. K. & Rao, R. R. (ed.). An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah, pp. 1-12.

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

STATUS: Rare; so far known only from Muthukulam, Boluampatty range, Palghat division, Kerala State in Peninsular India.

DISTRIBUTION: Endemic to Peninsular India. Known only from the location mentioned above.

HABITAT AND ECOLOGY: On open rocky slopes. The species exhibits a tendency to form nearly good patches, though often found mixed with its closely allied species, *Vateria indica* Linn., in the area. Natural regeneration is reported to be good.

CONSERVATION MEASURES TAKEN: The Kerala State Forest Deptt. has taken some management practices to protect the habitat and the species.

CONSERVATION MEASURES PROPOSED: (a) to promote the formation of a Nature reserve in the location with the help of Central and State Governments, (b) to promote planning controls through the State Forest Deptt. to ensure the protection of the habitat and (c) to carry out measures for the management of the habitat for the survival of the species.

BIOLOGY AND POTENTIAL VALUE: A rare and interesting species, endemic to Peninsular India; so far known only from its Type locality.

DESCRIPTION: Trees, 8-10 m tall. Leaves reaching about 25 × 12 cm, sometimes much larger, elliptic-oblong or oblong-lanceolate, shortly acuminate, rounded or subcordate at the base, entire, glabrous on both surfaces, rarely with a few stellate hairs on the midrib beneath mainly at its base. Petiole 2.5-6 cm, swollen at the tip, minutely pubescent. Flowers in axillary panicles, shorter than the leaves. Panicles 1.5-2.4 cm long, jointed a little below the middle. Calyx lobes 3 mm long. Corolla lobes 1.5 cm long, elliptic, minutely apiculate, coriaceous, glabrous on both the surfaces. Stamens numerous; filaments about 2 mm long; anthers linear, about 7 mm long, glabrous, connective prolonged beyond the anther cells into a subulate point. Ovary 3-celled; cells 2-ovuled; style subulate, slightly longer than the stamens. Capsules reaching 11 cm long and 6 cm broad, ovate, narrowed towards the apex, coriaceous, splitting from the top downwards at maturity into 3, 1-seeded valves.

REFERENCES:

1. Gupta, B. L. (1929). A new species of *Vateria*. *Ind. For.* 55: 231-232.
2. Subramanian, K. N., Jayachandran, C. K. & Venkatasubramanian, N. (1982). Occurrence of *Vateria macrocarpa* B. L. Gupta in Kerala State. *J. Econ. Tax. Bot.* 3: 620.

The material for this sheet was supplied by K. P. Janardhanan, Botanical Survey of India, Calcutta.

STATUS: Rare. Causes for its decline are submersion of its habitat for Bhadra dam, cutting down of trees for fuel and consequent elimination of associated shrubs and undergrowth.

DISTRIBUTION: So far known from a single locality in Chikmagalur district of Karnataka. It has not been recollected since the type collections in the year 1968. It was originally recorded from the deciduous forests of Sukalhatti, Lakkaveli taluk.

HABITAT AND ECOLOGY: At lower elevations of 500-600 m in deciduous forests with an annual rainfall of less than 100 cm, associated with Bamboo-Terminalia thickets.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The forests are not easily approachable being inundated during monsoon and these harbour many interesting taxa of Asteraceae, Fabaceae, Rubiaceae and Poaceae besides being rich in other herbaceous flora. A careful search may possibly reveal a few more populations of this rare species which is so far known from two collections only.

ECOLOGY AND POTENTIAL VALUE: This species of *Dalechampia* with its strikingly 3-lobed, oblong-lanceolate leaves could be readily distinguished even in the vegetative state. Except as a botanical curiosity no economic value is known presently.

CULTIVATION: No attempt has been made.

DESCRIPTION: Perennial, woody scandent shrub, 2 m tall; stems striate, young shoots pilose. Leaves alternate, simple, 3-lobed, deeply divided upto base; lobes pubescent, linear or oblong-lanceolate, 13-17 × 2-2.3 cm, 6-9 times as long as broad, base tapering, apex acute, margins dentate and retroseely incurved; petiole 4.5-5.5 cm long. Inflorescence compound, axillary or terminal, solitary or 2 together, peduncles glabrous; involucre bracts ovate or 3-lobed, 2-3 cm and as long as broad, pilose, palmately 5-nerved, margins incurved. Cymes contracted; female 3-flowered; male not seen; bracteoles ovate, lobed, 7 × 7 mm, margins ciliate. Sepals in pistillate flowers 12, 2.5-3.5 × 0.8 mm, glands stipitate; ovary glabrous with 1.2 cm long style; stigma peltate, concave. Capsule ovoid, ca 10 mm, cocci dehiscent; seeds ovoid, greyish-brown, 3-4 mm across.

REFERENCE:

1. Sundararaghavan, R. & Kulkarni, B. G. (1980). A new species of *Dalechampia* (Euphorbiaceae) from peninsular India. *Kew Bull.* 35 (2): 323-325. t. 1.

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

STATUS: Endangered due to destruction of habitat. Gamble described on collection of V. Narayanaswami from E. Godavari.

DISTRIBUTION: Known only from Eastern Ghat hills in East Godavari and Visakhapatnam Districts, Andhra Pradesh. Endemic.

HABITAT AND ECOLOGY: Undershrubs growing on rocky and laterite soils at about 1400 m altitude.

CONSERVATION MEASURES TAKEN: None known.

CONSERVATION MEASURES PROPOSED: Intensive search for the species and introduction in botanic gardens and protected reserves in Eastern Ghats in Andhra Pradesh.

BIOLOGY AND POTENTIAL VALUE: Phytogeographical and academic interest.

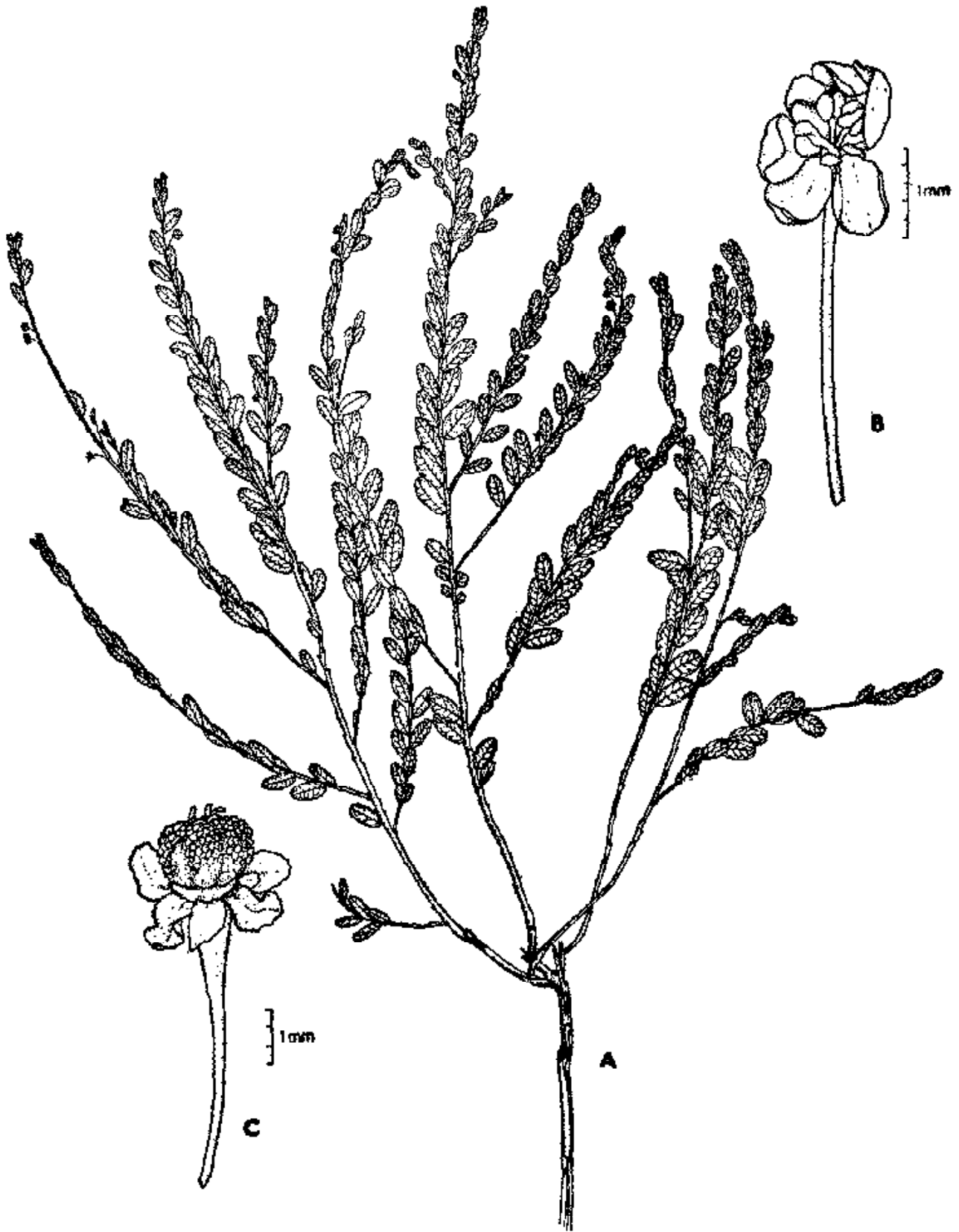
CULTIVATION: None on record.

DESCRIPTION: Glabrous, monoecious undershrubs; branches many, arising from a stout rootstock, wiry, reddish brown, terete, winged, young ones flat and winged. Leaves alternate, distichous, overlapping, upto 1.5×0.8 cm, elliptic or oblong, coriaceous, rounded or obtuse, rarely acute, sometimes slightly emarginate or mucronate at apex, cordate and unequal at base; margins thickened, recurved; veins and midrib raised on both sides, more so on the lower side, veins arched. Petioles upto 0.5 cm long, black; stipules 0.25×0.1 cm, peltate, lacerate, acuminate, hastate at base. Flowers axillary, solitary; pedicels upto 0.6 cm long, very thin, thickened at the top. Perianth lobes 6, ovate, glabrous, rounded at apex; midrib thickened. Disc in female flower saucer-shaped; in male flowers of 6 small glands at base of perianth lobes and alternating with them. Stamens 3. Ovary 3-loculed, verrucose glandular; styles 3, joined at base and spreading over top of ovary, each bifid half way. Capsules ca 0.3 cm across, globose, depressed, brown, verrucose glandular. Seeds golden-brown, upto 0.2 cm long, covered with red glands.

REFERENCES:

1. Gamble, J. S. (1925). *Kew Bull.* 329.
2. Gamble, J. S. & Fischer, C. E. C. (1925). *Fl. Pres. Madras* 2: 1289.
3. Rao, R. S. (1964). *J. Bombay Nat. Hist. Soc.* 61: 322.

Material for this sheet was supplied by G. V. Subba Rao and G. R. Kumari, Botanical Survey of India, Coimbatore.



Phyllanthus narayanaswamii Gamble A. Habit. B. Flower. C. Capsule.

STATUS: Endangered due to loss of habitats.

DISTRIBUTION: Hilly areas in Coimbatore, Madurai (Dindigul hills) and Salem districts, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: Found in hills upto 600 m.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To search for the species in its distribution habitats; measures to protect a few of its habitats, introduction of the species in botanic gardens and in other similar habitat conditions in its distribution range through seeds, should be undertaken.

BIOLOGY AND POTENTIAL VALUE: Of botanical and economic interest.

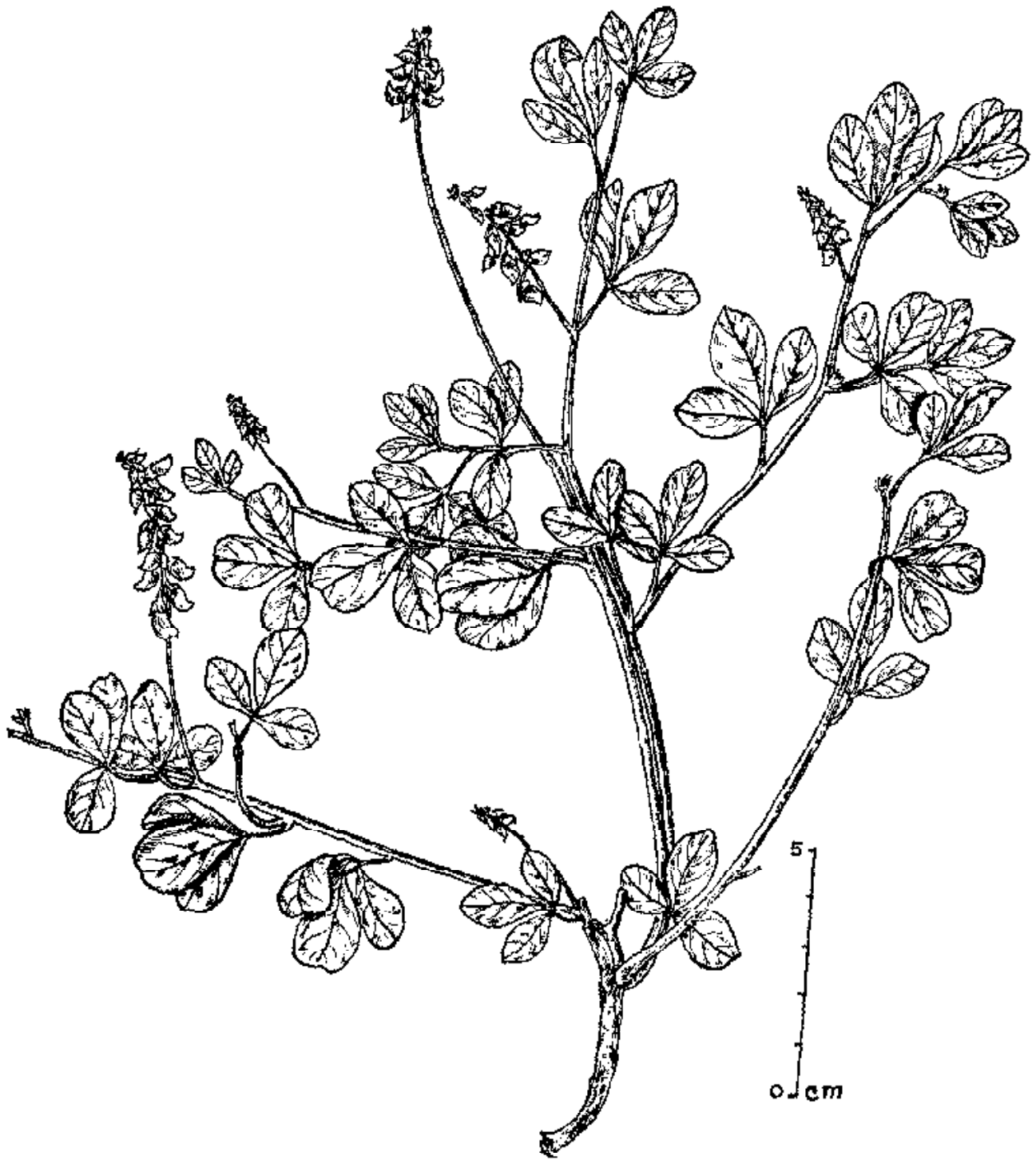
CULTIVATION: None on record.

DESCRIPTION: Erect low shrubs, obscurely downy; branches arcuate. Leaves trifoliolate, alternate, stipules very minute, setaceous; petioles grooved above. Leaflets thick, rather fleshy, upto 3 cm long, obovate, apex obtuse, emarginate, base cuneate, glabrous above. Flowers yellow, numerous, in terminal and leaf-opposed elongate, stiff, short-peduncled, racemes; bracts minute, setaceous, reflexed; bracteoles lanceolate, reflexed, at the base of the calyx. Calyx campanulate. Corolla much exserted, glabrous. Pods upto 2 cm long, oblong-cylindrical, clavate, deflexed, minutely silky—pubescent. Seeds 10-12.

REFERENCES:

1. Baker, J. G. (1876). *In*: Hooker, J. D., *Fl. Brit. India* 2: 83.
2. Gamble, J. S. (1918). *Fl. Pres. Madras* 1: 205 (repr. ed. 1: 212, 1957).
3. Wight, R. & Walker-Arnott, G. A. (1834). *Prodr. Fl. Penin. Ind. Orient.* 194.

Data for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.



Crotalaria clavata Wt. et Arn.

STATUS: Endangered due to conversion of its habitats through human activities. Represented by type specimens (CAL). It was collected in 1916 by C. Tomtand and later by Debberman and Biswas in 1937. Since then it has not been recollected.

DISTRIBUTION: Endemic to Kodaikanal hills, Tamil Nadu.

HABITAT AND ECOLOGY: In hills up to 360 m.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: To search for the species in wild and if located it should be introduced, multiplied in botanic gardens. The plants should be reintroduced in its original and only known habitat.

BIOLOGY AND POTENTIAL VALUE: The species has been described on the basis of fruiting specimens and in flowering it has not been collected so far. It is a curious species of botanical interest quite distinct from other species of the genus.

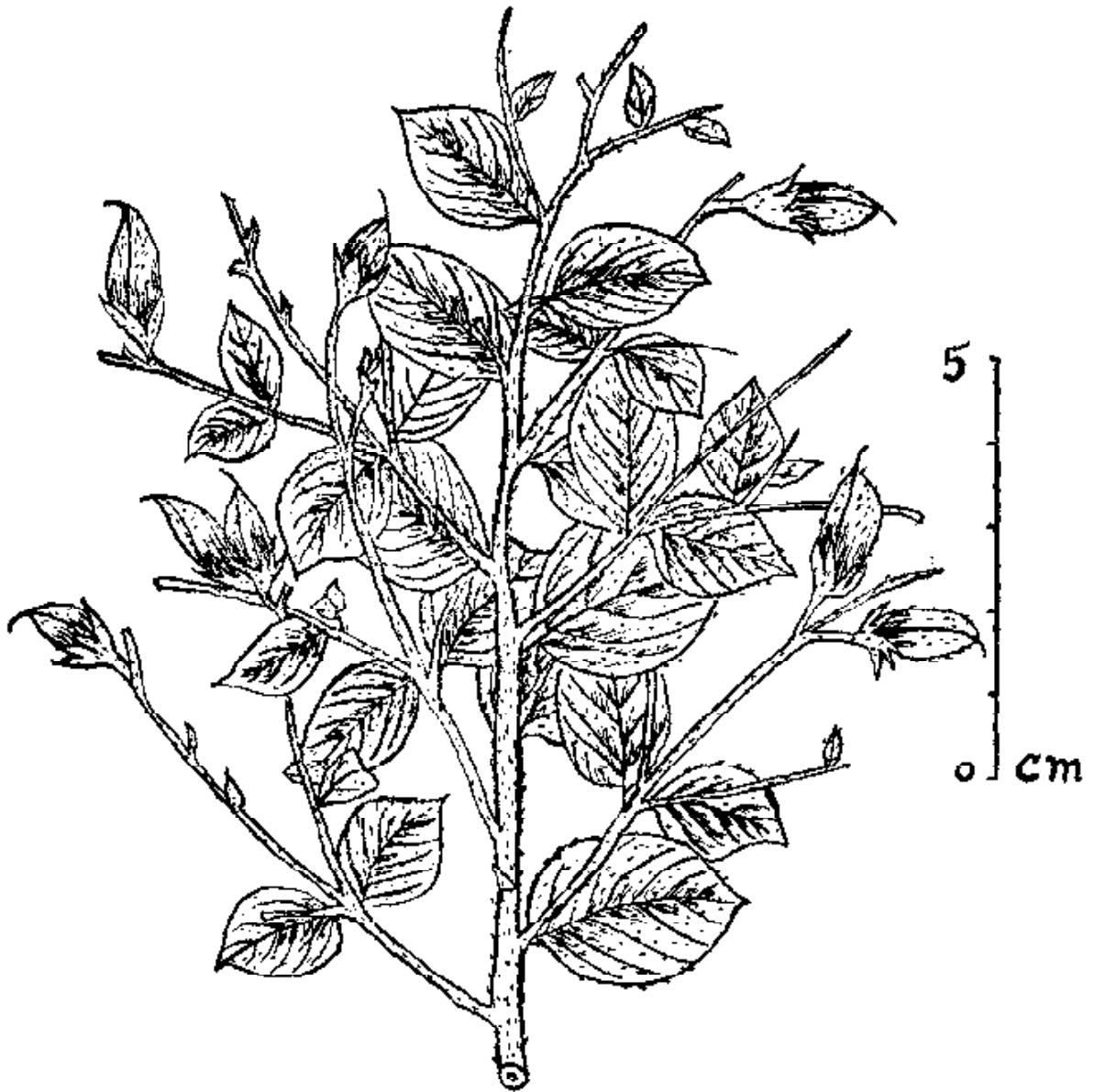
CULTIVATION: Not known so far.

DESCRIPTION: Much branched under shrubs; young parts and inflorescence densely fulvous-sericeous; branches alternate, branchlets opposite or alternate. Leaves subcoriaceous, simple, subsessile, lower alternate, upper sometimes opposite, 2.5-6 × 1.5-3.5 cm, broadly ovate, apex acute, base rotundate, obscurely reticulate and densely, thickly adpressed sericeous; petioles upto 3 mm long; stipules nil. Inflorescence paniculate; bracts sub-coriaceous, sub-deciduous, alternate, margins never revolute, 5 × 3 cm, ovate-acute, blackish-brown above when dry; bracteoles 2, opposite, subtending the calyx, ovate-lanceolate, persistent. Calyx campanulate, hirsute, profoundly bilabiate, margins never revolute. Pods 2.5-3.5 cm long, oblong, thick, densely adpressed-sericeous; fruiting pedicels upto 1 cm long, opposite. Seeds 10-12, 3-3.5 mm long, black, shining.

REFERENCE:

1. Debberman & Biswas, K. (1937). *J. Ind. Bot. Soc.* 56: 59-60.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.



Crotalaria kodaiensis Debb. et Biswas

STATUS: Endangered, possibly due to destruction of its habitat. Recent plant surveys could not locate the species.

DISTRIBUTION: Kolli and Nilgiri hills, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: In hills, not much is known.

CONSERVATION MEASURES TAKEN: The Nilgiri Hill ranges are covered within the proposed Nilgiri-Wynaad Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: To search for in the wild and to introduce the species in botanic gardens if located, reintroduction and propagation through seeds.

BIOLOGY AND POTENTIAL VALUE: Of botanical and phytogeographical interest.

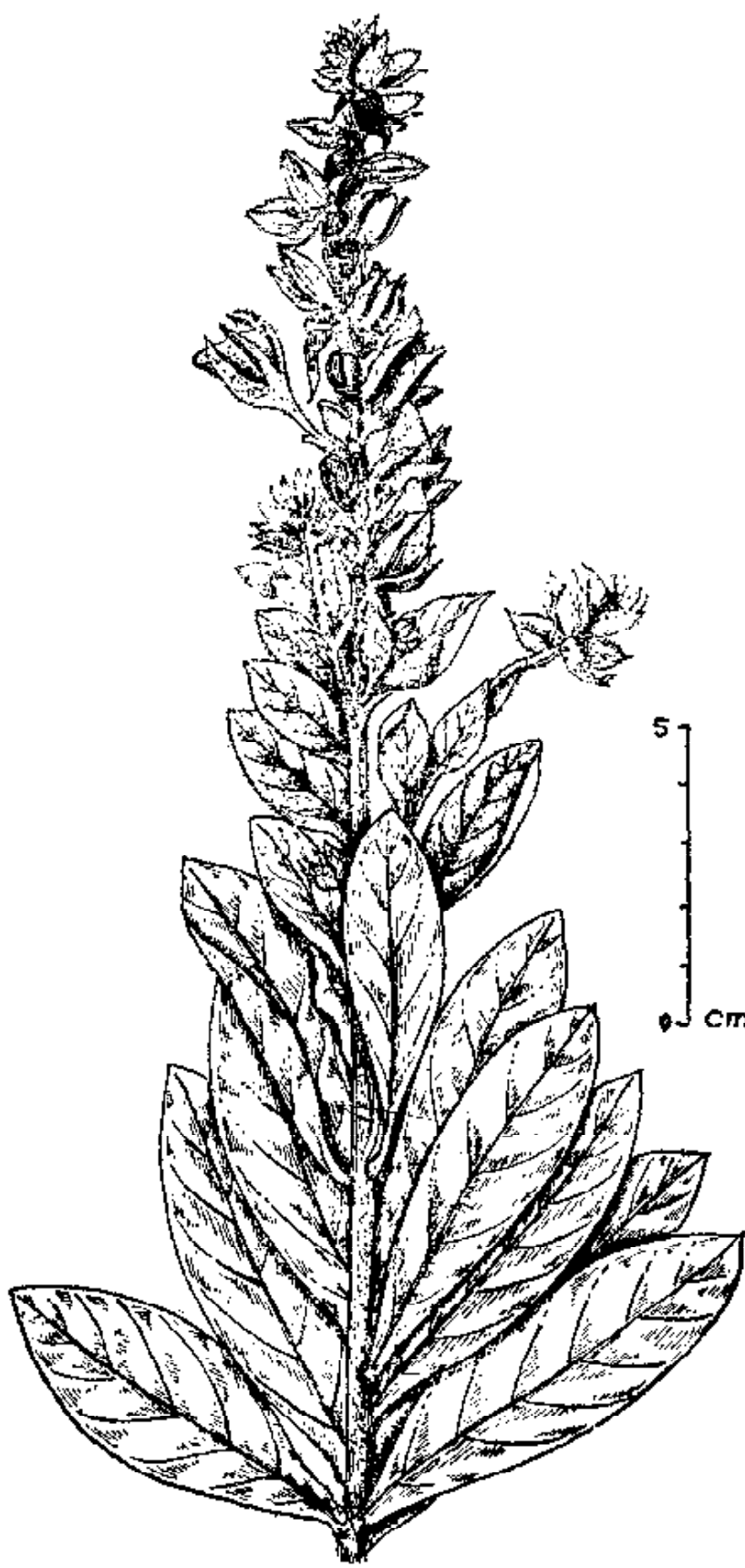
CULTIVATION: Not known so far.

DESCRIPTION: Undershrubs, branches stiff, shortly silky sericeous, velvety. Leaves simple, alternate, chartaceous, 1.7-7.5 × 1-3.1 cm, obovate-oblong or oblanceolate, apex obtuse, apiculate, base cuneate, hairy on both sides, upper shining and almost silvery; petioles 3 mm long; stipules nil. Flowers 2.5 cm across, yellow in terminal and lateral panicles; pedicels alternate; bracts foliaceous, ovate, acuminate, spreading; bracteoles ovate, closely adpressed to calyx. Calyx lobes not revolute. Corolla twice as long as calyx, vexillum broadly ovate, sericeous on the back. Pods stalked, 2-2.5 cm long, linear-oblong, nearly glabrous. Seeds 8-12.

REFERENCES:

1. Baker, J. G. (1876). *In*: Hooker, J. D., *Fl. Brit. India* 2: 76.
2. Gamble, J. S. (1918). *Fl. Pres. Madras* 1: 298. (repr. ed. 1: 210. 1957. Calcutta.)
3. Wight, R. & Walker-Arnott, G. A. (1834). *Prodr. Fl. Penin. Ind. Orient.* 183.

The material for this sheet was supplied by A. A. Ansari and K. Thothathri, Botanical Survey of India, Calcutta.



Crotalaria longipes Wt. et Arn.

STATUS: Rare, due to loss of its habitats and other biotic factors.

DISTRIBUTION: Anamalai (Kadamparai), Palani, Nilgiri (Doddabetta) hills, Tamil Nadu; Travancore hills, Kerala. Endemic.

HABITAT AND ECOLOGY: In grasslands on hills. Flowering and fruiting: July-December.

CONSERVATION MEASURES TAKEN: Some of the distribution localities in Anamalai and Nilgiri hills are under consideration for declaration as Biosphere Reserves.

CONSERVATION MEASURES PROPOSED: To search for the species in wild habitats and if located attempts should be made for its introduction into botanic gardens for multiplication and reintroduction into its original habitats through seed germination and propagation.

BIOLOGY AND POTENTIAL VALUE: Of botanical and economic interest.

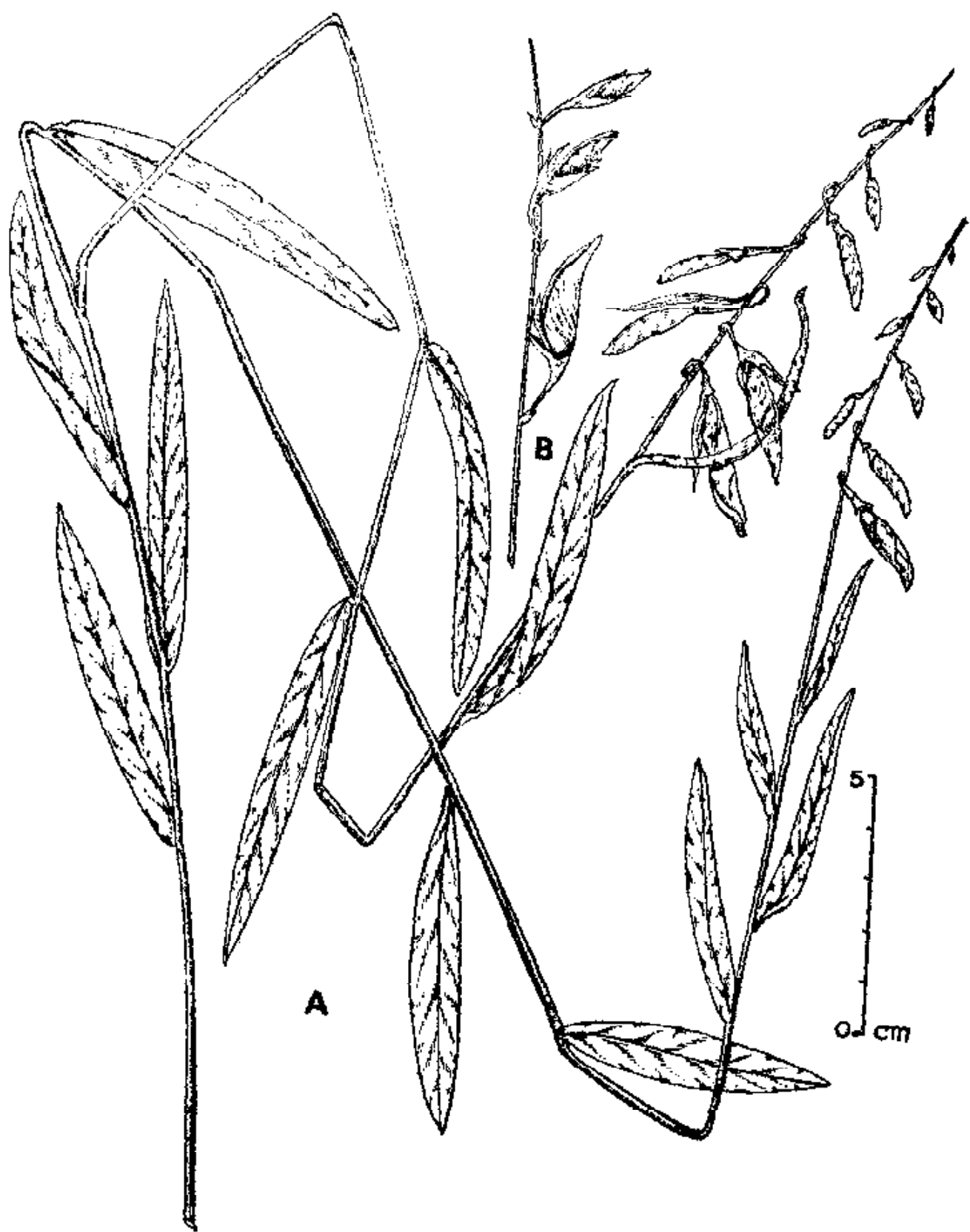
CULTIVATION: Not known.

DESCRIPTION: Erect glabrescent herbs or undershrubs. Leaves simple, alternate, subsessile, membranous, 3.5-7 × 0.4 cm (sometimes upto 12 cm long), narrow linear, grass-like, mucronate, margins involute; stipules absent. Flowers yellow, in terminal lax racemes; peduncles with many extra bracts; bracts foliaceous, 8 × 4 mm, ovate, long-acuminate, base auriculate; bracteoles 2 at the base of the calyx, minute, setaceous. Calyx lobes lanceolate, glabrous. Corolla exerted; vexillum 1.8 cm long, emarginate, glabrous. Pods stalked, 5-5.5 × 1.4 cm, oblong, glabrous, blackish-brown. Seeds numerous.

REFERENCES:

1. Baker, J. G. (1876). In: Hooker, J. D., *Fl. Brit. India* 2: 74-75.
2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 207. (repr. ed.)
3. Wight, R. & Walker-Arnott, G. A. (1834). *Prodr. Fl. Penin. Ind. Orient.* 186.

The material for this sheet was supplied by A. A. Ansari, and K. Thothathri, Botanical Survey of India, Calcutta.



Cratogeomys peduncularis Grah. ex Wt. et Arn.

A. Habit. B. Inflorescence.

STATUS: Rare, due to destruction of its habitats for plantation crops.

DISTRIBUTION: Anamalai and Nilgiri hills (Doddabetta). Tamil Nadu; Bababudan hills (Kulhatty), Karnataka. Endemic.

HABITAT AND ECOLOGY: In grasslands on exposed hill slopes upto 1500 m. Flowering and fruiting: October-December.

CONSERVATION MEASURES TAKEN: Its distribution localities in Anamalai Sanctuary and in Nilgiris are proposed Biosphere Reserve areas.

CONSERVATION MEASURES PROPOSED : To search for the species in its areas of distribution. If located it should be introduced into botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Of botanical and phytogeographical interest.

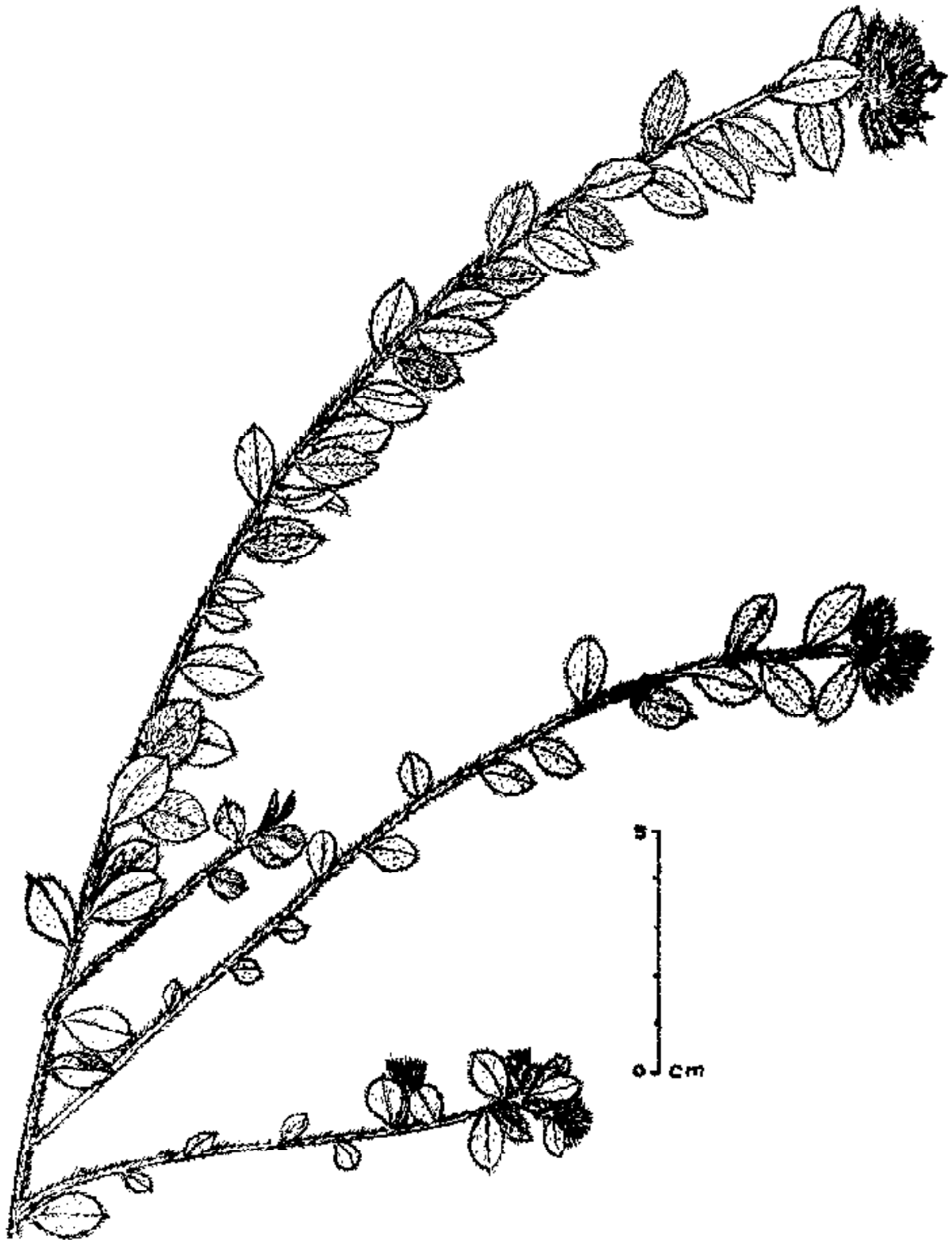
CULTIVATION: Not known.

DESCRIPTION: Brown-silky trailing herbs or undershrubs (black when dry). Leaves simple, alternate, subsessile (upper larger, lower smaller), chartaceous, hispid, 0.5-3 × 0.3-1.6 cm, broadly obovate or suborbicular-obovate, apex obtuse or rounded, mucronate, base cuneate, acute or rounded; stipules absent. Flowers yellow, 2-3 (-4-8), in dense terminal heads amongst the leaves; bracts foliaceous, lanceolate, long acuminate, bracteoles minute, sub-apical on pedicels. Calyx lobes 1.5 cm long, linear and lanceolate, shaggy. Corolla as long as the calyx; vexillum obovate-oblong, emarginate with a few hairs on the back. Pods sessile, 1.1-1.2 × 0.6-0.7 cm, oblong, glabrous, brown or blackish-brown, much included inside the calyx. Seeds 10-15, 2 mm, ovoid, chestnut-brown, smooth, polished.

REFERENCES:

1. Baker, J. G. (1876). *In: Hooker, J. D., Fl. Brit. India* 2: 74.
2. Cooke, T. (1958). *Fl. Pres. Bombay* 1: 36. (repr. ed.)
3. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 209. (repr. ed.)

The material for this sheet was supplied by A. A. Ansari, and K. Thothathri, Botanical Survey of India, Calcutta.



Crotalaria prestleyoides Benth. ex Baker

STATUS: Rare. Its habitats particularly along coastal areas are threatened due to destruction and developmental activities along east coast.

DISTRIBUTION: Krishna to Nagapatnam along east coast; Coimbatore to Tirunelveli, Tamil Nadu; Mysore, Karnataka. Endemic.

HABITAT AND ECOLOGY: Mostly in coastal areas growing amongst strand vegetation.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: To search for the species in wild and to observe the populations; if required it should be introduced in botanic gardens.

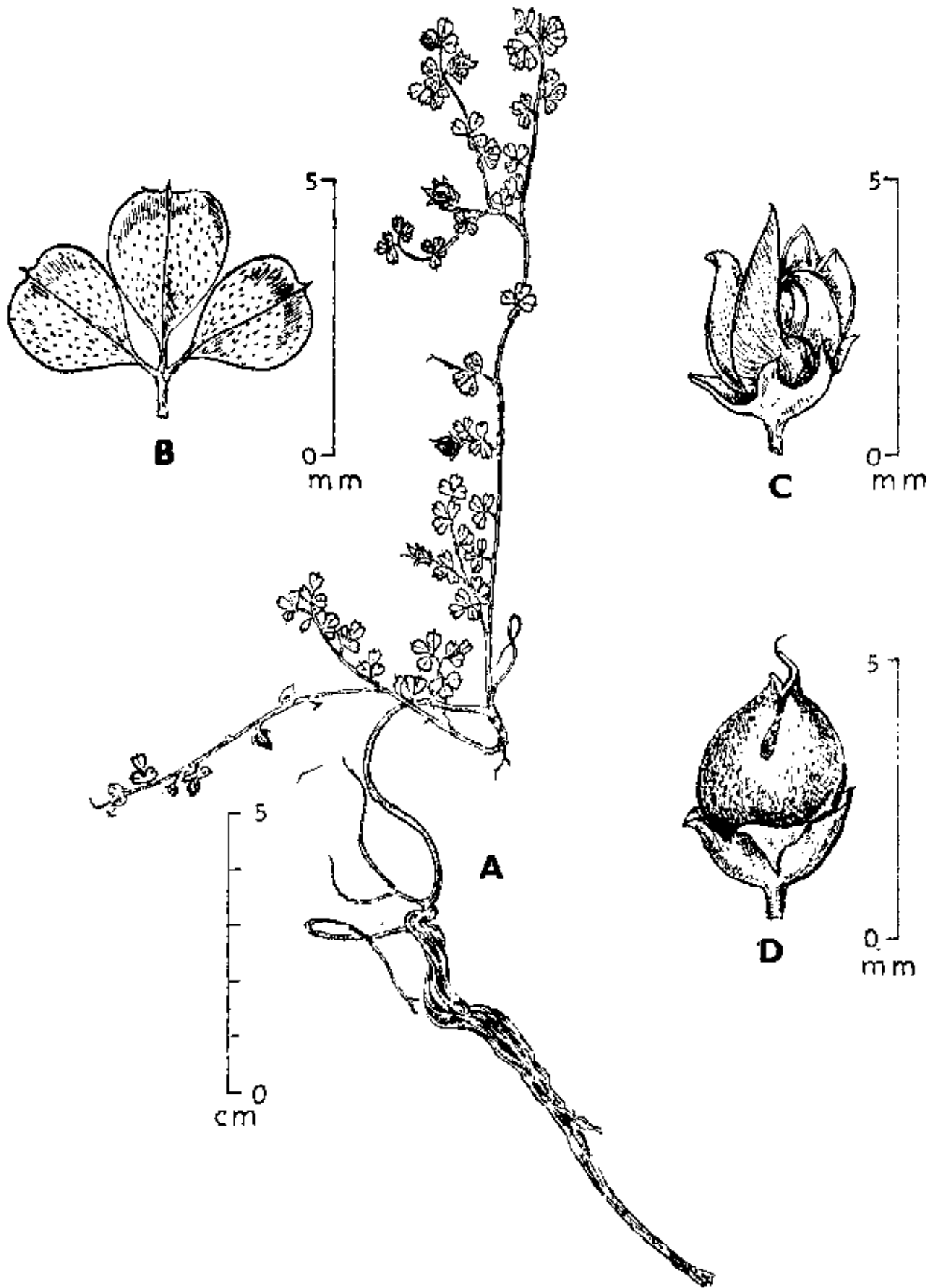
BIOLOGY AND POTENTIAL VALUE: Of botanical and economic interest; may be grown for green manure.

DESCRIPTION: Undershrubs, branches many, diffuse, rigid, glabrescent, spinescent. Leaves sessile, thick, 3-4 mm long, obcordate, apex emarginate, glabrous above, pilose below; stipules setaceous, very minute. Flowers yellow, 2-6, dense, 4-6 mm long in axillary or terminal racemes; bracts linear, very minute. Calyx lobes lanceolate, pubescent. Corolla well exerted; vexillum glabrous. Pods sessile, very small, obliquely subglobose, beaked. Seeds 2.

REFERENCES:

1. Baker, J. G. (1876). *In: Hooker, J. D., Fl. Brit. India* 2: 82.
2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 212 (repr. ed.).
3. Roth, A. W. (1821). *Nov. Sp. Pl. Ind. Orient.* 343.

Material for this sheet was supplied by A. A. Ansari, (Dehra Dun) and K. Thothathri, (Howrah), Botanical Survey of India.



Crotalaria rigida Heyne ex Roth A. Habit. B. Leaf. C. Flower. D. Capsule.

STATUS: Endangered due to habitat destruction. Represented by type specimens in Indian herbaria.

DISTRIBUTION: Endemic to Bellary District in Karnataka. It was reported by Beddome from Sandoor hills in May, 1880 and later by an unknown collector from Ramandrug (Sandoor hills) of the same district in February, 1917. Since then it has not been recollected.

HABITAT AND ECOLOGY: Occasional on hillsides in Northern interior areas. Flowering and fruiting: December–March.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To undertake intensive survey in its original habitat and if relocated to declare the habitats as protected for *in situ* conservation; to collect its seeds for cultivation in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Of botanical interest due to its endemism.

CULTIVATION: None at present.

DESCRIPTION: Erect herbs with silky hairs. Leaves subsessile, 4-7 × 1-3 cm, lanceolate or obovate-oblong, apex acute, mucronate, long-villous on both the sides; stipules absent. Flowers yellow in terminal panicles; bracts and bracteoles subcordate, acuminate, recurved, viscous, shining and black above. Calyx lobes with revolute margins. Corolla twice the calyx; vexillum 1.5 cm long, obovate, silky-hairy on dorsal surface. Pods 2 cm long, oblong, obtuse, pilose. Seeds 5-7, large.

REFERENCES:

1. Gamble, J. S. (1917). *Bull. Misc. Inf. Kew*, 29. and *Fl. Pres. Madras* 1: 211. 1957. (repr. ed.)
2. Saldanha, C. J. (1985). *Fl. Karnataka*, p. 441.

The material for this species was supplied by A. A. Ansari (Dehra Dun) and K. Thothathri (Howrah), Botanical Survey of India.

STATUS: Vulnerable. Causes for its decline are indiscriminate exploitation of evergreen forests and failure to replenish the seedlings in nature.

DISTRIBUTION: Endemic to Karnataka in South Kanara and Hassan districts and probably on its way to extinction. Hardly 2-3 collections exist, one of which is the Type (*Bourdillon* 1617) from South Kanara. Recently Saldanha had rediscovered it from Bisle ghat in Hassan district after Bourdillon's collection. Further surveys are required to relocate and multiply this useful timber tree.

HABITAT AND ECOLOGY: In evergreen forests at lower elevations of 200-300 m along the ghats.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: With various developmental projects in progress and introduction of cash crops such as rubber, cocoa, coffee etc., the rich luxuriant forests of Western Ghats are being depleted at an alarming rate. Unless remedial measures are taken to create biosphere reserves and protect the natural habitat, it is difficult to conserve such rare species. There are still many underexplored regions in South Kanara like Subramanya range, bordering Sullia, Aletty reserve forest, Kodachadri range etc. which need to be preserved. It is likely that this rare species may still occur and this has to be raised in forest nurseries for reintroduction in its natural habitats.

BIOLOGY AND POTENTIAL VALUE: Wood hard and used as timber. A handsome tree with clusters of flowers and small didymous pods.

CULTIVATION: Not attempted.

DESCRIPTION: Tree, 15-35 m tall. Leaves paripinnate; leaflets 3 pairs, similar; lamina glabrous, obliquely obovate-oblong, 2.5-4 × 1.0-1.8 cm, cuneate at base, apex obtuse, obliquely emarginate, lateral nerves 6 pairs. Inflorescence a dense raceme; rachis 1.5-2.5 cm long, pubescent, bracteate. Flowers crimson. Sepals 4, puberulous, ca 3 mm long. Petals crimson, 3.5 × 1.0 mm. Stamens 10, all fertile, filaments filiform, unequal, alternately long and short. Ovary brown-pubescent; style 2-2.5 mm, hairy. Pod smooth, globose, with a vertical groove, 1.5-1.7 × 1.3-1.5 cm.

REFERENCES:

1. Gamble, J. S. (1908). *Bull. Misc. Inform.* 446.
2. Krep van Meeuwen, M. S. (1970). The Indo-Malesian and Pacific *Cynometreae*. *Blumea* 18: 10-20.
3. Gandhi, K. N. (1976). In: Saldanha, C. J. & Nicolson, D. (ed.) *Fl. Hassan District, Karnataka, India*, p. 221.

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

STATUS: Endangered. It has not been collected after the two collections made in the years 1894 and 1907. Its possible rarity may be due to large scale clearing of forests for cultivation of cardomom near its habitats. There may still be some plants along water courses.

DISTRIBUTION: Ghats of Peermade and Courtallum in Kerala and Tamil Nadu respectively. Endemic.

HABITAT AND ECOLOGY: An evergreen tree along the banks of streams at altitudes varying from 800-850 m. Flowers during February-March and fruits in April-May.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: (a) Immediate steps should be taken to locate the populations and to determine the full extent of the species' range. (b) To stop allotment of forest land which include possible habitats of the species for purposes of plantation crops. (c) Collection of seeds (when located) for introduction into gardens and to reintroduce them into wild.

BIOLOGY AND POTENTIAL VALUE: The pods are eaten by hill tribals (1) and are probably rich in proteins. Like its allied genus *Saraca*, bears attractive flowers and may prove to be of ornamental value.

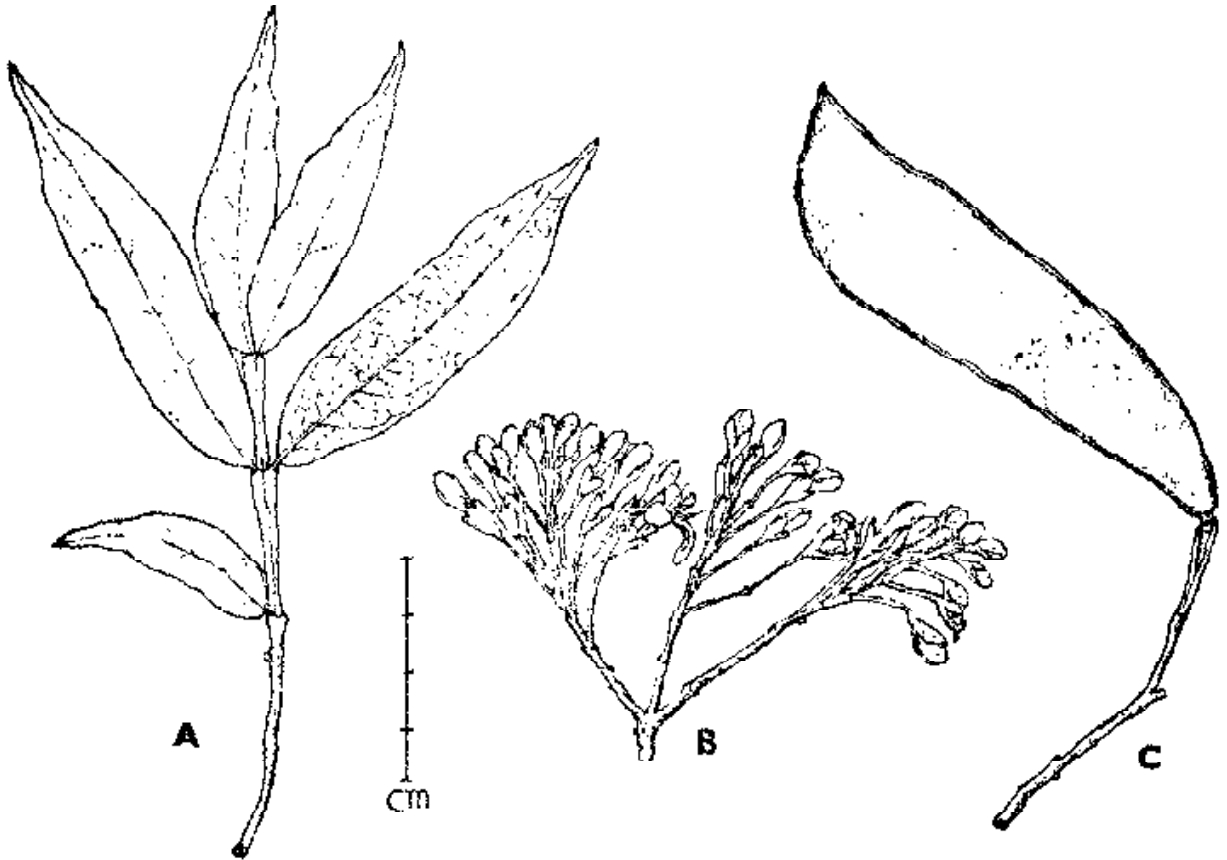
CULTIVATION: Despite the recommendation by Bourdillon in 1908 (1) for its introduction into gardens for its ornamental appearance, it has not found a place in gardens.

DESCRIPTION: Moderate-sized trees upto 16 m tall, trunk 35-45 cm in diameter. Leaves (4-) 6-8-foliolate, leaflets 7.5-12 × 1.5-4 cm, linear to narrowly ovate, unequal at base, obtusely acuminate at apex, chartaceous, glabrous, prominently reticulate with indistinct marginal arches; rachis obcordately winged between leaflets; stipules ovate, acute, glabrous, appendages falcate, rounded, veined, persistent. Corymbs 5 cm long on tubercles on stem and old branches, tawny velvety. Flowers 7 mm long, pinkish; pedicels 1.4-1.7 cm long, brown velvety; bracts 4 × 1.8 mm, ovate, acute, densely brown tomentose on both surfaces, fugacious; bracteoles 2, 8 × 1.5 mm, ovate-oblong, obtuse or rounded at apex, densely brown tomentose on both surfaces. Calyx-tube 1.4 cm long, obconical, brown tomentose, persistent; lobes 4, crimson, imbricate, 11 × 3 mm, linear, rounded at apex. Petals 5, white with pink veins, 3 longer and 2 shorter, 16-20 × 6 mm, shortly clawed, obovate, obtuse at apex, sparsely pilose within, glabrous without, fugacious. Stamens 5, filaments 3-4 cm long, broad at base, pilose; anthers 4 mm long, shortly apiculate at one end. Ovary 8-10 mm long on 1-1.5 mm long stipe, obliquely linear, 3-5-ovuled; style 2 cm long, pilose throughout when young; stigma capitate. Pods 10-11 × 2.5 cm, dolabriform, velvety brown pubescent, bright red or crimson, 3-5 seeded; sutures thick, valves prominently veined. Mature seeds not seen.

REFERENCE:

1. Sanjappa, M. (1986). A revision of the genus *Humboldtia* Vahl (Leguminosae-Caesalpinioideae). *Blumea* 31: 329-339.

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Humboldtia bourdilloni Prain A. Leaf. B. Inflorescence. C. Pod.

STATUS: Rare and sparsely distributed. The species is common in the known localities. None of the populations are believed to be under immediate threat nor there is any report of its exploitation or depletion in the wild. Interestingly only sparse collections have been made so far.

DISTRIBUTION: Southern parts of Western ghats in Travancore and Tirunelveli evergreen forests. It has been collected as recently as 1980 (3). Except for 2 collections of Beddome which are from Tirunelveli, all other known collections are from Travancore forests. Endemic.

HABITAT AND ECOLOGY: A tree in evergreen forests at altitudes between 150 and 900 m. Usually confined to valleys and along streams. Flowers from January to April and fruits from May to June (3).

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED : A thorough study of its distribution and of its existing habitats is required to plan conservation measures. However, efforts should be made to collect seeds for introduction into botanical and horticultural gardens.

BIOLOGY AND POTENTIAL VALUE: In flowering the species is very conspicuous in the forest by its white flowers in pendulous corymbs all over branches and stem (2). It will prove to be an asset for horticulturists when introduced into gardens. No other use has been recorded so far.

CULTIVATION: Not known.

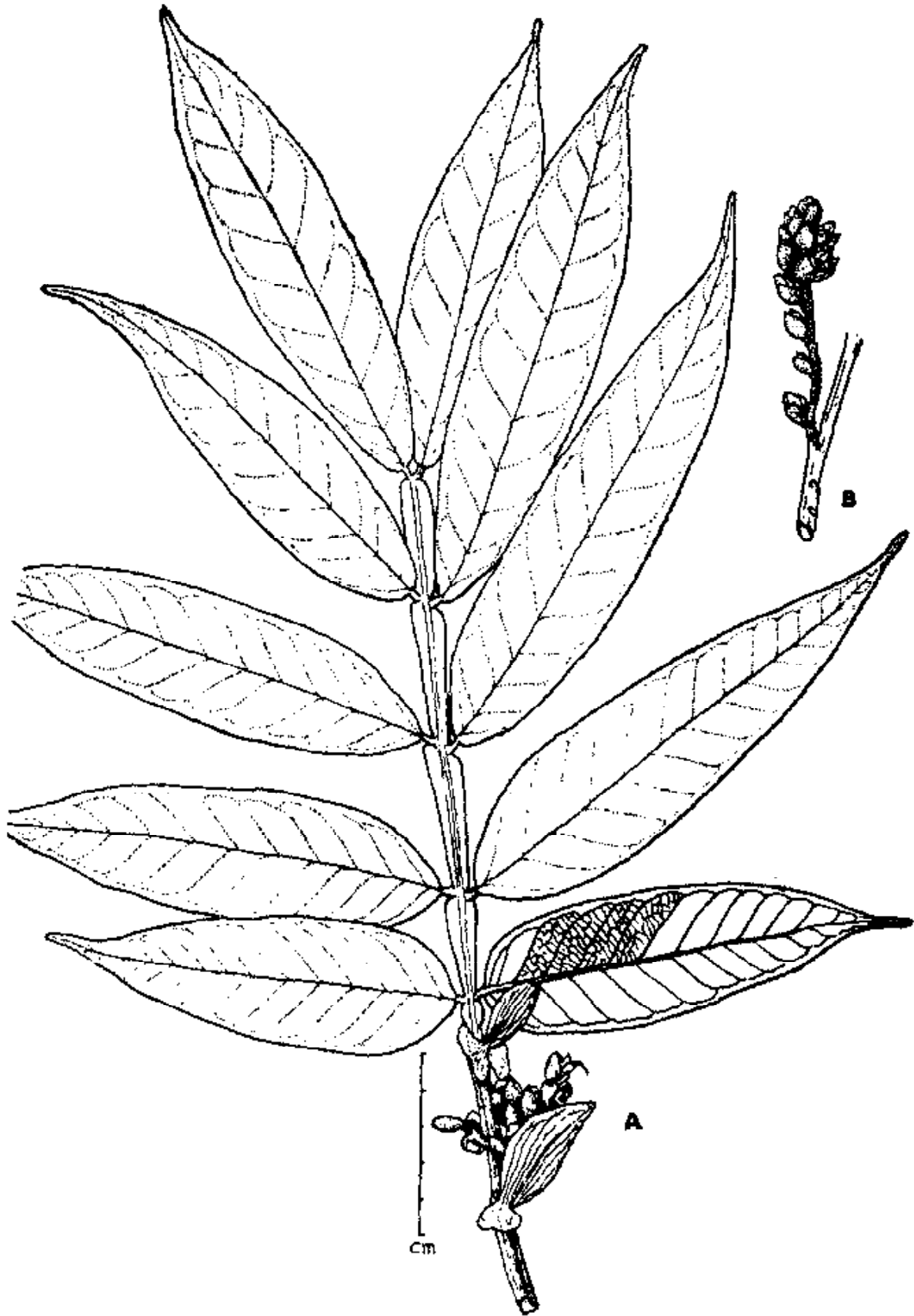
DESCRIPTION: Moderate-sized trees, 10-15 m tall, trunk 25-35 cm in diameter; branches dark-brown, glabrous. Leaves upto 45 cm long, subsessile, 10-12-foliolate, brown tomentose on midrib beneath, young leaves pink or white, pendulous; rachis obcordately or decurrently winged, wings reticulately veined, glabrous; petiolules 4-5 mm long, densely brown tomentose; leaflets 15-38 × 4-12 cm, narrowly ovate or elliptic, sometimes linear, obtuse or rounded at base, obtuse to acuminate at apex, subcoriaceous, prominently reticulately veined beneath with marginal arches, sparsely depressed glandular beneath, glabrous; stipules 5-8 × 1-2.5 cm, ovate to narrowly ovate, falcate, acuminate to cuspidate at apex; prominently parallel veined, brown tomentose on both surfaces, appendages 2-4 × 1-2.5 cm, reniform with divergent reticulate veins, brown tomentose, depressed glandular. Racemes 5-8.5 cm long, pendulous, axillary as well as cauliflorous, subsessile; tawny villous, 10-30-flowered. Flowers 3-4 cm long, pink or white; pedicels 1-1.2 cm long, brown villous; bracts 7-8 × 5 mm, broadly ovate, obtuse to acute at apex, brown villous and glandular without, black and glabrous within, fugacious; bracteoles 2, connate at base, 7-13 × 4-5 mm, ovate, obtuse, brown villous on both surfaces. Calyx-tube upto 1.2 cm long, obconical, brown villous; lobes 4, 11-5 mm, oblong, rounded at apex, brown villous without, imbricate (in cauliflorous flowers the petals are 2 × 0.5 cm, lan-

ceolate, distinctly clawed, abruptly acute at apex, sparsely pilose at base within). Stamens 3.5-4 cm long, filaments filiform, broad and brown pilose at base (glabrous in cauliflorous flowers), anthers 3-3.5 mm long, obtuse at both ends. Ovary 5 mm long on 1.5 mm long stipe, obliquely-linear, brown villous, 3-6-ovuled; style filiform, glabrous; stigma capitate. Pods 7-12 × 4 cm, dolabriform, 2-3-seeded, brown, rugulose, dark-brown tomentose when young. Seeds 1-2 cm broad, thick, flat, glabrous.

REFERENCES:

1. Oliver, D. (1895) *In: Hooker, Icon. Plant.* 4 (3): t. 2368.
2. Bourdillon, T. F. (1908). *The Forest Trees of Travancore.* Trivandrum. p. 148.
3. Sanjappa, M. (1986). A revision of the genus *Humboldtia* Vahl (Leguminosae-Caesalpinioideae). *Blumea* 31: 329-339.

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Humboldtia decurrens Bedd. ex Oliv. A. Flowering twig. B. Inflorescence.

STATUS: Endangered; restricted to the banks of streams in evergreen forests in southern parts of Western Ghats. Known only from Types collected in 1867 and no data was recorded with regard to density of its population. Causes of threats not clearly known, but may be due to habitat destruction by increasing cardamom and rubber plantations.

DISTRIBUTION: Endemic to Ghats of Travancore and Tirunelveli in Kerala and Tamil Nadu respectively. No collections have been made after type collection (1).

HABITAT AND ECOLOGY: An evergreen forest species growing along the banks of streams at altitudes varying from 600 m to 1300 m. Flowers during January-February and fruits in May-June.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: (a) Adequate measures should be taken to search and relocate the species from its known localities which will help in making desirable proposals for conservation. (b) Collection of seeds for introduction into its wild habitats as well as gardens. (c) To stop further allotment of forest land in its distribution range (which includes possible habitats of the species) for cultivation of plantation crops.

BIOLOGY AND POTENTIAL VALUE: One of the most handsome species of the genus which may prove to be of good horticultural value. The species yields hard and durable timber.

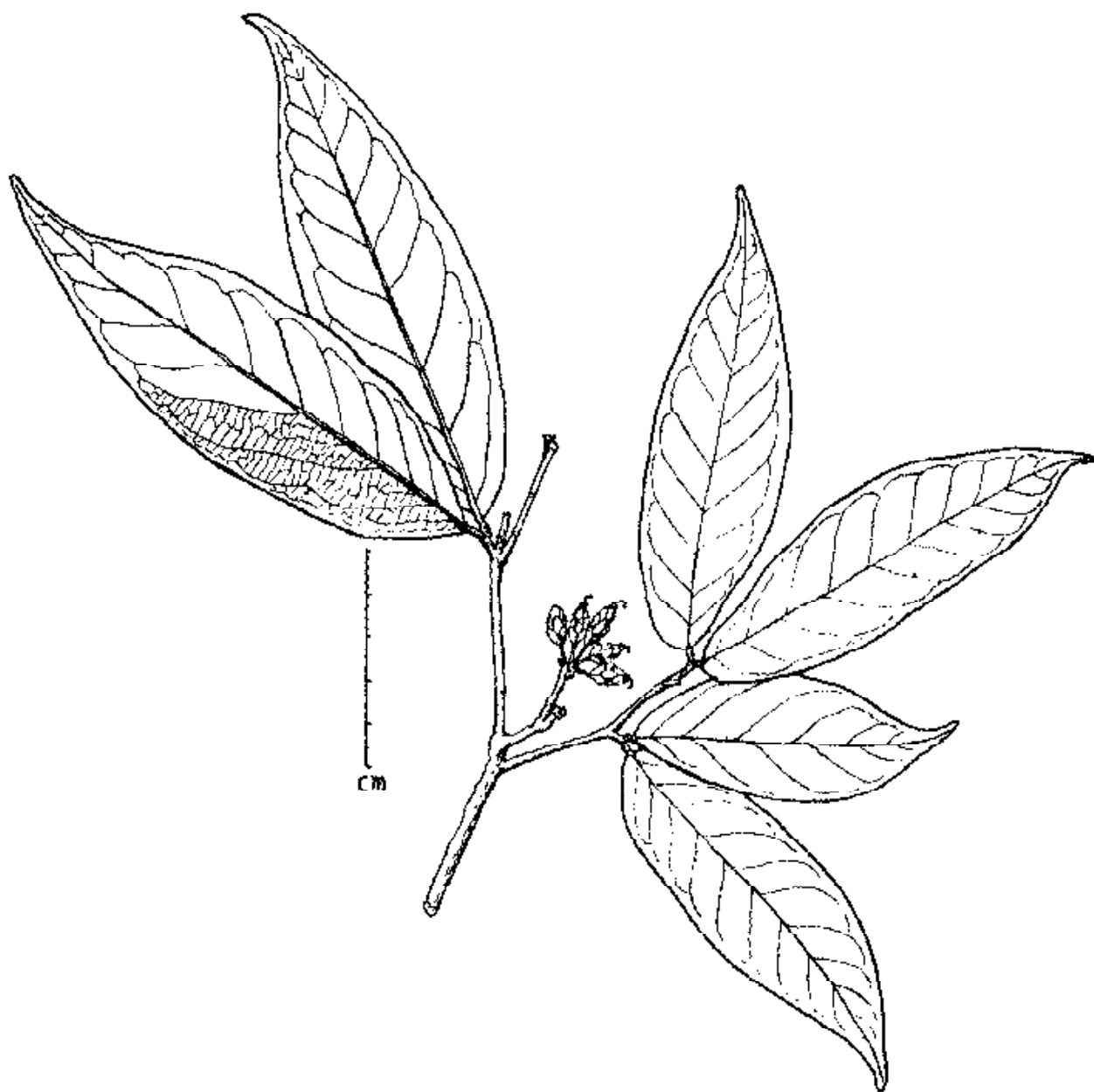
CULTIVATION: Not in cultivation so far.

DESCRIPTION: Moderate to large-sized trees, 10-15 (-20) m tall, trunk 20-30 cm in diameter; branches slender, solid, terete, glabrous. Leaves 2-foliolate, infrajugal rachis 3-6 mm long, glabrous; leaflets subsessile, 8-15 × 2-5 cm, elliptic to narrowly ovate, base unequal, obtusely acuminate at apex, coriaceous, glabrous, prominently veined below with marginal arches; stipules 5-7 × 2.5 mm, narrowly ovate, acute, prominently parallel veined, connate at base, intrapetiolar, glabrous, appendages absent. Racemes 2-2.5 cm long, axillary as well as cauliflorous; sterile bracts present at the base of racemes; rachis pubescent, many-flowered. Flowers 1.5-2.5 cm long, crimson, pedicels 5-10 mm long, finely brown pubescent; bracts 2-3 × 1.5 mm, ciliate and brown pubescent without; bracteoles 2, 4-5 × 1.5-2 mm, ovate, rounded at apex, finely pubescent without. Calyx-tube 8 mm long, obconical, brown pubescent; lobes 4, 8-10 × 2-3 mm, oblong, rounded at apex. Petals 5, crimson, 10-15 mm long, obovate, narrowed at base, veined, glabrous. Stamens 5, filaments 10 mm long, filiform, anthers 2.5-3 mm long. Ovary 5-6 mm long on 2-3 mm long stipe, obliquely oblong, densely brown pubescent, 2-3-ovuled; style 8-10 mm long, filiform, glabrous; stigma capitate. Pods 5-8 × 2-3 cm, compressed, veined, 2-3 seeded.

REFERENCES:

1. Beddome, R. H. (1872). *Fl. Sylv.* t. 183.
2. Beddome, R. H. (1868-74). *Ic. Pl. Ind. Orient.* t. 107.
3. Sanjappa, M. (1986) A revision of the genus *Humboldtia* Vahl (Leguminosae-Caesalpinioideae). *Blumea* 31: 329-339.

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Humboldtia unijuga var. *unijuga* Beed.

STATUS: Rare; confined to 5 localities in dry hilly slopes of Eastern Ghats. Causes of its rarity are possibly due to changing rainfall pattern or long periods of drought which has led to aridity of the habitats. Known to be surviving near water sources.

DISTRIBUTION: Endemic to Eastern Ghats in Andhra Pradesh and Tamil Nadu (2). It was described (1) based on gatherings of C. A. Barber from hills of South Arcot District and those of Bourne from Shevroy Hills. After the type collection only few gatherings have been made from Cuddpah, Kurnool and Chittor Districts. All the collectors have recorded the species to be very rare.

HABITAT AND ECOLOGY: In open areas among other legumes and grasses at altitudes varying from 300 to 700 m. Deep rooted in rocky soils along the hill slopes. Grows luxuriantly during August-September, flowers in September-October and fruits in October-December.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: (a) To locate more habitats in its distribution range. (b) To collect seeds from existing populations for introduction near water sources in some proposed areas of conservation in Eastern Ghats.

BIOLOGY AND POTENTIAL VALUE: There is no record of its uses so far. However, it has been introduced into Australia along with other exotic fodder legumes. Its cultivation for forage is unknown. May prove to be biologically important for future breeding of Indigo-yielding species.

CULTIVATION: Cultivated in CSIRO Plant Introduction Division in Australia(?)

DESCRIPTION: Suffruticose shrub, 20-120 cm tall; branches scabrous. Leaves pinnately trifoliolate; petioles 1.5-2.5 cm long, canaliculate, adpressed pubescent; stipules 1-2 mm long, subulate, pubescent without; leaflets 2.5-5.5 × 1-2.5 cm, obovate, obtuse at base and apex, mucronulate, adpressed pubescent on both surfaces, sparsely brown gland-dotted beneath; petiolules 1.5-2 mm long; stipels minute, setaceous. Racemes 5-7 mm long, axillary, subsessile, rachis pubescent, glandular, 10-15-flowered. Flowers solomon red; pedicels 1 mm long; bracts 2-2.5 mm long, subulate, pubescent, glandular, caducous; calyx 2mm long, adpressed pubescent and glandular without; teeth narrowly triangular; standard 2-3 × 1-1.5 mm, elliptic or obovate, acute at apex, puberulous and glandular without; wings obliquely oblong, finely ciliate along margins; keels obovate, puberulous and glandular without, spurred on sides; stamens 9-11, filaments 2.5-3 mm long, anthers basifixed, apiculate; ovary 2 mm long, linear, glandular towards tip, 3-4-ovuled; style 1 mm long, sparsely covered with glands; stigma capitate. Pods 1.5-2 cm long, subcylindric, moniliform, curved towards tip, pubescent and glandular, sutures thick. Seeds 2-4, 1.5 × 1 mm, ovoid, smooth, reddish-brown or yellow.

REFERENCES:

1. Gamble, J. S. (1919). *Kew Bull.* 1919: 222.
2. Sanjappa, M. (1984). Endemic species of Indian *Indigofera* L. (Fabaceae-Papilionoideae) and their distribution. *J. Econ. Tax. Bot.* 5: 1028.

The material for this sheet was supplied by M. Sanjappa, Botanical Survey of India, Howrah.



Indigofera barberti Gamble

STATUS: Vulnerable, due to habitat loss. This species was last collected by N. L. Bor in 1937.

DISTRIBUTION: Meghalaya (Syrengam, Khasia & Jaintea Hills); Assam (Bhutan hill, Cachar). Endemic.

HABITAT AND ECOLOGY: In sub-tropical high rainfall forests along with other evergreen trees, in the altitudes of about 1000-1500 m.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Efforts should be made to determine the extent to which this species occurs; collection of a few plants and multiplication from seeds in botanic gardens, and preservation of its habitats.

BIOLOGY AND POTENTIAL VALUE: Flowers during April-May. Wood is suitable for cabinet work. This is the only species of the family known from India.

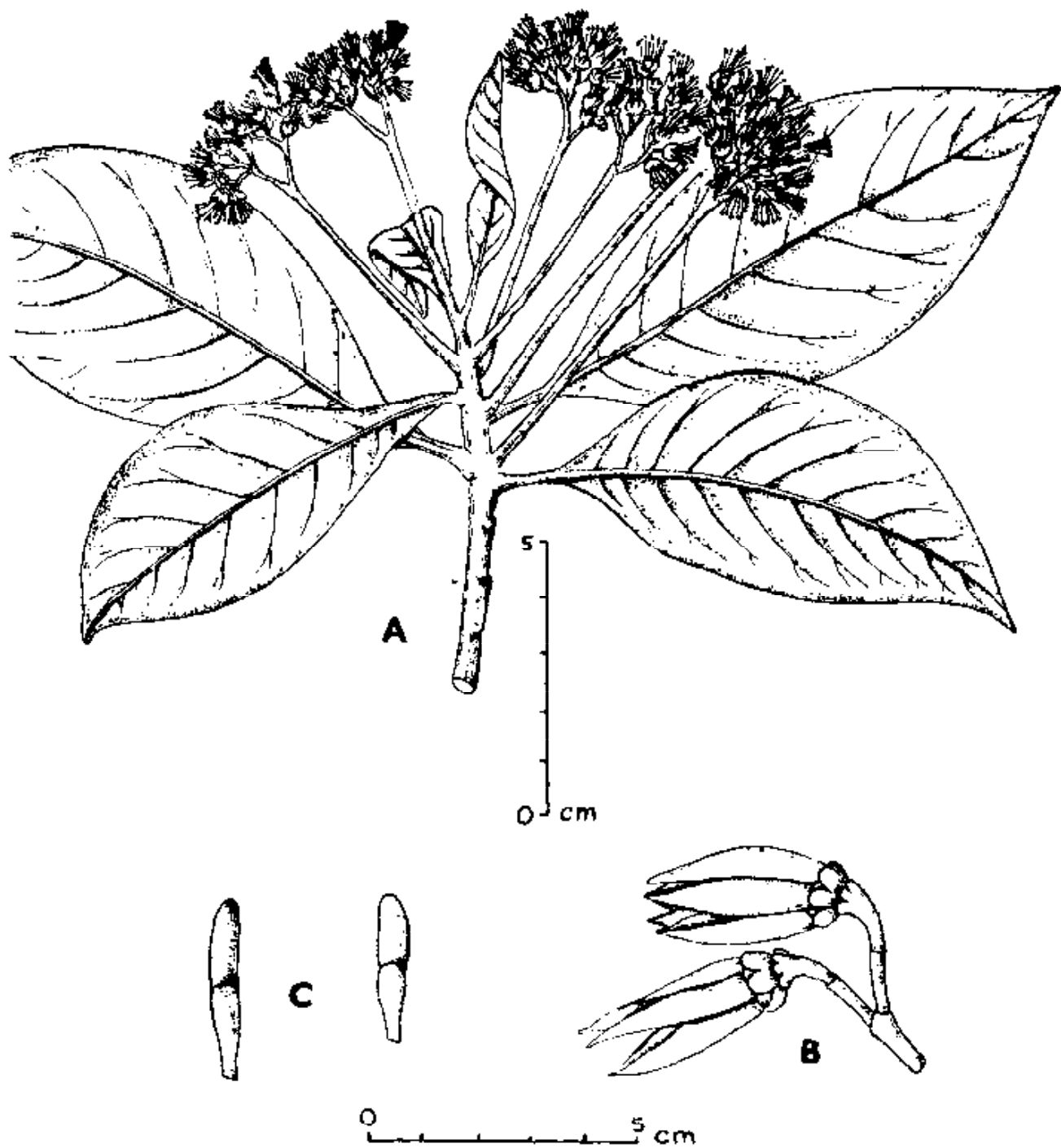
CULTIVATION: Not known.

DESCRIPTION: Trees ca 40 m high, ca 80 cm in diam.; fluted at base. Leaves 7.0-13.0 × 2.5-5.0 cm, elliptic-lanceolate to oblong, glabrous, membranous, obtusely acuminate at apex, narrowed at base, decurrent into a short petiole; secondary nerves 6-9 on either half with many intermediate nerves; petiole 0.6-1.8 cm long, glabrous. Peduncles slender, 4.0-10.5 cm long, obscurely winged; pedicels 0.3-0.8 cm long. Flowers ca 5 mm across. Fruits 3.0-4.0 × 1.0-1.5 cm, oblong, capsular, 5-valved. Seeds winged.

REFERENCES:

1. Hajra, P. K. (1983). Linaceae & Ixonanthaceae. *Fasc. Fl. India* 13: 14, t. 1-3. Botanical Survey of India. Howrah.
2. Kanjilal, U., et al. (1936). *Fl. Assam* 1(2): 186.

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



Ixonanthes khasiana Hook. f. A. Flowering twig. B. Fruits. C. Seeds.

STATUS: Rare. Known from one or two old specimens collected nearly 70 years ago and no recent collections are seen.

DISTRIBUTION: North Kanara Distt., Gersoppa ghat, Karnataka. Endemic.

HABITAT AND ECOLOGY: The species occurs in stony, rocky places.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: The type locality and neighbouring areas are to be searched for this species. The area is declared as protected area. The plants or seeds should be collected and propagated in the experimental gardens.

BIOLOGY AND POTENTIAL VALUE: Not known.

CULTIVATION: Not known.

DESCRIPTION: Erect herbs upto 30 cm tall, stem woody, branched from base, branches 4-angled, 4-sulcate; leaves narrowly linear, 3.0 × 0.3 cm, margins revolute. Floral whorls axillary, few-flowered; calyx 0.6 cm, slightly curved, minutely hispid outside, mouth oblique, slightly extended, toothed; corolla conspicuously swollen, tube 0.5 cm long, upper lip 0.3 cm long and broad, white villous, lower lip deflexed, 0.9 cm long, puberulous in lower half, 3-lobed, lateral lobes narrow, recurved, middle lobe emarginate; stamens didynamous.

REFERENCE:

1. Sedgwick, L. J. (1921). New Bombay species. *J. Ind. Bot. Soc.* 2: 123.

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

STATUS: Vulnerable, reported from a single locality. Only twice this species has been collected from the known locality.

DISTRIBUTION: Tirunelveli hills, Western Ghats. Endemic.

HABITAT AND ECOLOGY: It grows on hilly tracts at higher altitudes.

CONSERVATION MEASURES TAKEN: The entire area falls within the Mundanthurali and Kafakad wildlife sanctuaries of the Forest Department, and thus its habitats are partially protected.

CONSERVATION MEASURES PROPOSED: Seeds/seedlings be collected and introduced in Botanical/Experimental gardens for *ex situ* conservation and multiplication.

BIOLOGY AND POTENTIAL VALUE: It is of considerable scientific interest as a member of the family Lamiaceae having many aromatic/medicinal plants.

DESCRIPTION: Slender erect herbs with 4 angled stems. Leaves opposite, petioled, membranous, ovate, acute, rounded at base and then acutely decurrent, sharply serrate; base entire. Racemes lax flowered with leafy bracts, terminal and axillary; bracts linear-lanceolate. Calyx campanulate, sparsely glandular hairy; corolla white; upper lobes of lip curved, acuminate; side lobes acute.

REFERENCES:

1. Gamble, J. S. (1924). *Kew Bull.* 1924: 266.
2. Gamble, J. S. (1957). *Fl. Pres. Madras* 2: 810. (repr. ed.)
3. Mukherjee, S. K. (1940). *Rec. Bot. Surv. India* 14 (1): 222.

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

STATUS: Possibly Extinct in the wild; known from two gatherings; it has not been seen since 1861, though the region has been repeatedly explored.

DISTRIBUTION: Endemic to S. India.

HABITAT AND ECOLOGY: Sandy sea coasts.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To make a thorough search of the species in the localities mentioned above; if available the bulbs may be introduced in Botanic Gardens.

BIOLOGY AND POTENTIAL VALUE: It is a member of the genus *Dipcadi* Medik., which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It also belongs to the same tribe to which the alkaloid yielding plants, *Urginea indica* Kunth and *Scilla hyacinthina* Macbride, belong.

DESCRIPTION: Small 18-28 cm tall, bulbous, scapigerous herbs. Bulbs tunicated. Leaves smaller than scape, linear. Scapes slender, terete, glabrous, naked, bearing terminal raceme of 2-6 flowers. Flowers shining white, 25-26 mm long, bisexual, hypogynous, solver shaped, gamophyllous, bracteate, pedicelled. Perianth segments 6, in two whorls, united below to form tubes, outer tube shorter than inner, outer lobes ca 15 × 3 mm lanceolate, inner ca 4 × 3 mm, deltoid. Stamens at the throat of the tube, filaments inconspicuous; anthers narrowly oblong, dorsifixed. Ovary obovoid-oblong, style very long, to times longer than ovary. Capsule deeply trilobed; seeds 6 in each locule, compressed, rotund, shining black.

REFERENCES:

1. Baker, J. G. (1871). Revision of the genera and species of herbaceous capsular gamophyllous Liliaceae. *J. Linn. Soc.* 11:395-400.
2. Dalzell, N. A. (1850). Contributions to the Botany of W. India. *J. Botany* 2: 142-143.
3. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Dipcadi* Medik., (Liliaceae) in India. *J. Bombay Nat. Hist. Soc.* 75:69.
4. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae. Tribe: Scilleae. *Fasc. Fl. India* 7:1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

STATUS: Endangered. Known only from Panchgani in Maharashtra. It has not been collected since its first discovery in 1955 though the area has been thoroughly explored during this period.

DISTRIBUTION: Endemic to Panchgani plateau in Maharashtra state.

HABITAT AND ECOLOGY: In sandy gravel on the plateau.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: To make a thorough search for the plants, and if available, to grow the bulbs in botanic gardens as a measure of *ex situ* conservation.

BIOLOGY AND POTENTIAL VALUE: It is a member of the genus *Dipcadi* which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It belongs to the same tribe in which alkaloid yielding plants, *Urginea indica* Kunth and *Scilla hyacinthina* Macbride belong, so may be a potential alkaloid containing species.

CULTIVATION: It was in cultivation in St. Xavier's College, Bombay.

DESCRIPTION: Plants small, about 36 cm long, bulbous, scapigerous, herbs. Bulbs ca 2.5 × 2.5 cm, globose, tunicated, profusely rooting. Leaves smaller, linear, arising from the bulb. Scape slender, erect, terete, glabrous, naked, bearing terminal raceme of about 12 flowers. Flowers small, 11-13 mm long, bisexual, hypogynous, campanulate, gamophyllous, pedicelled. Perianth segments 6, united in two whorls; outer united 1/3rd of the length from the base and inner united 2/3 rd of the length from the base forming a tube. Stamens 6, at the throat of the tube without conspicuous filaments, anthers oblong, dorsifixed. Ovary broadly oblong; style slightly longer than ovary.

REFERENCES:

1. Deb, D. B. & Dasgupta, Syamali (1975). New taxa of the genus *Dipcadi* Medik., (Liliaceae). *J. Bombay Nat. Hist. Soc.* 72(3): 822-824.
2. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Dipcadi* Medik., (Liliaceae) in India. *J. Bombay Nat. Hist. Soc.* 75:62.
3. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae. Tribe. Scilleae. *Fasc. Fl. India* 7: 1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

STATUS: Indeterminate. Known on the basis of two gatherings only. It has not been collected after 1959, though the region has been repeatedly explored during this period. Capsule of the plant is unknown.

DISTRIBUTION: Endemic to Deccan plateau. Specific localities are unknown.

HABITAT AND ECOLOGY: Sandy plateau.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To make a thorough search in the Deccan Peninsula, and if the plants are rediscovered, their cultivation in botanic gardens through bulbs.

BIOLOGY AND POTENTIAL VALUE: It is a member of the genus *Dipcadi* Medik., which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It belongs to the same tribe to which the alkaloid yielding plants, *Urginea indica* Kunth and *Scilla hyacinthina* Macbride belong, and may prove to be another potential alkaloid yielding plant.

CULTIVATION: None on record.

DESCRIPTION: Herbs, 12-15 cm long, bulbous, scapigerous. Bulbs 1.8-2.0 × 1.5-2.0 cm, ovoid, tunicated. Leaves as long as the scape, linear, arising from the bulbs. Scape terete, glabrous, naked with loose terminal raceme of 6-12 flowers. Flowers small, 8-9 mm long, bisexual, hypogynous, campanulate, gamophyllous, bracteate, pedicelled. Perianth segments 6, in 2 whorls, both the whorls united 1/3 to 1/2 from the base forming a tube. Stamens 6, at the throat of the tube, filaments very short, anthers oblong, dorsifixed. Ovary narrowly obovoid, style as long as ovary.

REFERENCES:

1. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Dipcadi* Medik., (Liliaceae) in India. *J. Bombay Nat. Hist. Soc.* 75: 66.
2. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae. Tribe: Scilleae. *Fasc. Fl. India* 7: 1-23. Botanical Survey of India, Howrah.
3. Hooker, J. D. (1892). *Fl. Brit. India* 6: 345.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

STATUS: Presumed Extinct. Known only from a single gathering and has not been collected during the last 100 years.

DISTRIBUTION: Western Himalaya (without precise locality). Endemic (?).

HABITAT AND ECOLOGY: In mountains at 2300 m altitude.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: Thorough search of the area mentioned above may be made and if rediscovered, the bulbs may be introduced into the botanic gardens.

BIOLOGY AND POTENTIAL VALUE: It is a member of the genus *Dipcadi* Medik., which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It also belongs to the same tribe to which alkaloid yielding plants *Urginea indica* Kunth and *Scilla hyacinthina* Macbride belong and so the species may be of potential importance.

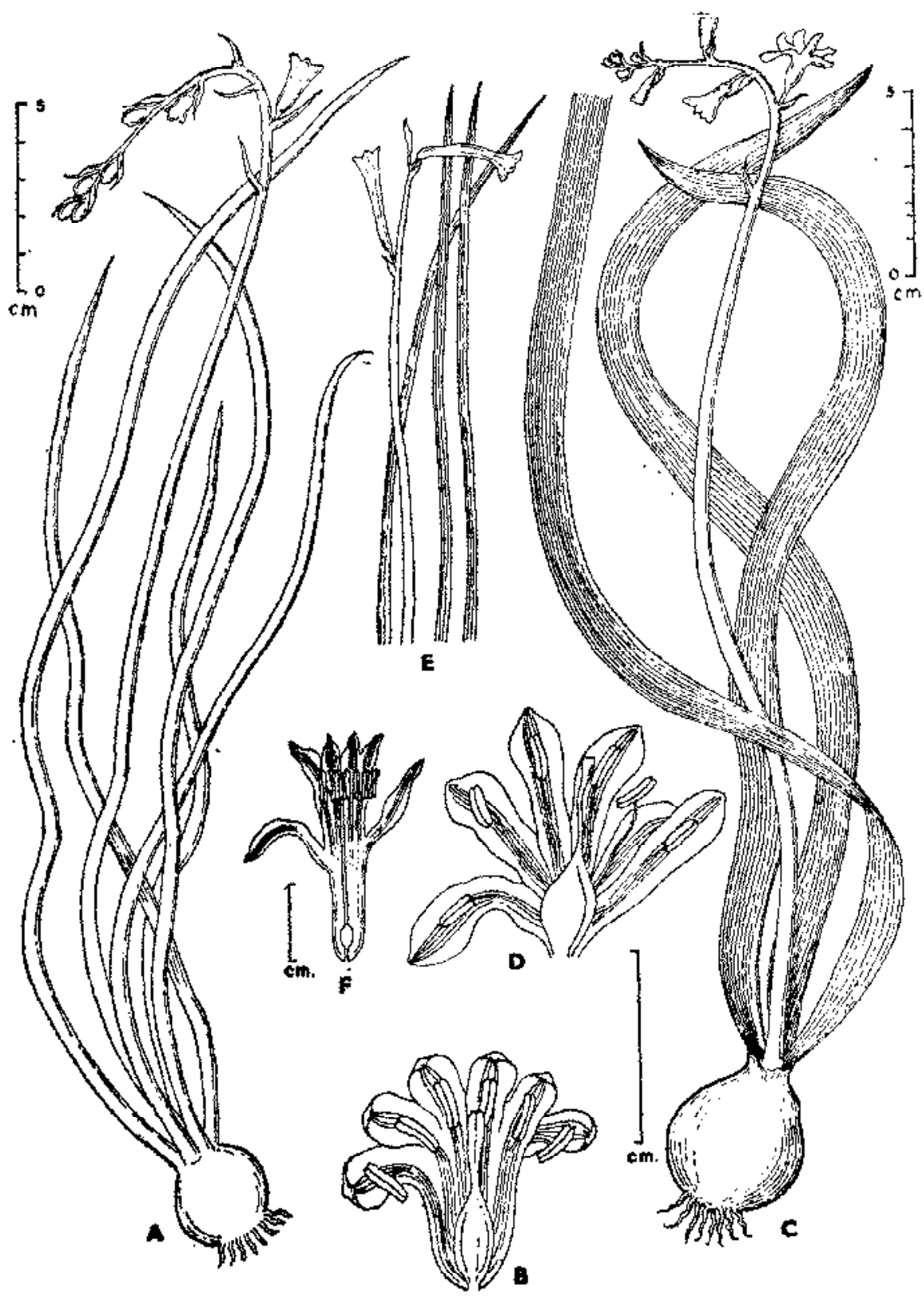
CULTIVATION: None on record.

DESCRIPTION: Plants small, 30-40 cm long, bulbous, scapigerous. Bulbs ca 43.5 cm, ovoid, tunicated. Leaves linear, as long as scape, arising from the bulbs. Scape terete, glabrous, naked, with terminal racemes of 10-18 flowers. Flowers 13-15 mm long, light brown when dry, bisexual, hypogynous, campanulate, gamophyllous, bracteate, pedicelled. Perianth segments 6, in two whorls, united 1/3-1/2 the length from the base, forming a tube. Stamens 6, at the throat of the tube; filaments short; anthers narrowly oblong, dorsifixed. Ovary trisulcate, oblong, style as long as ovary.

REFERENCES:

1. Deb, D. B. & Dasgupta, Syamali (1975). New taxa of the genus *Dipcadi* Medik. (Liliaceae). *J. Bombay Nat. Hist. Soc.* 72 (5): 822-824.
2. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Dipcadi* Medik. (Liliaceae) in India, *J. Bombay Nat. Hist. Soc.* 75: 69.
3. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7: 1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.



A. *Dipcadi maharashtrensis* Deb et Dasgupta-Habit. B. Dissected flower. C. *Dipcadi reidii* Deb et Dasgupta-Habit. D. Dissected flower. E. *Dipcadi concanense* (Dalz.) Baker-Habit. F. Dissected flower.

STATUS: Vulnerable. It grows in Boriveli, Salsette, in Maharashtra, which are tourist spots, being in the Boriveli National Park.

DISTRIBUTION: Endemic to Maharashtra State.

HABITAT AND ECOLOGY: On rocky hills.

CONSERVATION MEASURES TAKEN: Although no direct measures have been taken, possibly its habitat falls within the boundaries of the Boriveli National Park.

CONSERVATION MEASURES PROPOSED: 1) To declare the locality as a protected reserve by the State and Central Governments; (2) to grow the bulbs in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: It is a member of the genus *Dipcadi* Medik., which is taxonomically and phylogenetically interesting for its gamophyllous flowers. It belongs to the same tribe to which alkaloid containing plants, *Urginea indica* Kunth and *Scilla hyacinthina* Macbride belong.

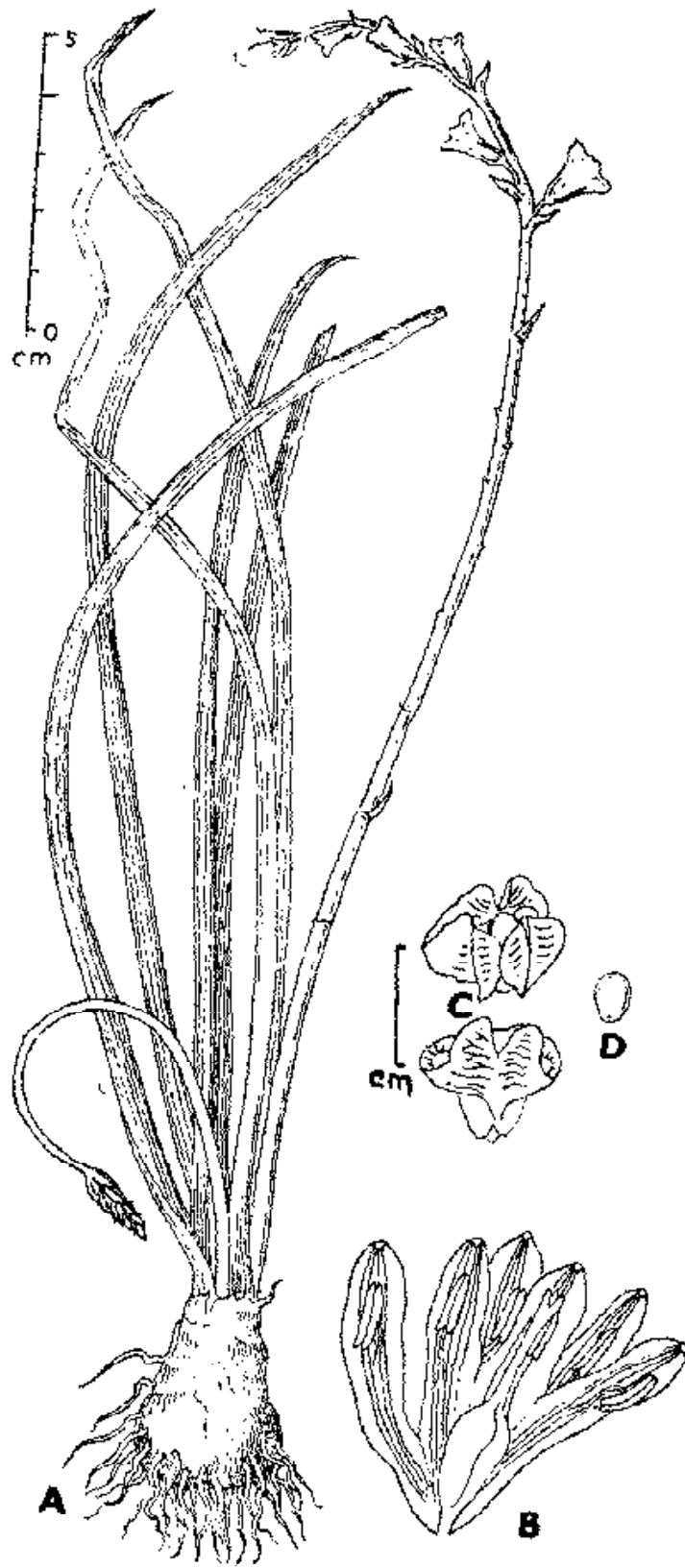
CULTIVATION: The plant was in cultivation in St. Xavier's College, Bombay.

DESCRIPTION: Small, 20-40 cm long, bulbous scapigerous herbs. Bulbs 1.5-2 × 1.5-2 cm globose, tunicated. Leaves smaller than the scape, linear, arising from the bulb. Scape terete, glabrous, naked with a terminal raceme of 15-20 flowers. Flowers small, 10 mm long, bisexual, hypogynous, campanulate, gamophyllous. Perianth segments 6, in 2 whorls; outer united upto 1/3 of the length from the base and inner united upto 2/3 of the length from the base forming a tube. Stamens 6 at the throat of the tube, without conspicuous filaments, anthers oblong, dorsifixed, dehiscing longitudinally; pistil consists of oblong ovary and style as long as ovary. Capsule 8-10 × 10-13 mm, trilobed, loculicidally dehiscent. Seeds 4-9 in each chamber, orbicular or quadrangular, black, not shining, wingless, compressed.

REFERENCES:

1. Blatter, E. & McCann, C. (1928). Some new species of plants from Western Ghats. *J. Bombay. Nat. Hist. Soc.* 32: 735-736.
2. Mahabale, T. S. & Chennaveeraiah, M. B. (1954). Karyotypes in *Dipcadi* Medik. *Curr. Sci.* 11: 367.
3. Chennaveeraiah, M. B. & Mahabale, T. S. (1962). Morphological and embryological studies in *Dipcadi*. *Plant Embryology: A symposium*. CSIR, New Delhi. p. 12-22.
4. Deb, D. B. & Dasgupta, Syamali (1977). Revision of the genus *Dipcadi* Medik., (Liliaceae) in India. *J. Bombay. Nat. Hist. Soc.* 75:62.
5. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7: 1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.



Dipsadi saxorum Blatt. A. Habit. B. Flower-dissected. C. Capsule. D. Seed.

STATUS: Rare, due to destruction of its habitats.

DISTRIBUTION: Jammu and Kashmir, Himachal Pradesh. Endemic to Western Himalaya.

HABITAT AND ECOLOGY: A hardy perennial herb found in temperate, dry, open grasslands and hill sides in Kashmir and Himachal Pradesh at an altitude of 2400-3300 m.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Conservation of its populations in its natural habitats. The species be introduced for cultivation in Botanic gardens and conservatories.

BIOLOGY AND POTENTIAL VALUE: The species readily propagates by seeds or by division of rootstock. Also, ornamental for its white flowers; leaves are used as vegetable in Lahul, Himachal Pradesh (1).

CULTIVATION: Reported to be widely cultivated in gardens in Europe and America.

DESCRIPTION: Stately, scapose, perennial, glabrous, 80-150 cm tall herbs; rootstock thick. Leaves radical, flat, 30-70 cm long. Racemes dense, 30-60 cm long. Flowers white, 2-3 cm across, segments oblong, equalling the stamens. Capsules 1-1.5 cm. Seeds triquetrous.

REFERENCES:

1. Bor, N. L. (1941). *Ind. For.* 67: 629.
2. Collet, H. (1902). *Fl. Simlensis*, 525.
3. Hooker, J. D. (1892). *Fl. Brit. India* 6: 332.

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

STATUS: Vulnerable. Though the seeds do not contain high quantity of colchicine, the yield in terms of number of fruits and seeds is more than in other species of the genus. Hence, it appears to be equally high in demand, causing depletion of its populations.

DISTRIBUTION: Endemic to Western Ghats. So far known from Dhule, Raigad, Pune and other adjoining districts in Maharashtra. It is also reported to have been collected in Karnataka, though exact localities are not known.

HABITAT AND ECOLOGY: Grows on exposed grassy slopes of the hills on gravelly soil with ca 150 cm annual rainfall.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Uprooting of the plants be legally prohibited for export. (b) Ban on large scale collection of its corms and seeds from the wild. (c) Conservation of the species *in situ* or *ex situ* in protected areas having similar ecological conditions; drug farms could be established by introducing more corms removed from unprotected areas liable to be exploited. (d) Propagation through seeds be tried.

BIOLOGY AND POTENTIAL VALUE: A conspicuous species which flowers during July to September and fruiting from August to October. The seeds contain ca 0.7% colchicine. However, it provides a better source of raw-material as the amount of seeds produced per plant is more than in any other species of the genus.

CULTIVATION: Not known. However it can be easily cultivated by means of corms under suitable ecological conditions.

DESCRIPTION: Erect herb, reaching ca 60 cm in height. Corms subglobose. Stem generally branching. Leaves grass-like, many. Inflorescence 4-many flowered raceme. Pedicels 2.5-5.5 cm long, longer in fruits. Flowers dark brownish-purple; perianth lobes 6, 1-2 x 0.2 cm, linear-subulate or elliptically linear, 1-3 nerved, spreading and later reflexed. Stamens 4-6 mm long, purple; anthers oblong-ovate, dark purple, without any apicule; filaments 2.5-4 mm long, always glabrous. Ovary green, oblong-obovate; styles 3, united in the lower half, recurved above to form 3 stigmas. Capsule 0.8-1.75 x 0.5-1 cm, sub-globose or elliptically oblong, many-seeded.

REFERENCE:

1. Ansari, M. Y. & Rolla Rao (1978). Two new species of the genus *Iphigenia* Kunth (Liliaceae) from Western Ghats (India). *Bull. Bot. Surv. India*, 20 (1-4): 162. t. 1, f. 1-6 b.

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

STATUS: Endangered. Causes of its rare collections and poor representation in herbaria are not known. Even recent efforts to locate it from known distribution areas have failed.

DISTRIBUTION: Restricted to Karnataka State. So far known from Halial, North Kanara (1886) and Hulical in Shimoga district (1978) on the basis of which this species was described as new recently. It is likely to occur in the adjoining regions also, but not recorded so far, although the areas are fairly well-explored. The recent special exploration to locate the plant in Hulical in Shimoga is not fruitful.

HABITAT AND ECOLOGY: It grows on exposed, grazed grassy areas on gravelly or sandy-loam soil with high rainfall.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Uprooting of the plant with its root-stock (corm) should be legally prohibited. (b) Should be conserved *in situ* or be grown in protected areas with similar ecological conditions. (c) Commercial trade of its corms and seeds be banned, as large scale collection of the wild plants and fruits is apprehended. (d) Propagation through seeds and other techniques be tried.

BIOLOGY AND POTENTIAL VALUE: The species flowers from July to mid-August and fruits from August onwards. The flowers are solanaceous-violet in colour. It was earlier considered to be *I. pallida*; however it is quite distinct in its floral pattern and fruits. The seeds of this species also contain about 1% colchicine and hence is very much in demand.

CULTIVATION: Whether any private agency is cultivating the species, is not known.

DESCRIPTION: Small erect herbs, 8-10 cm in height. Corms globose, small. Leaves grass-like, 3-4 in number. Inflorescence mostly a 2-flowered corymb; pedicels 2.0-2.7 cm long, ascending. Perianth lobes 6, 6-8 × 1.5-2.0 mm, 5-7 nerved, linear-elliptic or elliptic-oblancheolate, spreading. Stamens 2.5-3.0 mm long, violet coloured; anthers 1 × 1 mm, filaments ca 2 mm long, glabrous. Ovary green; styles 3, shortly united at base, free and reflexed above with 3 stigmas. Capsule 1 × 0.6 cm, obovate, small, few seeded.

REFERENCE:

1. Ansari, M. Y. & Rolla Rao (1978). Two new species of the genus *Iphigenia* Kunth (Liliaceae) from Western Ghats (India). *Bull. Bot. Surv. India* 20 (1-4): 163, t. 2, f. 1-8.

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

STATUS: Vulnerable. Large-scale uprooting of the plants for cultivation and removal of seeds for commercial exploitation is causing great concern as it has led to depletion of populations.

DISTRIBUTION: So far known from Maharashtra State. This species is known from Panchgani-Mahabaleshwar zone (Satara district) and from Panhala plateau and Radhanagri area (Kolhapur district). It is likely to occur under similar ecological conditions in the neighbourhood.

HABITAT AND ECOLOGY: It grows on plateaus and in open grazed grasslands with gravelly, well-drained soil on gentle slopy areas. It needs *ca* 250 cm rainfall with cool and misty climate in altitude of *ca* 1500 m.

CONSERVATION MEASURES TAKEN: A small 'drug plant farm' was set up at Gureghar Forest nursery compound near Panchgani, under the care of the Forest department, Maharashtra, with its natural population. Earlier, the area was given on lease to private agencies for collection of seeds by the department; however, the present position is not known. In the recent past, large scale uprooting of the plants (with root-stock) was noticed for obvious reasons, from unprotected areas in the region without any check.

CONSERVATION MEASURES PROPOSED: (a) There should be a legal ban on uprooting of the plants and export of its roots (corms) and seeds. (b) Setting up of more 'drug plant farms' under similar ecological conditions and distribution/sale of its seeds through the farm agency would be ideal. This would conserve the species as well as provide outlet for its raw-material (seeds) to the concerned small-scale industry for production of the drug. (c) Propagation and multiplication of its populations through seeds and other techniques be tried to increase the availability of raw-material.

BIOLOGY AND POTENTIAL VALUE: A herb, flowers during mid-June to July and fruits in July-August. By the end of August, fruits ripen and dehisce. The seeds provide a rich source of Colchicine.

CULTIVATION: Except under natural ecological conditions, the cultivation of the species in rich clayey and water-logged soil would fail. In natural environment in its distribution range, it does not require any special watering/manuring facilities. Fruits need protection from caterpillars.

DESCRIPTION: Perennial herbs, upto 15 cm high, with grass-like alternate leaves. Flowers bright pink to pinkish-mauve, creamy-white in bud, varying from 2-6 in a short terminal raceme. Pedicels 2.5-4.0 cm long, longer in fruits, thin, broadening at top. Perianth segments 6, broadly elliptic or elliptic-ovate, acute or acuminate, 6-10 × 3-4 mm, spreading and ascending, 7-9 nerved. Stamens 3.5-4.0 mm long; anthers sub-globose, small, purple, pollen yellow; filaments 3 mm long, straight, tapering towards the apex. Ovary green, obovate, slightly shorter than the stamens; styles 3, united near the base, each recurved above to end in stigma.

Capsules 8-12 mm long, obovate or sub-globose, loculicidal, grooved between the carpels. Seeds 20-30, 2×1.5 mm in size, brownish-black on maturity.

REFERENCE:

1. Ansari, M. Y. & S. R. Rolla (1973). *Iphigenia stellata* Blatt. (Liliaceae)—its identity and economic importance. *Bull. Bot. Surv. India* 15 (1 & 2): 118-122. t. 1; f. 1-76.

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

STATUS: Endangered. It is known only from its type locality, i.e. the Shirhoy hill in Manipur (India). This is popularly called as "Shirhoy Lily". The pinkish-white flowered lily blooms during May-June covering the grassy hilly slopes. The frequent visits of tourists during its flowering time and uprooting of plants resulted in fast depletion of its population in wild. But the timely action taken by the Forest Department of Manipur helped to protect the plants.

DISTRIBUTION: Manipur, India. Endemic.

HABITAT AND ECOLOGY: It grows in open grassy hilly slopes and in rock crevices. The underground bulbs are devoid of leaves during winter. The new shoots with leaves bear flowers at apices.

CONSERVATION MEASURES TAKEN: At present, the Forest Department of Manipur has declared the Shirhoy hill as a National Park for *in situ* conservation of this lily.

CONSERVATION MEASURES PROPOSED: Earlier effort to cultivate this species was not successful. However, a few bulbs were collected from wild (*ca* 2700 m) and planted at "Woodlands Compound" of Botanical Survey of India, Shillong (*ca* 1500 m). They survived and flowered for the last two seasons. An attempt be made to multiply it on large scale by seed culture, to meet demands.

BIOLOGY AND POTENTIAL VALUE: The species with its bell-shaped pinkish-white flowers is of horticultural value. Flowers in May-June.

CULTIVATION: It can be grown from bulbs collected from wild under proper care. A few plants are under cultivation at "Woodlands Compound", Botanical Survey of India, Shillong.

DESCRIPTION: Slender bulbous herbs, *ca* 1 m tall; bulbs underground, *ca* 5 cm across, pale brownish. Leaves linear-elliptic, green. Flowers 1-2, terminal, pinkish-white, *ca* 6 cm across. Capsule trilobed, ovoid, green, *ca* 3 cm long.

REFERENCE:

1. Sealy, (1949). *Journ. Roy. Hort. Soc., London* 74: 349. t. 116-118.

This material for this sheet was supplied by S. K. Katak, Botanical Survey of India, Shillong.

STATUS: Endangered. Known only from a single gathering and not collected during the last 70 years though the region has been thoroughly explored.

DISTRIBUTION: Maharashtra. Endemic.

HABITAT AND ECOLOGY: Sandy hilly areas along sea coast.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: To make a thorough search for the species in the above mentioned areas and if available to introduce the bulbs in botanic gardens for multiplication and reintroduction in its natural habitats.

BIOLOGY AND POTENTIAL VALUE: It is related to the alkaloid yielding plant, *Scilla hyacinthina* Macbride, and so may be a potential source of alkaloids.

CULTIVATION: It was introduced in the garden of St. Xavier's College, Bombay, but does not appear to have persisted under cultivation.

DESCRIPTION: About 50 cm long, bulbous, scapigerous, herbs. Bulbs ca 5×4 cm, ovoid or globose, tunicated, pale green, bitter in taste. Leaves arising from the bulb after flowering. Scapes slender, terete, shining, yellowish-purple, glabrous, naked, bearing terminal racemes of about 40 flowers. Flowers 15 mm in diam, stellate, pinkish, bisexual, hypogynous, bracteate, pedicelled. Perianth segments 6, free, oblong. Stamens 6, free, filaments broader on the upper part; anthers small, oblong, dorsifixed. Ovary ovoid, subtrigonal; style as long as ovary.

REFERENCES:

1. Blatter, E. & Hallberg, F. (1921). *Species Novae Indiae Orientalis*. *J. Ind. Bot. Soc.* 2: 52.
2. Deb, D. B. & Dasgupta, Syamali (1978). Revision of the genus *Scilla* L. in India (Liliaceae). *Bull. Bot. Surv. India* 17: 41-50, 1975.
3. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7:1-23. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

STATUS: Presumed Extinct. It has not been collected after the original discovery made ca 100 years ago, though the region has been thoroughly explored during the last 30 years. Fruit of the plant is unknown.

DISTRIBUTION: Deccan Peninsula. Endemic.

HABITAT AND ECOLOGY: On the slopes of hills or on table land.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Thorough search in Western Ghats and Deccan Peninsula may be made. If the bulbs are available they be cultivated in Botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Being related to *Urginea indica* Kunth, well-known for its medicinal properties in cardiac trouble, this plant also may have similar properties.

CULTIVATION: None.

DESCRIPTION: Small 20-25 cm long, slender, scapigerous herbs. Leaves linear, slightly smaller than scape. Flowers about 6 in terminal raceme, small, bisexual, hypogynous, bracteate, companulate; bracts persistent, longer than pedicel, ca 4 mm long, subulate with broad membranous auricles. Perianth segments 6, free, in two whorls, ca 8 mm long, oblong-lanceolate. Stamens 6, free; filaments slender, as long as the perianth. Style as long as the perianth.

REFERENCES:

1. Hooker, J. D. (1892). *Fl. Brit. India* 6: 348.
2. Deb, D. B. & Dasgupta, Syamali (1977). Revision of the genus *Urginea* Steinh. (Liliaceae) in India. *Bull. Bot. Surv. India* 16: 116-124.
3. Deb, D. B. & Dasgupta, Syamali (1981). Liliaceae: Tribe Scilleae. *Fasc. Fl. India* 7: 1-23.

The material for this sheet was supplied by Syamali Dasgupta and D. B. Deb, Botanical Survey of India, Howrah.

STATUS: Vulnerable. After the Type collection, the plant has been collected nearly a century afterwards from a seasonal pond on Chakan-Alandi road, Pune district, Maharashtra State in 1966. Due to construction of a highway along this area, even this habitat has now perished.

DISTRIBUTION: The species was originally described by C. B. Clarke (1) under the name *Ammannia ritchiei* based on a specimen collected by Ritchie from Belgaum. After that there is no record of the collection of the plant from anywhere for nearly a century till the recent report of it about two decades ago in 1966 from Pune district, Maharashtra State. Endemic to Western ghats.

HABITAT AND ECOLOGY: An aquatic plant usually occurring in the shallow margins of a seasonal fresh water ponds with the flowering branch apices alone emerging out of the surface of water. The plant usually makes its appearance within one month of the onset of the monsoon, i.e., in the month of August, flowers towards September and sets fruits soon after, in October. The plant perishes away towards the end of November simultaneously with the drying of the ponds.

CONSERVATION MEASURES TAKEN: None. Attempts were made to grow the plant in a shallow tank in the compound of the Botanical Survey of India at 7, Koregaon Road, Pune in 1966 without success.

CONSERVATION MEASURES PROPOSED: (a) To make a thorough search for the plant during the monsoon season in the seasonal ponds in and around the locality from where the plant was collected in 1966, (b) if located to declare the area as a protected reserve.

BIOLOGY AND POTENTIAL VALUE: A taxonomically interesting species of restricted distribution.

DESCRIPTION: A slender glabrous aquatic annual herb reaching about 30 cm. high. Stem pale pinkish, angled. Leaves 7-10 × 3-5 mm, exstipulate, opposite, decussate, ovate-elliptic to obovate, obtuse or rounded at the apices, narrowed to the base, glabrous. Flowers shortly pedicelled, solitary in the axils of bractiform leaves, about 2 mm long, pinkish. Bracteoles 2, lateral, subulate, about one-quarter the length of the hypanthium. Calyx about 2 mm long, tubular-campanulate, 4-toothed with minute teeth interposed in between. Petals 4, rose coloured, about 1 mm long, free, slightly exerted, attached on the inside of the hypanthium. Stamens 4, inserted, episepalous. Ovary about 1.4 mm long, ellipsoid; style simple, short, persistent; stigma capitate, minutely papillose. Capsule reaching about 3 mm long, ellipsoid, much exerted beyond the remnants of the hypanthium, 4-celled, septicidally dehiscent, each cell containing 2 to 3 seeds; outer wall of capsule transversely striated. Seeds about 0.8 mm long, elliptical, rounded on the back.

REFERENCES :

1. Clarke C. B. (1879). *In: Hooker, J. D., Fl. Brit. India* 2: 566.
2. Cooke, T. (1958). *Fl. Pres. Bombay* 1: 540. (Repr. ed.)
3. Cook, C. D. K. (1979). A revision of the genus *Rotala* (Lythraceae). *Boissiera* 28: 71-72.
4. Janardhanan, K. P. (1979). Rediscovery of *Rotala ritchiei* (C. B. Cl.) Koehne (Lythraceae) after one hundred years. *Bull. Bot. Surv. India* 21 (1-4): 230-231.

The material for this sheet was supplied by K. P. Janardhanan, Botanical Survey of India, Calcutta.

STATUS: Rare and endemic to N. E. India. Cause of its decline is due to exploitation of the trees for timber. It has not been collected since 1938.

DISTRIBUTION: Reported from Meghalaya and Nagaland. The specimen collected from Nagaland by Boris is in vegetative state and needs further critical study.

HABITAT AND ECOLOGY: It prefers open sunny places, in thick moist virgin forests.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: It is depleting fast due to loss of habitat. It is likely that it may be surviving in the sacred and reserve forests. Efforts should be made to locate and introduce it in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: Botanical interest and timber value; flowering from October-January.

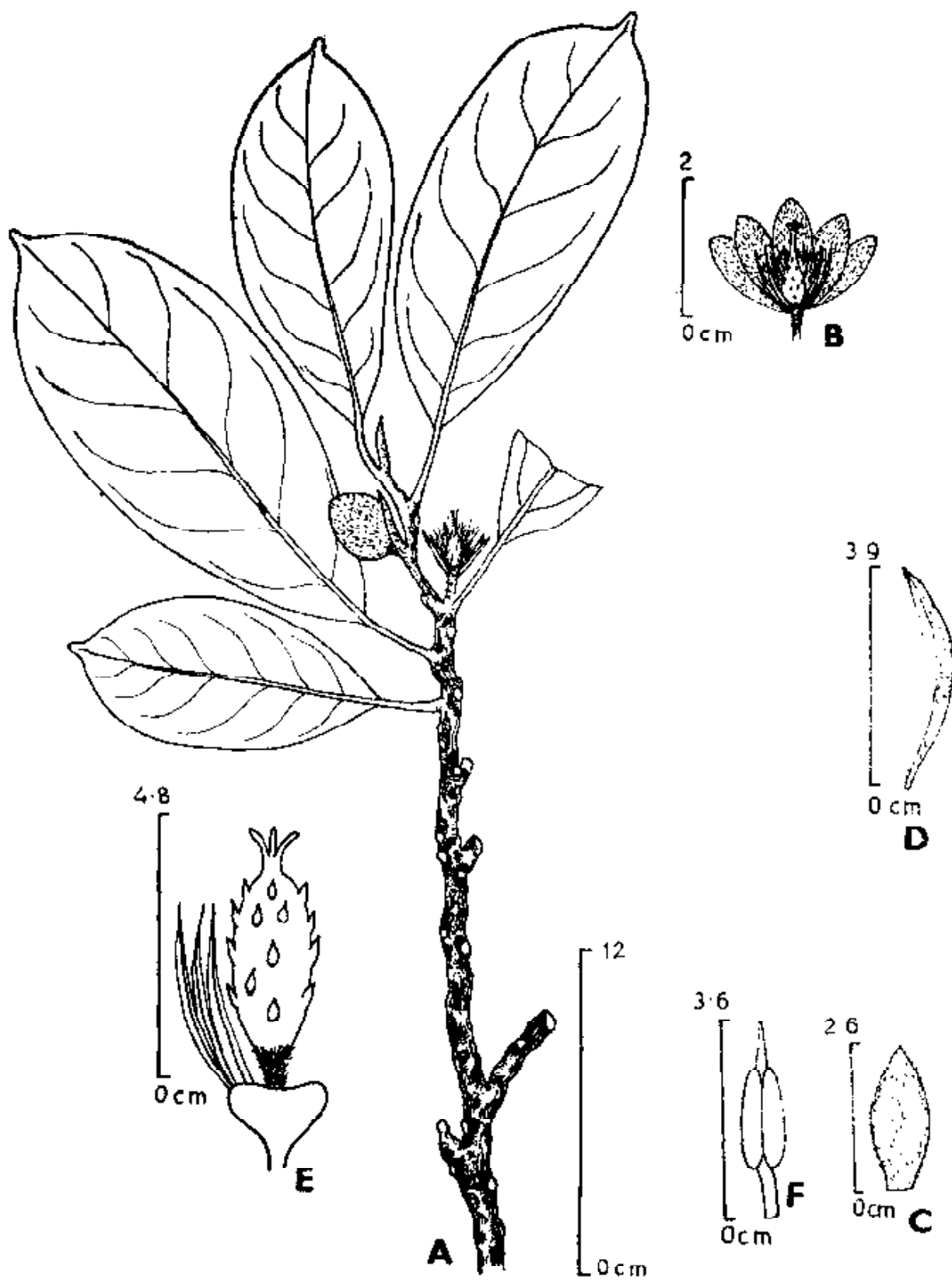
CULTIVATION: Not known in cultivation.

DESCRIPTION: A medium sized tree, young parts reddish, silky, soon becoming glabrous. Leaves ca 10-15 × 4.5-5.2 cm, base acute or obtuse, petiole ca 1.5-2.3 cm. Flowers white, axillary, solitary, ca 3.5-4 cm across, perianth segments 9, obovate, outer obtuse, inner acute. Stamens indefinite, shorter than gynoecium. Ovary densely pubescent, on stalked gynophore. Fruit a follicle, woody, obovoid, sessile with many reddish-brown seeds. Previous year's fruits remain attached to the plants for a long time.

REFERENCES:

1. Balakrishnan, N. P. (1981). *Fl. Jowai* 1: 59. Botanical Survey of India, Howrah.
2. Hooker, J. D. (1872). *Fl. Brit. India* 1: 43.
3. Kanjilal, U. N. et al. (1934). *Fl. Assam* 1: 23.

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



Michella puiduana Hk. f. et Thoms. A. Flowering twig. B. Flower (open). C. Outer perianth. D. Inner perianth. E. Gynoecium. F. Stamen.

STATUS: Rare. An endemic species almost confined to Western Ghats of the country. It has not been re-collected after 1966.

DISTRIBUTION: Known to occur in Karnataka, Kerala and Maharashtra. It was first collected and described by Dalzell from Bombay (Maharashtra) but except for Dalzell's specimen which forms the type, there is no other collection from any part of Maharashtra. Hence, the occurrence of this species in Maharashtra at present is doubtful. In Kerala it has been collected only once in 1965 from Chandanathode, Cannanore district.

HABITAT AND ECOLOGY: A medium sized twining shrub found along ghats (800-2000 m) in shady areas of evergreen forests but no where abundant. It flowers during March-April and fruits are set by May-June.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Attempts should be made to grow it from the seeds.

BIOLOGY AND POTENTIAL VALUE: Nothing is recorded of its biology. An interesting species which can easily be distinguished with its axillary fascicled inflorescence borne on stem itself and truncate samaras. Its white flowers in axillary clusters make it quite showy and it has the potentiality to be introduced in gardens as an ornamental plant.

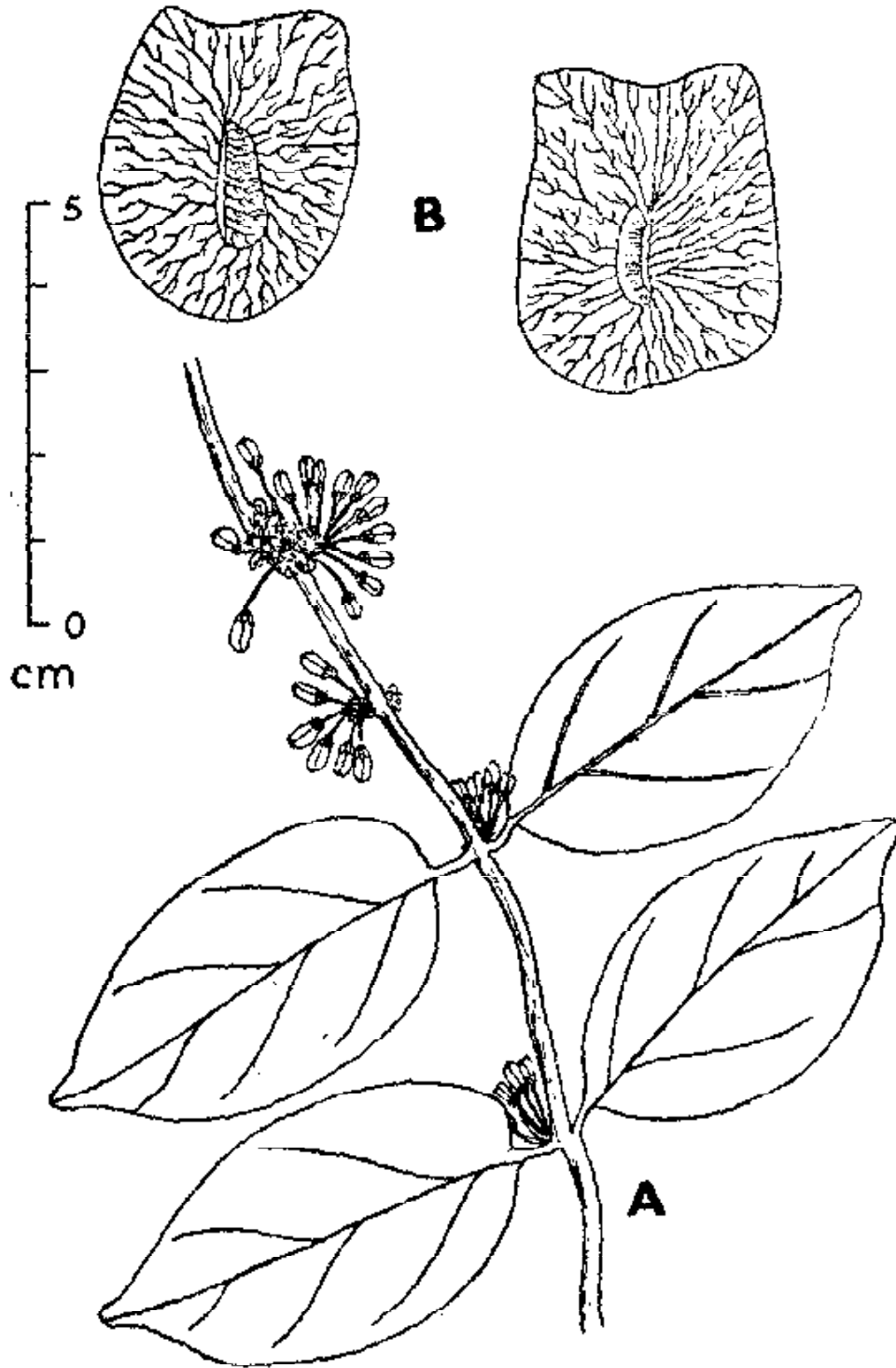
CULTIVATION: No attempt made so far.

DESCRIPTION: Twining shrubs with glabrous branches. Leaves ovate, elliptic-lanceolate, 5.5-10.5 × 2.5-5 cm, acute or rounded at base, acuminate at apex, glabrous, coriaceous; petioles 3-8 mm long, glabrous. Inflorescence reduced to axillary, 5-10, flowered fascicles, borne on stem itself; pedicels slender, 4-5 mm long, puberulent, rusty, non-articulated. Flowers white, 4-5 mm across; buds 3-5 × 2-3 mm; sepals ovate, ca 1 × 0.75 mm, obtuse; petals oblong, ca 4 × 2 mm; anthers oblong; ca 1.5 × 0.5 mm, filaments ca 1 mm, long; ovary glabrate, styles 3, stigma capitate. Samaras sub-orbicular 3.5-4 × 3-3.5 cm, truncate at top.

REFERENCES:

1. Cooke, T. (1901). *Fl. Pres. Bombay* 1: 168.
2. Gamble, J. S. (1915). *Fl. Pres. Madras* 1: 92.
3. Srivastava, R. C. (1985). Notes on threatened taxa of Malpighiaceae in India. *J. Econ. Tax. Bot.* 6(1): 61-72.
4. Wight, R. (1853). *Ic. Pl. Ind. Orient.* t. 1986.

The material for this data sheet was supplied by R. C. Srivastava, Botanical Survey of India, Allahabad.



Aspidopteris canariensis Dalz. A. Habit. B. Samara.

STATUS: Rare. It was first collected by Haines in 1917 and was subsequently collected in 1937 from its type locality. Since then, it has not been re-collected so far.

DISTRIBUTION: India. Endemic to Mayurbhanj Hills in Orissa State. Known from type locality only.

HABITAT AND ECOLOGY: A slender twiner growing on hilly tracts (1000 m). Flowers during December-January and fruits are set by May-June.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: A thorough search of the type locality be made to ascertain its present position. If re-located, its future collection should be stopped to ensure *in situ* conservation.

BIOLOGY AND POTENTIAL VALUE: Nothing is known of its biology but it can certainly be introduced in garden as an ornamental plant, for its foliage, profuse flowers and winged fruits.

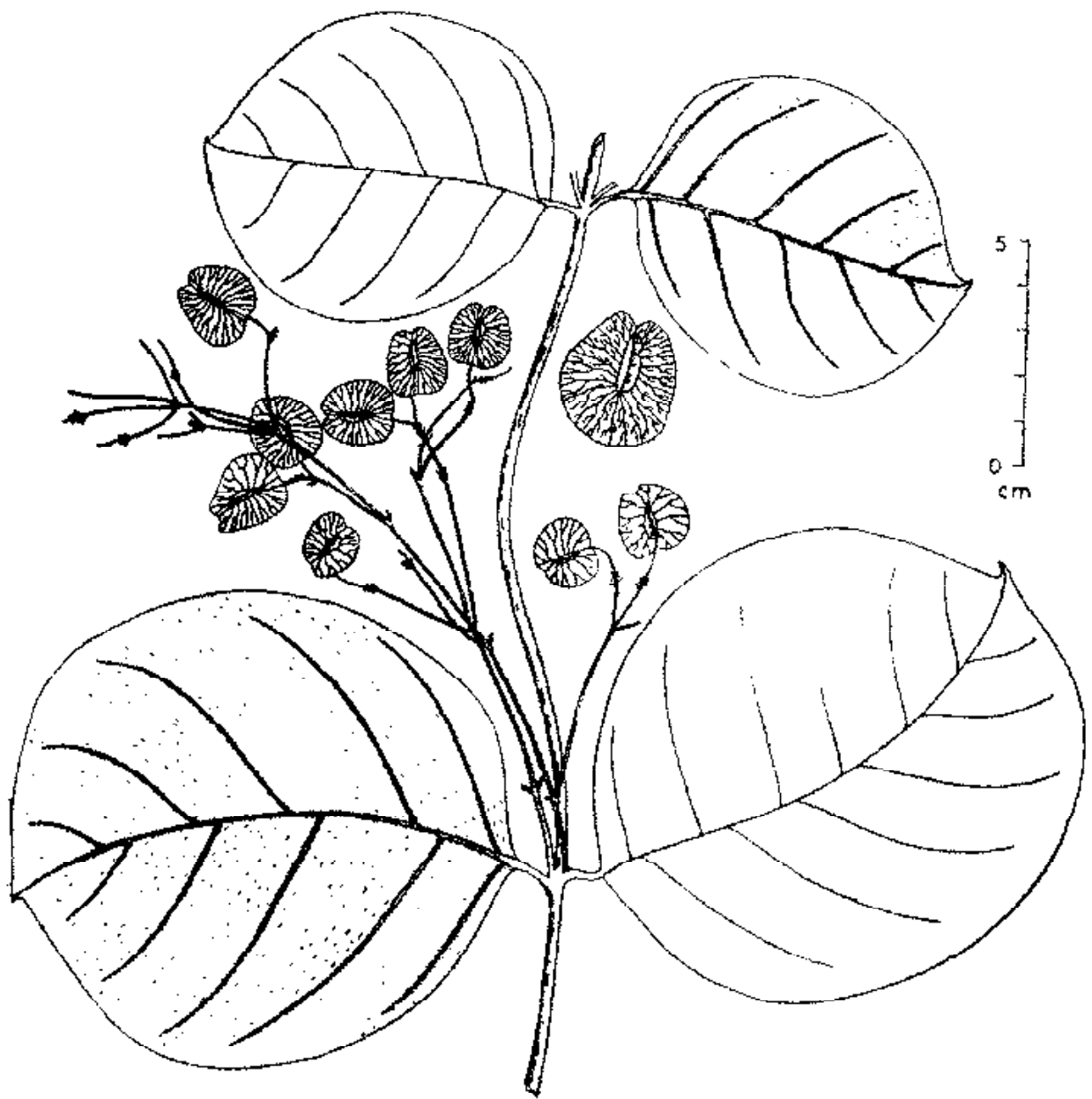
CULTIVATION: No attempt so far made.

DESCRIPTION: Twiners. Leaves elliptic-obovate, 8-11 × 7-8 cm, round at base, cuspidate at apex, glabrous above, tomentose beneath, petioles ca 2 cm long, tomentose. Panicles lateral, rusty tomentose, 12-28 cm long, pedicels ca 15 mm long, articulated below middle at ca 3 mm from base, sparsely pubescent above articulation. Floral buds oblong, ca 3 × 2 mm; sepals ovate, acute, ca 1 mm long, glabrous above; petals oblong or elliptic-oblong, 4.5-5 mm long; anthers oblong, 1-1.5 × 0.5-0.75 mm, filaments ca 2 mm long; ovary glabrous, styles ca 3 mm long. Samaras ovate, 2.8-3 × 2.2-2.5 cm, rounded at base, deeply notched at apex, margins wavy at base, pale brown cristate, cristae ca 12 × 3 mm. Carpochores ca 5 mm, acuminate.

REFERENCES:

1. Haines, H. H. (1920). *Plantarum Novarum in Herbario Horti Regii Conservatorum Kew Bull.* 1920 (2): 66-67.
2. Srivastava, R. C. (1984). A new combination in *Aspidopterys* Juss. (Malpighiaceae). *J. Bombay Nat. Hist. Soc.* 81 (3): 278.
3. Srivastava, R. C. (1985). Notes on threatened taxa of Malpighiaceae of India. *J. Econ. Tax. Bot.* 6(1): 61-72.

The material for this sheet was supplied by R. C. Srivastava, Botanical Survey of India, Allahabad.



Aspidopteris tomentosa var. *hutchinsonii* (Haines) Srivastava

STATUS: Endangered or Presumed Extinct. Cause of its decline is excessive habitat interference. It has not been reported since 1901 although the area is botanised recently. It was first described by Woodrow and Stapf in 1894 from specimens gathered from Ambaghat on the Kolhapur-Ratnagiri Road. Even in 1901 it was reported to be a very rare plant (1). After that there is no report or collection of this plant either from the type locality or from other adjoining areas.

DISTRIBUTION: Endemic to a single locality in Maharashtra state.

HABITAT AND ECOLOGY: On laterite soils in open places.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: If it is rediscovered in its habitat, further wanton collection should be checked and should also be cultivated in botanic gardens.

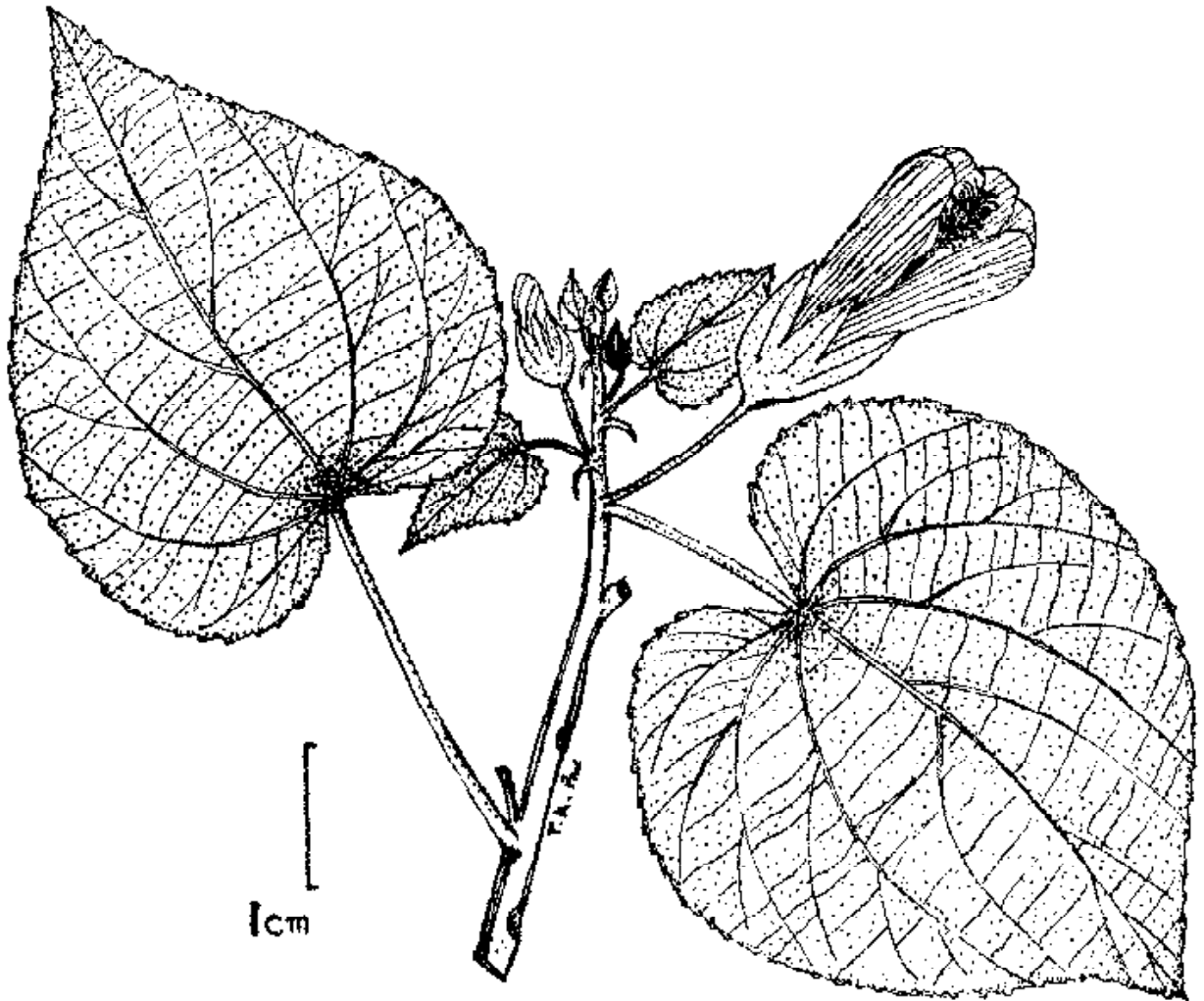
BIOLOGY AND POTENTIAL VALUE: Being very much allied to *A. persicum* it may also have some active principles of medicinal and silky fibres of commercial value.

DESCRIPTION: An undershrub upto 2.5m tall. Leaves ovate to round-ovate, 4-20 × 3-15 cm, apex acute to acuminate, base cordate, margin crenate to dentate. Stipules linear, 0.5 mm long. Flowers solitary, ca 2.5 cm across, orange-yellow. Calyx campanulate, lobes free upto the middle, 2.0 × 0.5 cm, stellate hairy. Corolla campanulate, petals about two times longer than calyx. Staminal column ca 2 cm long; glabrous. Carpels 5, mucronate, densely hairy throughout.

REFERENCES:

1. Cooke, T. (1901). *Fl. Pres. Bombay* 1:96.
2. Woodrow, G. M. (1897). The Flora of Western India. *J. Bombay Nat. Hist. Soc.* 11:126.
3. Woodrow, G. M. & Stapf. (1894). *Abutilon ranadei*. *Kew Bull.* p. 99.

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



Abutilon ranadei Woodr. et Stapf

STATUS: Endangered. Possible cause of its decline is due to forest clearing, tapping of stem bark by the locals for Cordage purpose. It has not been reported after 1915. It was reported from Tiruvallur and Kambakam Hill in Chingleput by Cleghorn and Ballipalle of Cuddapah district by Gamble. After Gamble (1915), these areas have been surveyed in 1983 but this species has not been found.

DISTRIBUTION: Endemic to Peninsular India.

HABITAT AND ECOLOGY: In dry areas.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: First priority would be to search in the area to see if it still survives, and to introduce it in the gardens if located.

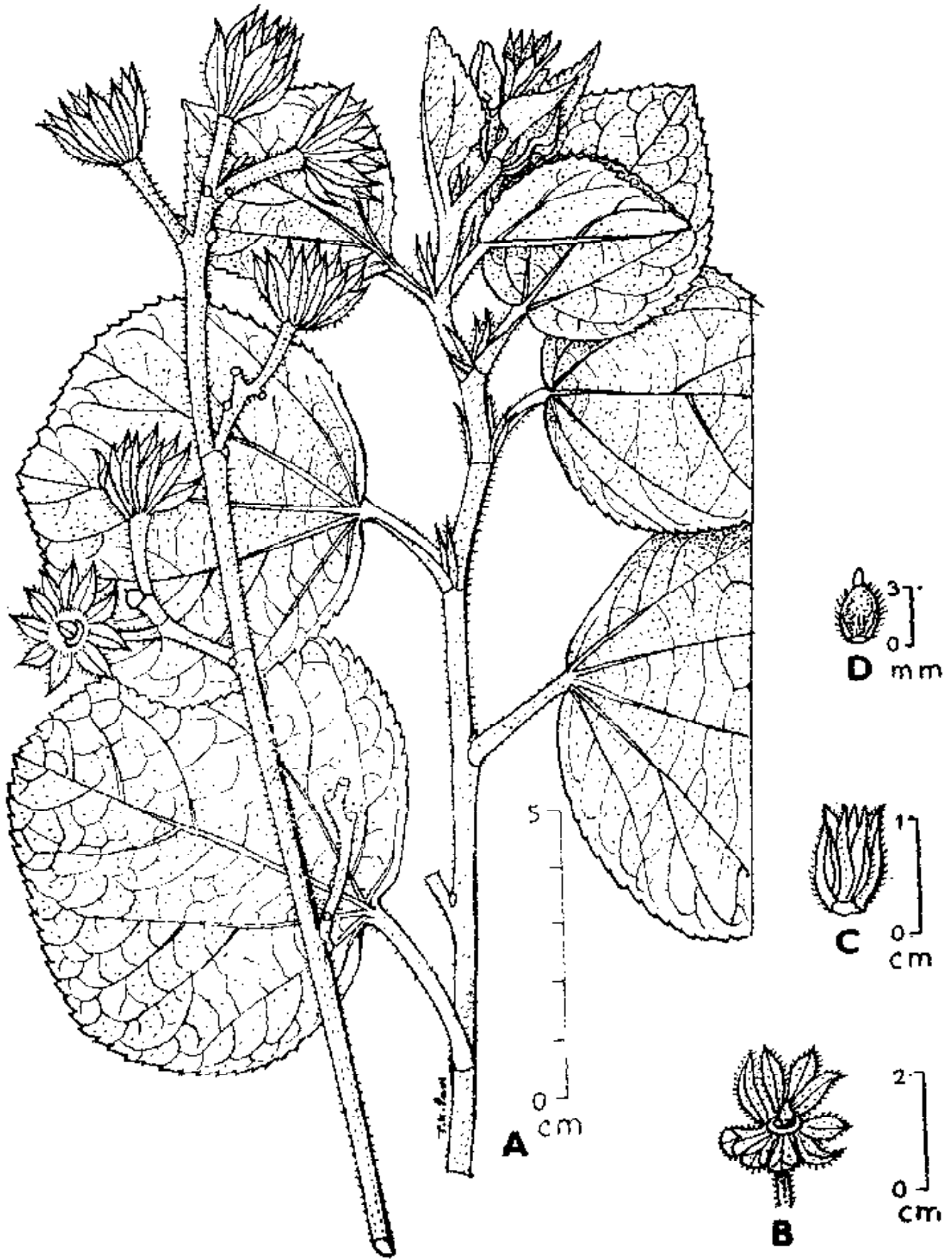
BIOLOGY AND POTENTIAL VALUE: The stem bark is a good source of fibre.

DESCRIPTION: A shrub upto 3 m high, young branches with reddish tomentum. Leaves almost rounded, 3.5-7.5 x 4.0-7.2 cm, base subcordate or rounded, apex shortly acuminate, acute or subobtuse, margin crenate-serrate or denticulate. Stipules linear, single or 2-3 lobed. Flowers solitary, 2.5-3.0 cm across, yellow. Epicalyx segments 10, connate at the base, lobes ovate-lanceolate. Calyx campanulate, lobes deltoid, fused below middle. Petals 2.0-2.5 x 1.0-1.5 cm, outside densely stellate hairy, glabrous, inside. Staminal column 1.2 cm long, antheriferous throughout. Ovary ovoid, *a.* 3.0 x 2.2 mm.

REFERENCES:

1. Craib (1912). *Decaschistia rufa*. *Kew Bull.* 35-36.
2. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 68 (repr. ed.)

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



Decaschistia rufa Craib. A. Habit. B. Epicalyx. C. Calyx. D. Ovary.

STATUS: Vulnerable. It is confined to coastal belt along Western Ghats from North Kanara southwards but not extending to Kerala. Talbot remarks that it is very common along the coasts of Konkan and North Kanara but since his collections during 1882-1896, it has been rediscovered only in 1964 after a lapse of nearly 70 years. There is little doubt that it is becoming scarce due to disturbance in the habitat, felling down of trees for fuel and extension of land for cashewnut cultivation and agricultural purposes.

DISTRIBUTION: Endemic to India and restricted to Western Ghats along the coastal regions. It was first collected by Talbot in 1882 from Kumpta in North Kanara district but it is now known to extend slightly inland to Shimoga district (Karnataka) and Goa. It does not occur in Maharashtra and the solitary report of its occurrence in Thane district is due to misidentification. It is nowhere abundant and seen in isolated patches only.

HABITAT AND ECOLOGY: It occurs in laterite soil along rocky slopes, at low altitude of upto 300 m. It is a low evergreen bush, prefers open sunny situations and thrives in regions of moderate to heavy rainfall.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Though its density and frequency in nature is gradually on the decline, it can still be collected. The only remedial step that could be taken is to propagate it in forest nurseries and demarcate part of the coastal belt as protected, as otherwise it will eventually disappear.

BIOLOGY AND POTENTIAL VALUE: Wood hard, bright red.

CULTIVATION: Not attempted but fruiting is copious, hence seedlings could be raised.

DESCRIPTION: Evergreen bush to a small tree upto 4 m tall. Leaves imparipinnate; 15-25 cm long, 5-foliolate; leaflets obovate or elliptic, subcoriaceous, glabrous, lustrous, dark green above, paler beneath; lateral nerves 8-10 pairs; petiolules 2.5-3.5 mm. Panicle axillary, longer than leaves. Flowers small, yellowish, subglobose, polygamo-dioecious. Calyx 5-lobed, imbricate. Petals 5, concave, imbricate. Staminal tube subglobose; anthers 5, included within staminal tube. Disc minute. Ovary 1-2 celled; cells 1-2 ovuled. Berry yellow, obovoid, 12-18 × 81-0 mm, 2 seeded; seeds ovoid, 10-12 mm, planoconvex, surrounded by creamy aril.

REFERENCES:

1. Talbot, W. A. (1902). *Trees, shrubs and woody climbers of Bombay Presidency*, p. 76.
2. Sundararaghavan, R. (1969). A note on *Aglaia littoralis* Talb. *Bull. Bot. Surv. India* 11: 183-184.

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

STATUS: Rare. Possible cause of its rarity is due to habitat loss. Originally the plant was collected from Anamalai Hills, Tamil Nadu. In recent years the plant has not been reported from the type locality but has been collected from Silent Valley, Palghat District, Kerala.

DISTRIBUTION: India; endemic to Tamil Nadu and Kerala. After the type collection, the taxon was only once collected by Fischer from Anamalai hills in the year 1913 and thereafter there is no report of this plant in its type locality. Recently the plant has been reported from Silent Valley, Palghat District, Kerala by Vajravelu (1969), N. C. Nair (1978, 1979) & V. J. Nair (1980).

HABITAT AND ECOLOGY: An erect shrub in hilly places and has been reported to occur at altitudes varying from 900-1500 m.

CONSERVATION MEASURES TAKEN: The Silent Valley where this plant occurs is declared as a National Sanctuary.

CONSERVATION MEASURES PROPOSED: The recent occurrence of the plant in Silent Valley, Palghat District and the proposed Biosphere reserve of Nilgiris would help in the conservation of this plant.

BIOLOGY AND POTENTIAL VALUE: The plant may be cultivated for its beautiful leaves and white flowers.

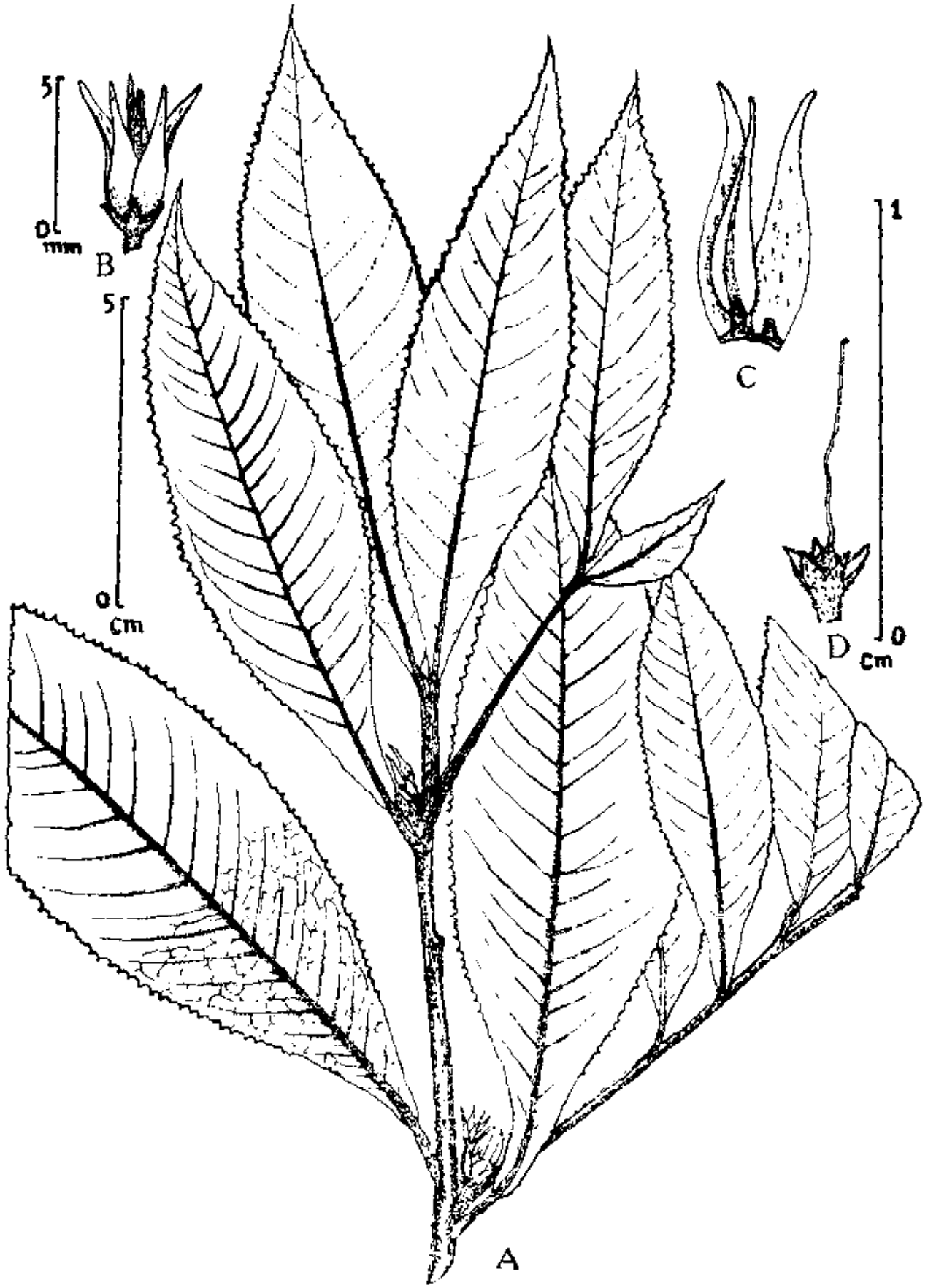
CULTIVATION: None.

DESCRIPTION: Erect shrubs, branches rusty villose particularly the younger parts. Leaves lanceolate, 10-20 × 2.5-5.5 cm, apex acute or abruptly acuminate, base cuneate, nerves prominent beneath, margin sharply serrate, upper surface glabrous, lower surface rusty villose, particularly on the nerves, glands minute, petioles 6-10 mm long, rusty villose. Inflorescence axillary, subumbellate, 2-3 flowered; peduncle very short, bracts subulate, pedicels 6-8 mm long, rusty pilose. Sepals narrowly triangular, margin ciliate, dorsally pilose. Petals lanceolate, acuminate, 6-7 mm long, glands elongate. Filaments very short, anthers lanceolate-acuminate, 5-6 mm long, gland dotted on back. Ovary ovoid, style filamentous. Berry reddish, 8-10 mm in diameter.

REFERENCES:

1. Beddome, R. H. (1869). *Ic. Pl. Ind. Or.* 1. 113. (*Ardisia serratifolia*)
2. Clarke, C. B. (1882). Myrsinaceae, *In: Hooker, J. D., Fl. Brit. Ind.* 3: 532.
3. Gamble, J. S. (1921). *Fl. Pres. Madras Part 4.* p. 756.

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



Antistrophe serratifolia Hook. f. A. Habit. B. Flower. C. Petals with a stamen. D. Gynoecium.

STATUS: Endangered or Possibly Extinct. Not seen after the type collection made by Beddome in the later half of last century. A single specimen (type) is available at MH.

DISTRIBUTION: South India—endemic to Wynad forests of Kerala State. Beddome (1) himself has recorded it as a rare tree.

HABITAT AND ECOLOGY: Evergreen forests of Western Ghats at an altitude of about 1000 m (1-3).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The precise locality wherefrom the type specimens were collected is not mentioned. (1). Therefore intensive search should be made in Wynad district to relocate the trees if exist and be preserved.

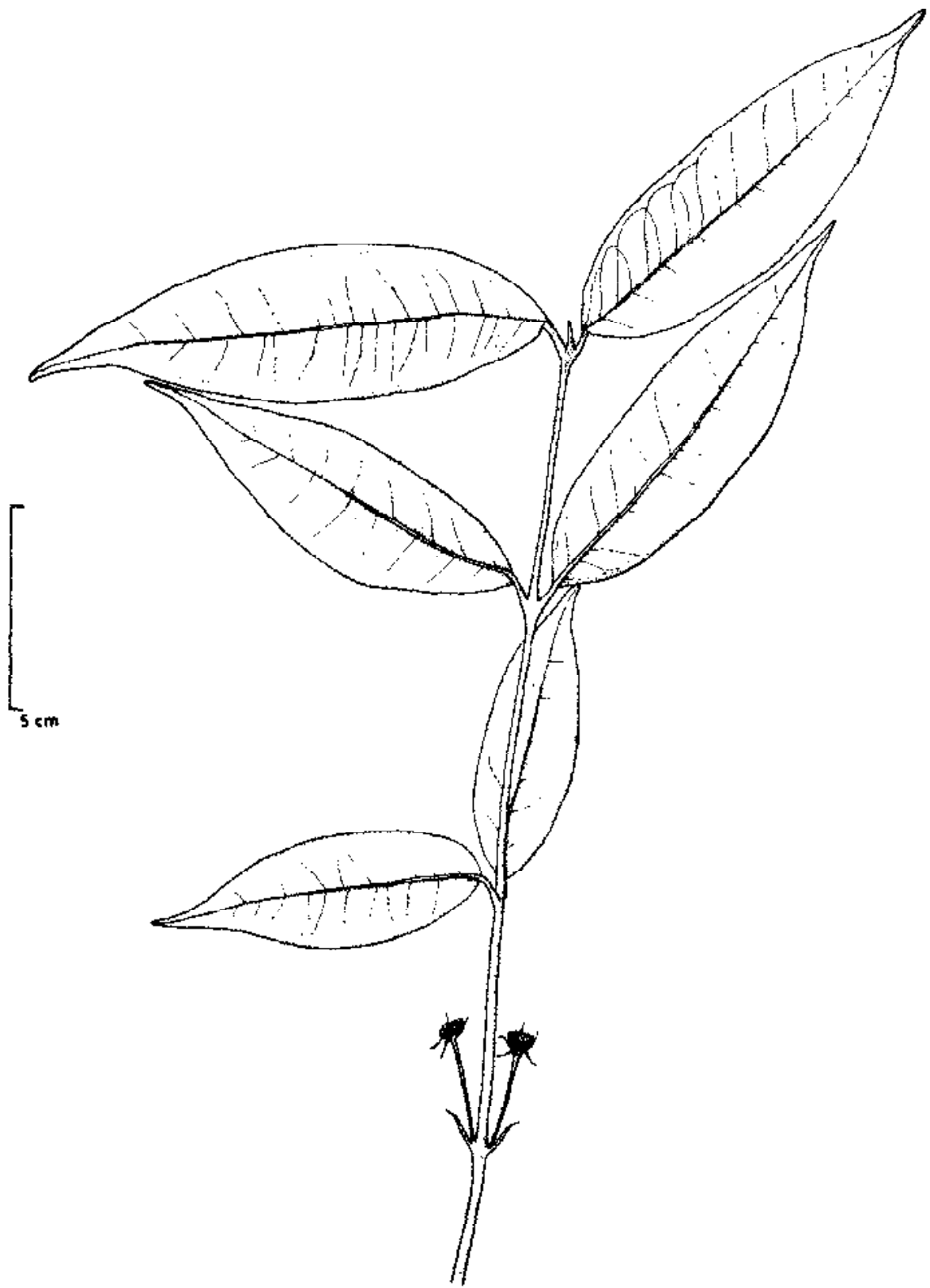
BIOLOGY AND POTENTIAL VALUE: The silvery-pubescent leaf-base is the characteristic feature of this species.

DESCRIPTION: Shrubs or small trees. Leaves 10-12 × 3-4 cm, elliptic-lanceolate, long-acuminate, rounded at base, silvery-pubescent beneath; nerves prominent, at right angles to midrib. Flowers solitary, axillary; pedicels 2.0-2.5 cm long, pubescent; bracteoles filiform, exceeding the calyx-lobes, silvery-pubescent. Berries globose, ca 1.2 cm diam., adpressed-pubescent.

REFERENCES:

1. Beddome, R. H. (1872). *Forester's Manual of Botany*, p. 109.
2. Brandis, D. (1921). *Indian Trees*, p. 325.
3. Duthie, J. F. (1879). Myrtaceae. In: Hooker, J. D., *Fl. Brit. India* 2: 503.
4. Gamble, J. S. (1919). *Fl. Pres. Madras*, Part 3. p. 483-484.

Materials for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



Eugenia argentea Bedd.

STATUS: Endangered. This species discovered in 1895 could not be relocated in the type locality (near Chimunji) till now. (Type in CAL.) But after a lapse of 85 years it was rediscovered in some other locality, i.e., Sethur hills (3) where it was found to be rare.

DISTRIBUTION: South India; known from two areas, viz., Chimunji, Trivandrum District, Kerala and Sethur hills, Kamarajar District, Tamil Nadu (1-3). Endemic.

HABITAT AND ECOLOGY: Reported from the evergreen forests of Western Ghats in altitudes between 1300-1400 m (1, 3).

CONSERVATION MEASURES TAKEN: None.

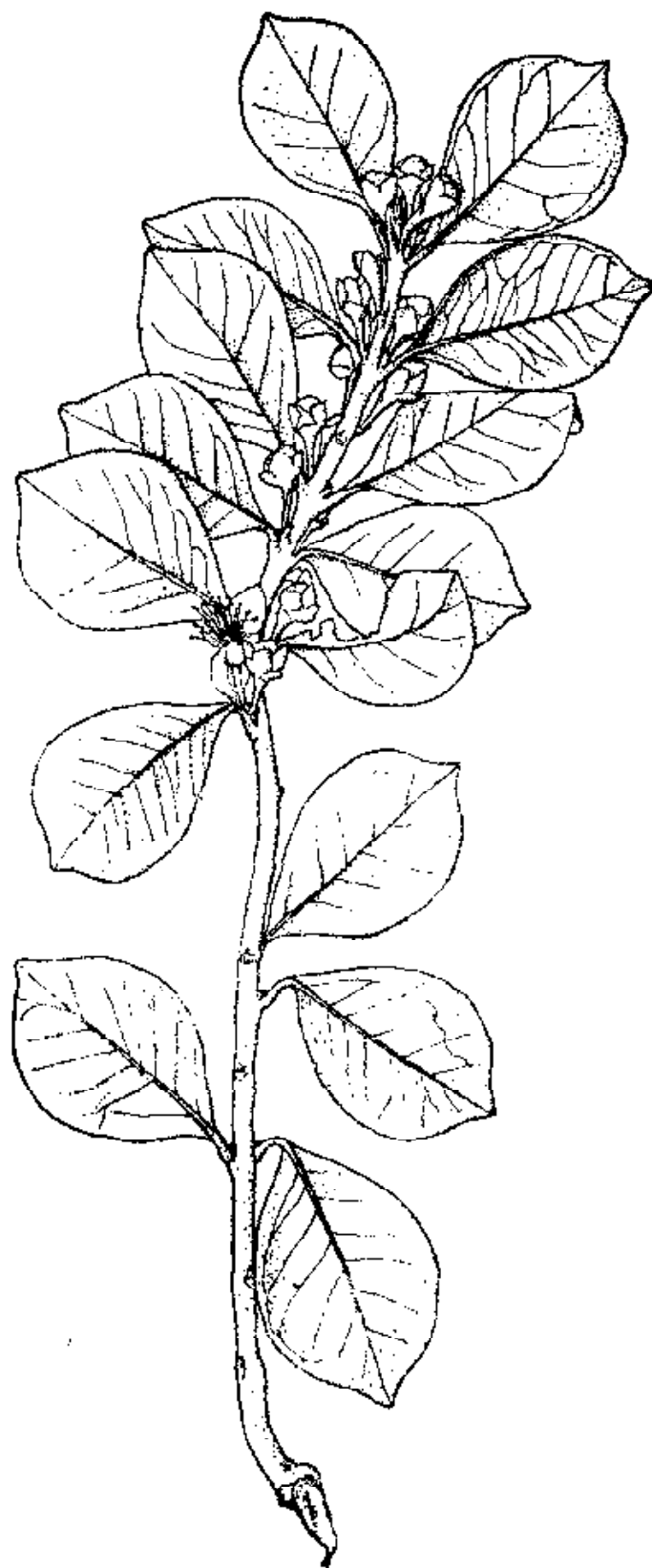
CONSERVATION MEASURES PROPOSED: In Sethur hills patches of reserve forests have been converted into cardamom estates. No further forest lands should be allowed to be converted into plantation crops so that the isolated and restricted population of this endangered species could be saved.

DESCRIPTION: Trees 7-10 m high; trunk 30-50 cm across; branchlets terete, glabrous. Leaves 5-6 × 2.0-3.5 cm, orbicular-obovate or obovate, abruptly acuminate at apex, attenuate at base, recurved, pellucid-dotted; petiole 3-10 mm long. Flowers white, axillary, in pairs; pedicels 5-7 mm long; calyx-lobes rotundate, pubescent, ciliate; petals orbicular, pellucid-punctate; staminal disc conspicuous. Berries ca. 12 × 8 mm, subglobose (1, 3).

REFERENCES:

1. Gamble, J. S. (1918). *Bull. Misc. Inform.* 1918: 239; et (1919). *Fl. Pres. Madras*, Part 3. p. 483-484.
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
3. Nair, N. C. & Srinivasan, S. R. (1980). Rediscovery of *Eugenia discifera* Gamble (Myrtaceae) and its lectotypification. *Bull. Bot. Surv. India* 22: 232-233.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



5 cm

Eugenia discifera Gamble

STATUS: Endangered or Possibly Extinct. The only known collection is by Beddome made between 1864-74 (1, 5). Never has it been collected again during the last 110 years.

DISTRIBUTION: South India; endemic to Tirunelveli District, Tamil Nadu. Beddome had made two collections—one from Singampatti hills (1, 2) and the other from Papanasam hills of which the latter is available in MH.

HABITAT AND ECOLOGY: The original gathering has been made from the evergreen forests of Western Ghats at 1000 m (1, 3, 4). Obviously the habitat might have been destroyed by the activities connected with dam construction at Papanasam.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The possibility of its existence around Singampatti be explored and if discovered they be protected with the help of forest officials.

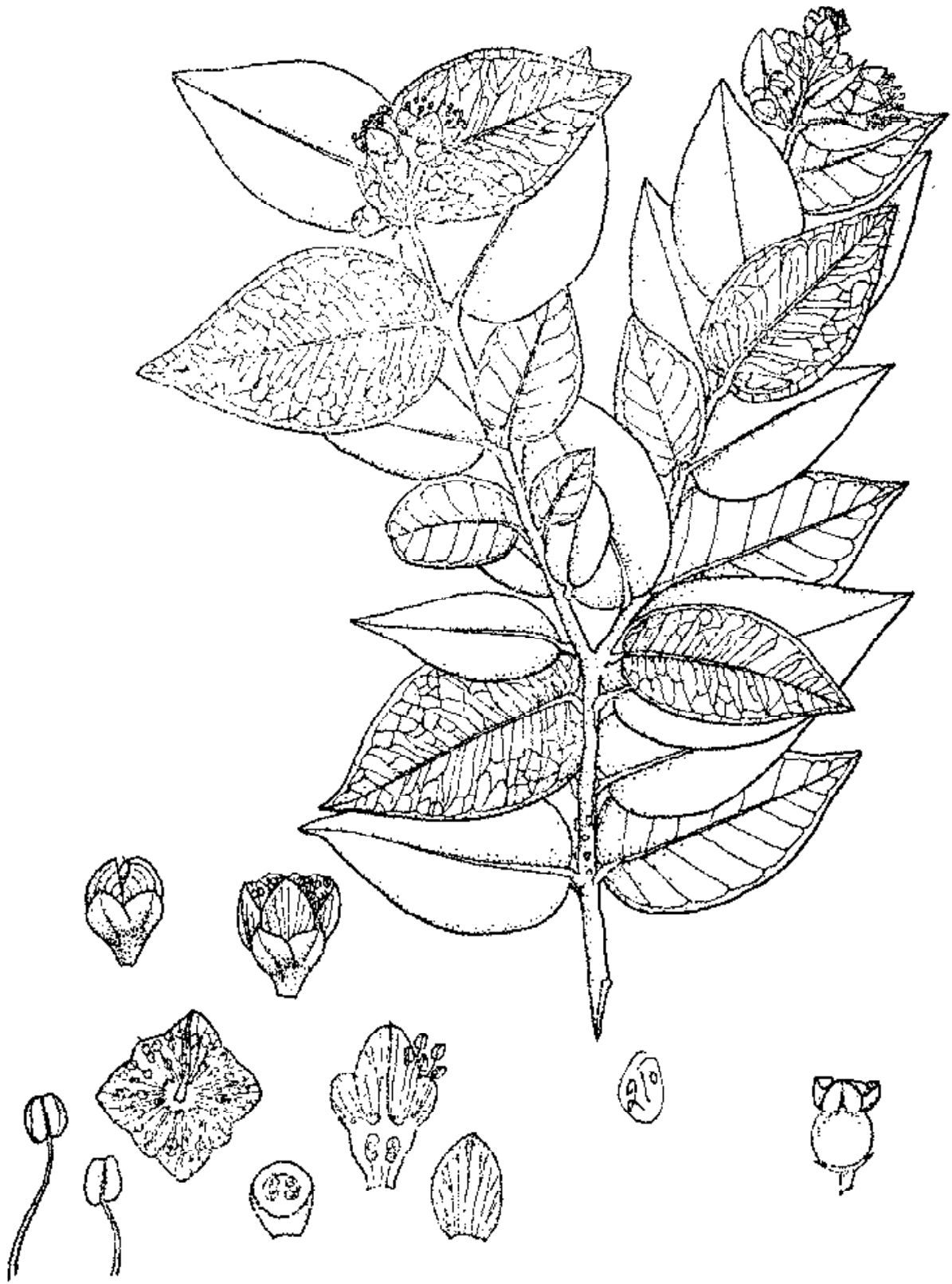
BIOLOGY AND POTENTIAL VALUE: It is one among the 4 endemic species of *Eugenia* reported from South India. Taxonomically it differs from other species of *Eugenia* by its racemose inflorescence.

DESCRIPTION: Small trees; branchlets terete. Leaves 7-10 × 3-4 cm, ovate or elliptic-oblong, acute or acuminate at apex, cordate or rounded at base, greenish above, pale beneath; nerves and intramarginal nerves prominent, petiole short. Flowers white, in short terminal racemes; bracts and bracteoles pubescent; calyx tube 3 mm long; petals nerved, inconspicuously dotted (1, 3, 4).

REFERENCES:

1. Beddome, R. H. (1868-74). *Ic. Plant. Ind. Orient.* p. 65, t. 273.
2. Brandis, D. (1921). *Indian trees,* p. 326.
3. Duthie, J. F. (1879). Myrtaceae: *In: Hooker, J. D., Fl. Brit. India* 2: 506.
4. Gamble, J. S. (1919). *Fl. Pres. Madras* Part 3. p. 483, 485.
5. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India-I. *In: Jain, S. K. & Sastry, A. R. K. (ed.). Plant Conservation Bulletin* 4: 27.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



Eugenia singampattiana Bedd. (after Beddome, *Ic. Pl. Ind. Or.* t. 273.)

STATUS: Endangered or Possibly Extinct. Till now known only from the original gathering made by T. F. Bourdillon in 1895 (1-4).

DISTRIBUTION: South India; it is one among the 4 endemic species of *Syzygium* known from Kerala. It has been recorded from Merchiston and Colatoorpolay (1) of Trivandrum and Quilon Districts respectively.

HABITAT AND ECOLOGY: Evergreen forests of Western Ghats at 660 m (1).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive search may be made in the type locality to see if any trees still survive to be protected *in situ* and *ex situ*.

DESCRIPTION: Medium-sized trees. Leaves 8-12 × 2.5-4.0 cm, elliptic-oblongate, obtusely acuminate at apex, cuneate at base, chartaceous; leaf-nerve and intramarginal nerves prominent; petiole ca 1 cm long. Cymes terminal, lax-flowered. Calyx-tube 1 cm long, campanulate, later hemispheric with conspicuous disc; petals 4, orbicular, glandular-dotted. Berries hemispherical.

REFERENCES:

1. Gamble, J. S. (1918). *Bull. Misc. Inform.* 1918: 239.
2. Gamble, J. S. (1919). *Fl. Pres. Madras*, part 3, p. 473-474.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
4. Rathakrishnan, N. C. & Nair, N. C. (1983). Nomenclatural changes in some Myrtaceous Plants. *J. Econ. Tax. Bot.* 4: 277-278.
5. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India—1. *In: Jain, S. K. & Sastry, A. R. K. (ed.). Plant Conservation Bulletin* 4: 27.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



Syzygium bourdillonii (Gamble) Rathakr. et Nair

STATUS: Endangered. It has not been collected since the middle of last century after Wight's discovery. (Type in K.)

DISTRIBUTION: South India; confined to a single locality in Courtallam hills of Tamil Nadu (2) and reported as cultivated in gardens of Sri Lanka (1).

HABITAT AND ECOLOGY: Moist deciduous forests of Southern Western Ghats where the precipitation is high just after the onset of monsoon in June (2).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: To declare the area as protected. The spot being a tourist centre, public should be prevented from disturbing the forest area from where the type specimens were collected.

BIOLOGY AND POTENTIAL VALUE: The trees are of horticultural value because of attractive flowers.

DESCRIPTION: Trees; branchlets pale brown, subtetragonous. Leaves opposite, 7-13 × 4-6 cm, elliptic, obtusely acute, rounded at base, coriaceous; leaf-nerves and intramarginal nerve not conspicuous, the latter irregular and often double. Flowers in terminal corymbose cymes; calyx-tube 12-15 mm long, subcylindric with an annular disc; petals 4, orbicular, spreading. Fruits not known.

REFERENCES:

1. Alston, A. H. G. (1931). In: Trimen, H., *A Handbook to the Flora of Ceylon* 6: 115.
2. Gamble, J. S. (1918). *Bull. Misc. Inform.* 1918: 239; et (1919). *Fl. Pres. Madras* part 3, p. 472, 474.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-687.
4. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India-I. In: Jain, S. K. & Sastry, A. R. K. (ed.). *Plant Conservation Bulletin* 4: 27.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.

STATUS: Endangered due to the destruction of habitat. R. H. Beddome (1) collected this species between 1864-81. (Type in K.) There is no collection afterwards (4). It is obvious now that the type locality has been submerged due to the construction of Kothayar dam.

DISTRIBUTION: South India; endemic in Kanyakumari district. There are only 2 collections made from the same place and both are available in MH.

HABITAT AND ECOLOGY: The only known locality is along the Muthukuzhi river banks at an alt. of 1500 m in the evergreen forests of Southern Western Ghats (1, 3, 5, 6).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The catchment area of the Muthukuzhi river should be explored for any surviving trees which should be protected, if located.

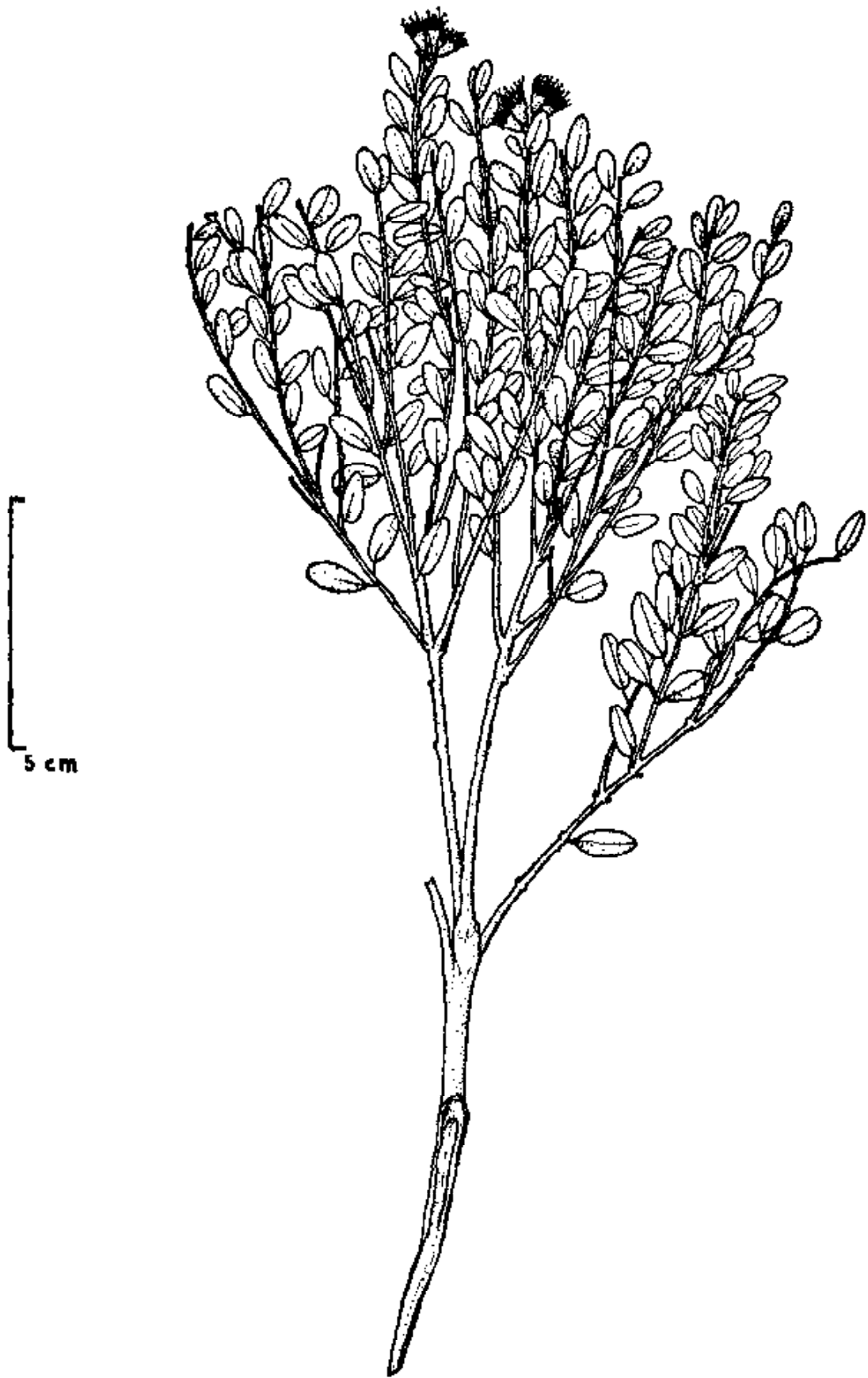
BIOLOGY AND POTENTIAL VALUE: This species has the smallest leaves in the genus in South India and the flowers are in umbellules, a characteristic feature shared by few other species of the genus. It is reported to flower in April-May (2).

DESCRIPTION: Small trees or large shrubs, branching profusely; branchlets angled. Leaves opposite, rarely alternate, 8-12 × 3-5 mm, elliptic-oblong, obtuse, coriaceous; nerves inconspicuous. Flowers in umbels of 5-10 at the ends of branchlets; calyx-tube ca 5 mm long, more or less covered with resinous scales; petals free. Fruit unknown.

REFERENCES:

1. Beddome, R. H. (1872). *Forester's Manual of Botany*, p. 110.
2. Bourdillon, T. F. (1976). *The Forest trees of Travancore*, p. 189. (rep. ed.)
3. Brandis, D. (1921). *Indian trees*, p. 322.
4. Chitra, V. (1983). Myrtaceae. In: Nair, N. C. & Henry, A. N. (ed.). *Fl. Tamil Nadu*. Ser. 1, 1: 150-158. Botanical Survey of India, Coimbatore.
5. Duthie, J. F. (1879). Myrtaceae. In: Hooker, J. D., *Fl. Brit. India* 2: 505-506.
6. Gamble, J. S. (1919). *Fl. Pres. Madras*, part 3, p. 476, 479.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



Syzygium gambleanum Rathakr. et Chitra

STATUS: Endangered or Possibly Extinct. Destruction of forest is the possible cause of this status. Not collected after Beddome in the last century (2, 3). There is no specimen in MH. (Type in K.)

DISTRIBUTION: South India; endemic to Palghat hills of Kerala State (1).

HABITAT AND ECOLOGY: It has been collected at an altitude of 1625 m which is a part of Tropical Rain Forests of Southern Western Ghats (1).

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: To make intensive search for it in the type locality to find out if any tree still survives for conservation.

DESCRIPTION: Large trees; branchlets subtetragonous, brownish. Leaves sessile, 3.5-4.5×1.2-1.5 cm, obovate, abruptly obtusely acuminate, cuneate at base, margins recurved, conspicuously glandular; nerves distant, not prominent. Flowers few, in axillary or terminal cymes. Calyx-tube 1 cm long, funnel-shaped; petals calyptrate. Fruits not known (1).

REFERENCES:

1. Gamble, J. S. (1918). *Bull. Misc. Inform.* 1918: 240; et (1919). *Fl. Pres. Madras*, part 3, p. 477, 480.
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
3. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India-I. In: Jain S. K. & Sastry, A. R. K. (ed.). *Plant Conservation Bulletin* 4: 28.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.

STATUS: Endangered (3, 4). Very few plants are found in sacred grooves at Kodumon (2). Only one collection has been made since Bourdillon discovered it in 1894. Gamble (1) described this species based on Bourdillon's collection.

DISTRIBUTION: South India; endemic to southern region of Kerala. Apparently no tree is surviving in the type locality. Recently only 4 trees have been spotted in a sacred groove of Aickad in Quilon District (2).

HABITAT AND ECOLOGY: In swampy places in the low country at an altitude of 65 m. It flowers in March and the fruits are not known (1).

CONSERVATION MEASURES TAKEN: Only 4 trees have been conserved in a sacred groove (2) due to religious belief in folk-lore.

CONSERVATION MEASURES PROPOSED: More trees be grown in sacred grooves and an attempt should be made to introduce them in botanic gardens.

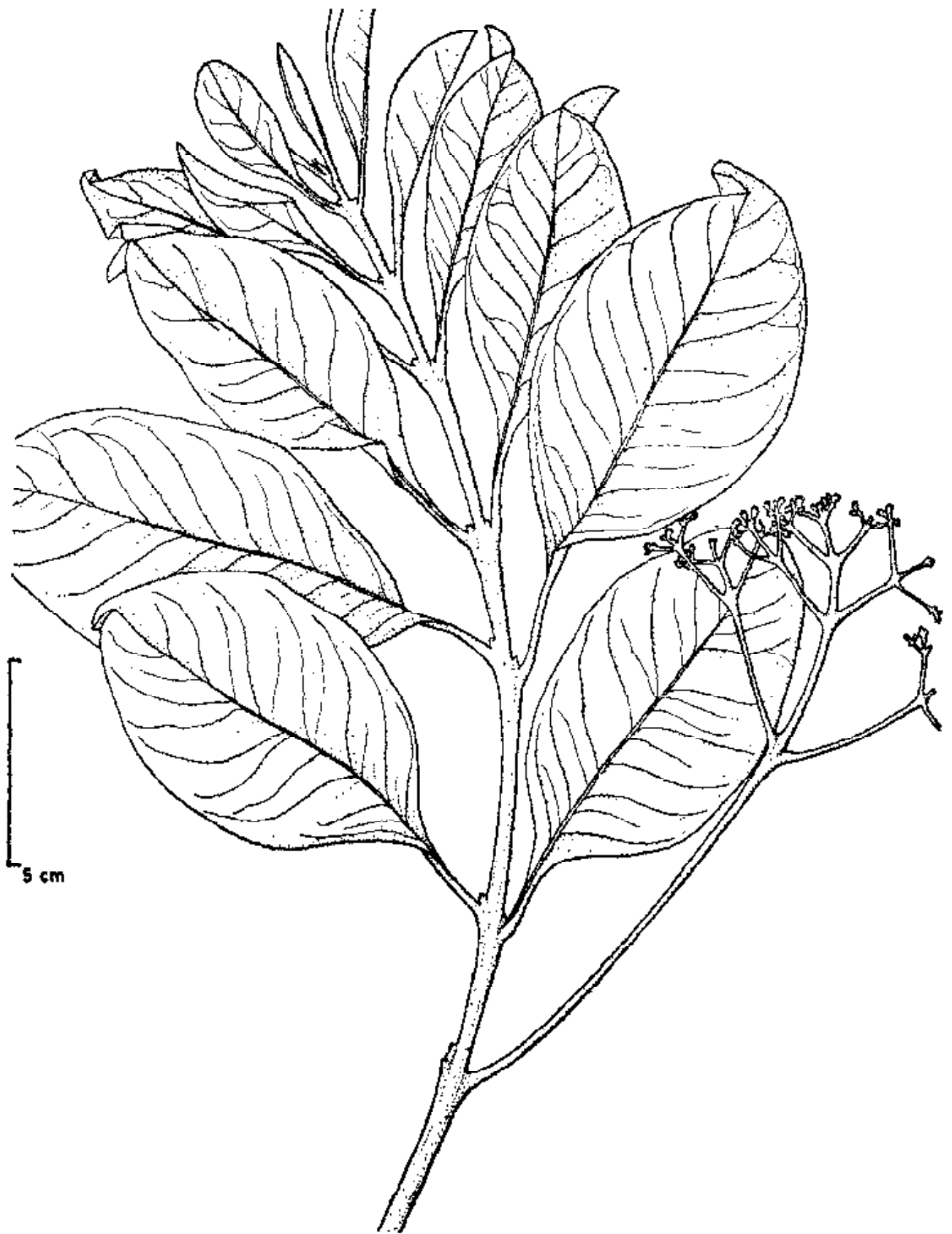
BIOLOGY AND POTENTIAL VALUE: The bark is used in local medicine (2). Taxonomically the species is allied to none of the known species of *Syzygium* (1).

DESCRIPTION: Medium-sized trees; branchlets tetragonous. Leaves 8-12 × 5-6 cm, ovate, obtusely acuminate, narrowed at base and decurrent on the 1.2-2.0 cm long petiole, chartaceous. Flowers small, white, in axillary corymbose cymes; peduncle 5-8 cm long; calyx-tube short, scarcely 2 mm in diam; petals calyptrate. Fruits not known (1).

REFERENCES:

1. Gamble, J. S. (1918). *Bull. Misc. Inform.* 1918: 240; et (1919). *Fl. Pres. Madras*, part 3, p. 477, 480.
2. Nair, N. C. & Mohanan, C. N. (1981). On the rediscovery of four threatened species from the sacred grooves of Kerala. *J. Econ. Tax. Bot.* 2: 233-234.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
4. Vajravelu, E. (1983). Rare, threatened and endemic flowering plants of South India-I. In: Jain S. K. & Sastry, A. R. K. (ed.). *Plant Conservation Bulletin* 4: 28.

Material for this sheet was supplied by N. C. Nair and N. C. Rathakrishnan, Botanical Survey of India, Coimbatore.



Syzygium travancoricum Gamble

STATUS: Endangered. Causes for its depletion are due to restricted distribution with limited number of individuals and destruction of natural habitats for rehabilitation of refugees.

DISTRIBUTION: Apparently Endemic to Great Nicobar Island. Type collection of 1975 noted only a few plants at 6 KM on East-West Road. Subsequent frequent intensive explorations in the island located this species only once again near Galathea river bank on East-West Road in 1977. The number of individuals in each of these populations are limited to 5-10 only.

HABITAT AND ECOLOGY: Shaded overgrown forest floors in inland hill forests, particularly near moist streamsides in humus covered clay-loam. Growing period is restricted to monsoon from April to December. It flowers in late November to early December and fruits in January.

CONSERVATION MEASURES TAKEN: No specific measures have been taken to protect this species. A few plants brought under cultivation into the Botanic Garden at Port Blair survived only for one growing season. All species of orchids are included in Appendix 2 of the Convention of International Trade in Endangered Species of Wild Fauna and Flora.

CONSERVATION MEASURES PROPOSED: This species should be searched again in the island and selected plants brought under cultivation taking special care to collect only one or two individuals from each population. Efforts should be made to protect, multiply and reintroduce in nature. Simultaneously the proposal for creation of a Biosphere Reserve in this island should also be taken up on priority as there are several other endemic and rare species.

BIOLOGY AND POTENTIAL VALUE: A very interesting species of the 'Jewel Orchid' genus and the only species found isolated in Andaman & Nicobar Islands. The leaves are extremely beautiful and the floral architecture is interesting and hence of ornamental and botanical value.

CULTIVATION: Preliminary trials on its cultivation have not succeeded. Detailed studies on the habitat requirements and various modern propagation methods should be undertaken for successful cultivation.

DESCRIPTION: Terrestrial erect herbs, 15-30 cm high; leaves 3-4, ovate, dark purplish with golden-reddish reticulations above, dark brownish below; inflorescence terminal, erect, 4-8 flowered, pubescent; sepals and petals greenish purple; lip white, spurred; blade channelled in middle; basal lobes rounded, erect; claw with 6-8 slender unequal lobes on either side; apical lobe bilobed with a minute tooth at apex.

REFERENCES:

1. Balakrishnan, N. P. & Chakraborty, P. (1978). Descriptive notes on some new or little known orchids of Nicobar Islands. *Bull. Bot. Surv. India* 20: 80-90.
2. Hore, D. K. & Balakrishnan, N. P. (1984). Orchids of Great Nicobar Island and their conservation. *J. Bombay Nat. Hist. Soc.* 81: 626-635.

The material for this sheet was supplied by N. P. Balakrishnan, Botanical Survey of India, Flora Cell, Department of Environment, New Delhi.

STATUS: Endangered or Possibly Extinct. (4, 5). Known by a single specimen collected by Blatter & Hallberg in 1917 (2) and remains untraceable till today.

DISTRIBUTION: Peninsular India; endemic to the High Wavy Mountains of Madura District in Tamil Nadu (2-5).

HABITAT AND ECOLOGY: Grows in the damp floor of evergreen forests. The members of the genus *Anoectochilus* Bl. as a whole grow under the shades among fallen leaves. This species is reported to flower in the month of May (2).

CONSERVATION MEASURES TAKEN: None so far. However, all species of Orchidaceae are in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973).

CONSERVATION MEASURES PROPOSED: (a) To search for the populations of the species in its distribution range; if it is rediscovered in the wild, its collection should be banned unless it is for pure research purpose. (b) To incorporate safeguards in planning future strategies to protect its habitats.

BIOLOGY AND POTENTIAL VALUE: The species of *Anoectochilus* Bl. are popularly known as 'jewel orchids' which are characterised by pretty velvety leaves veined in gold or silver. The closely allied genus *Odontochilus* Bl. in which the essential flower structure is very similar but with green leaves is also now treated under *Anoectochilus*. The genus thus includes about 40 species, out of which 14 are reported from India. The only two species occurring in Peninsular India are endemics of which *Anoectochilus elatior* Lindl., with ovate-lanceolate, coloured leaves is rather common in Western Ghats. The second species, *A. rotundifolius* (Blatt.) Balak., which has a very restricted distribution in the High Wavy Mountains of the Western Ghats can be distinguished by the orbicular, green leaves.

CULTIVATION: It is not presently known in cultivation.

DESCRIPTION: Terrestrial herbs. Stems creeping below, ca 15 cm tall. Leaves orbicular, mucronate, ca 2 cm in diameter; petiole amplexicaulous. Flower solitary, terminal, white. Dorsal sepal concave-hooded, ca 19 mm long, tip reflexed, 5-nerved; lateral sepals oblong, sub-obtuse, ca 16 mm long, 5-nerved, connate at base. Petals oblong, subfalcate, ca 15 mm long, acuminate, 3-nerved. Claw of lip ca 4 mm long, with a few, long filiform lobes on each side; midlobe broad-elliptic at base, narrowing into a linear portion of ca 5 mm long, terminated by two short, obtuse, spreading lobes. Ovary ca 5 mm long, densely pubescent.

REFERENCES:

1. Balakrishnan, N. P. (1966). Nomenclatural notes on some flowering plants. *J. Bombay Nat. Hist. Soc.* 63: 327-331.

2. Blatter, E. (1928). List of Orchids, with some new species from the High wavy Mountains (Madura District). *J. Bombay Nat. Hist. Soc.* 32: 521. (as *Odontochilus rotundifolius*).
3. Fischer, C. E. C. (1928). In: Gamble, J. S. & Fischex, C.E.C., *Fl. Pres. Madras*, part 8, p. 1453. (as *Odontochilus rotundifolius*).
4. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. Posscef, Botanical Survey of India, Howrah. p. 8.
5. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.

STATUS: Vulnerable or possibly endangered. This terrestrial species is presently known to occur from a single locality which is open to felling and *jhuming* or shifting cultivation (4). I quite suprisingly received a few plants of this species in 1977 along with some other plants from Manipur, which leads me to believe it still exists in nature if the area has not been cleared off by *jhuming* or felling.

DISTRIBUTION: Endemic to the State of Manipur in India at 800 m.

HABITAT AND ECOLOGY: *Anoectochilus* species are found in forest glades usually close to streams and on moss covered boulders, often forming beautiful carpets. The decaying leaves on the forest floor provide humus on which it grows and the mosses help in retaining moisture and preventing the plants from dessication. The habitats allow fresh air movement and is in no way "stuffy".

CONSERVATION MEASURES TAKEN: This accidental rediscovery after eight decades and its first introduction to cultivation has not proved successful, and I know of no specific measures that have been undertaken that would in anyway help this species for its survival.

CONSERVATION MEASURES PROPOSED: (1) Ban on *jhuming* and felling in its area of occurrence. Though *jhuming* was officially banned in India in 1976 (4), it should be noted that not much success has been attained in enforcing the ban on the local population. (2) Introducing it to cultivation as a matter of extreme urgency and propagating it artificially from seeds or through tissue culture methods.

BIOLOGY AND POTENTIAL VALUE: An exquisite plant with glistening velvety leaves run over by 5 yellowish-white nerves. The leaves resemble those of *Haemaria discolor* (Ker-Gawl.) Lindl., but the flowers are entirely different. It was Sir Joseph Hooker (1), who, based on this species deduced that *Odontochilus* and *Anoectochilus* were congeneric by the following remark: "From the shortness of its spur this species of *Anoectochilus* approximates nearest of all to *Odontochilus*, and tends to invalidate the very artificial character by which these genera are kept apart—namely, that in the former genus the spur, even if reduced to a sac is exposed, whereas in *Odontochilus* the sac is concealed by the bases of the lateral sepals and hence from a mentum". It is also the only *Anoectochilus* species with a divaricate apical lobes of lip. The species of this genus are commonly called as 'Jewel orchids'.

DESCRIPTION: Herbs, plants 15-20 cm, high; leaves ovate, acute-acuminate, 4-5 cm long, velvety and run over with 5 clear nerves; scape 5 cm long, 3-4 flowered, hairy and bearing 2-3 large elongate-acuminate sheaths; flowers 2 cm across, hairy on the outside; floral bracts lanceolate, equal to or longer than ovary; sepals broadly ovate, acuminate; petals obliquely lanceolate; both pubescent externally and ciliate at the tips; lip 12 mm long, pure white, produced into an arched claw which ends in divaricate apical lobes giving the flowers a peculiar appearance; column with broad auricles in front terminating in a 2-fid membrane overhanging the mouth of the very short conical obtuse spur; anther lanceolate, acuminate.

REFERENCES:

1. Hooker, J. D. (1893). *Ic. Pl. t. 2160.*
2. Hooker, J. D. (1890). *Fl. Brit. India 6: 96.*
3. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture 1:125.*
4. Pradhan, U. C. (1977). *Conserving Indian Orchids. Amer. Orch. Soc. Bull. 46 (2): 119.*
5. Pradhan, U. C. (1985). *Himalayan Plant Red Data Sheets--6. Himalayan Plant Jour. 3(5).*

The material for this sheet was supplied by U. C. Pradhan, Kalimpong, West Bengal.

STATUS: Endangered or Possibly Extinct. This species was last collected in 1900. During recent intensive exploration tour in the Tehri-Garhwal region, the plant could not be located in its original habitat. It appears to be gravely endangered due to habitat destruction.

DISTRIBUTION: Tehri-Garhwal, Uttar Pradesh. Endemic.

HABITAT AND ECOLOGY: Reported in the altitudes of 2,500-3,000 m in shady forest floors.

CONSERVATION MEASURES TAKEN: None so far except that the export of all species of Orchidaceae from the wild has been banned under the CITES Convention.

CONSERVATION MEASURES PROPOSED: It is necessary to search for the plant intensively in similar type of habitats in adjacent regions during its flowering season.

BIOLOGY AND POTENTIAL VALUE: Flowers in August. It is of considerable botanical interest.

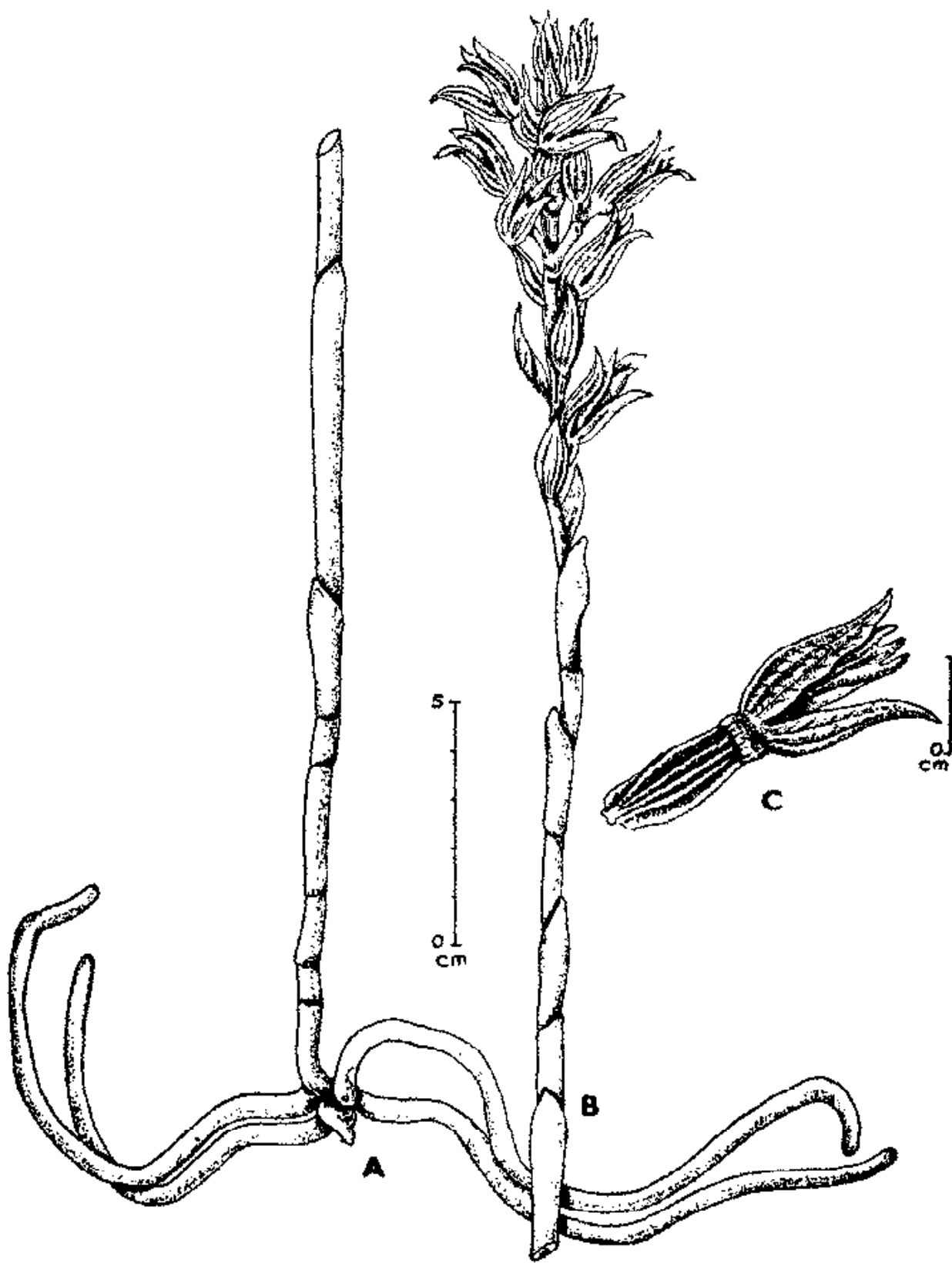
CULTIVATION: Not known.

DESCRIPTION: Terrestrial leafless herbs with thick fleshy roots. Scapes 40-50 cm high, erect, stout, with many tubular sheaths. Racemes ca 10 cm long. Flowers 8-10, crowded, ca 3.5 cm long; floral bracts longer than the clavate ovary, elliptic-lanceolate, 5-7 nerved; sepals ovate-lanceolate; petals shorter than sepals, lanceolate, acuminate; pale green with purple vein; lip pale yellowish-green, attached to the base of column. Column 1.2 cm long, stout, curved. Anther 2-celled. Pollinia ovate-oblong.

REFERENCES:

1. Duthie, J. F. (1902). *J. As. Soc. Beng.* 71: 42.
2. Duthie, J. F. (1906). Orchids of the North-Western Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 9(2): 155, t. 122.
3. Hajra, P. K. (1983). Rare, threatened and endemic plants of Western Himalayas-Monocotyledons. *Plant Conservation Bulletin* 4:2.
4. Seidenfaden, G. & Arora, C. M. (1982). An enumeration of Orchids of Northwestern Himalayas. *Nord. Journ. Bot.* 2:9.

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



Aphyllorchis gollani Duthie A. & B. Habit. C. Flower. (after Duthie)

STATUS: Rare; originally discovered by Mr. Mackinnon's collector from Tehri-Garhwal and the plant has become rare due to degradation of natural forests in the region.

DISTRIBUTION: Garhwal, Uttar Pradesh in the alt. of 1800-2000 m. Endemic.

HABITAT AND ECOLOGY: Grows in shady forest floor of *Quercus* and *Rhododendron* community.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Relocating the species and preservation of its natural habitats.

BIOLOGY AND POTENTIAL VALUE: Pale-green flowers appear during August-September. Botanical interest.

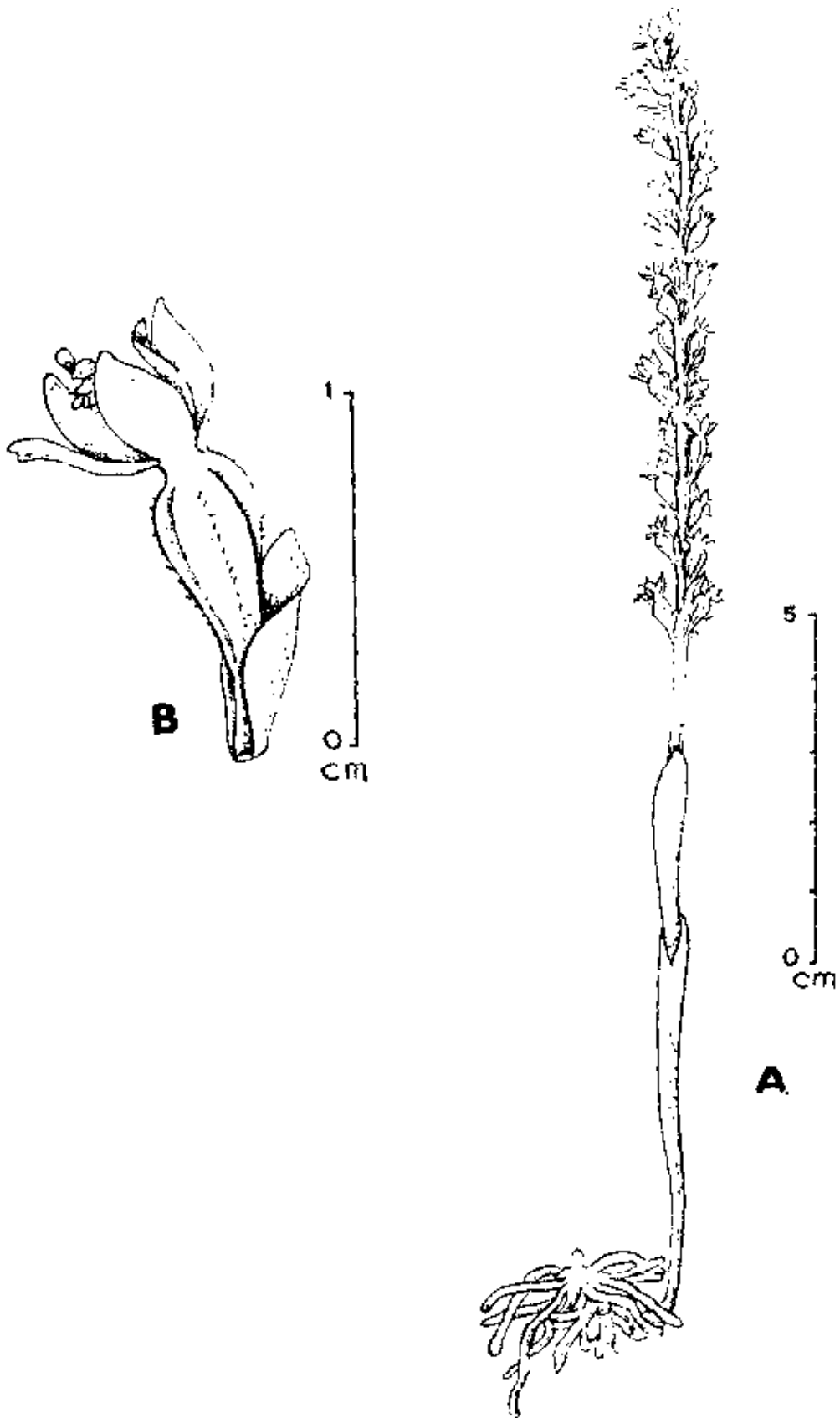
CULTIVATION: Not known.

DESCRIPTION: Terrestrial, erect, leafless, 20-30 cm high herbs. Roots pale-yellowish-brown, cylindrical, thick. Stem pale-yellow or white with 2-4 loose sheaths. Racemes 10-20 cm long, rachis, bracts and pedicels glandular-pubescent. Flowers crowded, ca 7 mm across, pale-green, pedicel slightly longer than the ovary; floral bracts equalling or exceeding pedicel, oblong, obtuse; sepals 4 mm long, sparsely clothed with hairs; petals as long as sepals, linear-spathulate, margins reflexed; lip erect, linear-oblong. Column erect, shorter than petals, rostellum prominent. Pollinia 2, obliquely ovate-oblong. Capsule obovate, sparsely hairy.

REFERENCES:

1. Duthie, J. F. (1906). The Orchids of North-Western Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 9(2): 154. t. 120.
2. Pradhan, U. C. (1976). *Indian Orchids : Guide to Identification and Culture* 1: 129.
3. Raizada, M. B. et al. (1981). *Orchids of Mussoorie*, p. 46. Dehra Dun.
4. Seidenfaden, G. & Arora, C. M. (1982). An enumeration of Orchids of North-Western Himalaya. *Nord. Journ. Bot.* 2: 9.

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



Archineottia microglottis (Duthie) Chen. A. Habit. B. Flower. (after Duthie)

STATUS: Rare; narrowly restricted. No recent collections even from the already reported areas.

DISTRIBUTION: Nilgiris, Ootacamund and Coonoor in Tamil Nadu; hence narrowly endemic to Nilgiris (1-5).

HABITAT AND ECOLOGY: Epiphytic herb in semi-evergreen to shola vegetation between 1500-2000 m altitude. The areas receive high rain fall during both south-west and north-east monsoons with frequent fog and mist during winter and rainy season.

CONSERVATION MEASURES TAKEN: None so far although its distribution localities are included in the Nilgiri Biosphere Reserve and hence habitat protection is likely.

CONSERVATION MEASURES PROPOSED: Thorough assessment of populations of the species in its natural habitats; *ex situ* cultivation in gardens and reintroduction in the original as well as similar habitats for their successful establishment and survival.

BIOLOGY AND POTENTIAL VALUE: Owing to the species' narrow endemism it is of distributional and biological value. This is closely related to *Bulbophyllum neilgherrense* Wight, but differs in not having pubescence on the lip beneath and face of the column.

CULTIVATION: Not so far reported.

DESCRIPTION: Epiphyte with pseudobulbs 2-2.5 cm, globose ovoid; rhizome stout. Leaves 3.5 to 5 cm, oblong. Scape slender, about equalling the leaves; sheaths 2-3. Inflorescence shortly racemed, 6-8-flowered. Bracts 0.5 cm, lanceolate; pedicel longer, slender. Flowers greenish-white or creamy. Lateral sepals 1-2 cm or less, linear-lanceolate, acuminate, 7 nerved, twice or thrice as long as the falcately ovate-lanceolate, long acuminate, 5-nerved dorsal sepal; petals broadly oblong, 3-nerved, tip rounded; lip with uncinata, recurved basal lobes, columnar, tooth minute.

REFERENCES:

1. Fischer, C. E. C. (1928). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras* 3: 1421.
2. Hooker, J. D. (1890). *Fl. Brit. India* 5: 779.
3. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. Pesscef, Botanical Survey of India, Howrah. p. 13.
4. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22: 98.
5. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 420.

Material for this sheet was supplied by A. V. N. Rao, Botanical Survey of India, Coimbatore.

STATUS: Rare with narrow distribution. One collection from type locality (4) followed by another from outside its type locality (2) exist.

DISTRIBUTION: Nilgiri District, Kotagiri, St. Catherines falls; Thirunelveli District: Kannikatti (1-3), Tamil Nadu.

HABITAT AND ECOLOGY: On moist rocks beside waterfalls surrounded by Shola forests and wet evergreen forests. The habitats receive heavy rainfall in south-west and north-east monsoons and are often bathed in thick fog and moist. The soil is loamy with rich humus. The habitats are situated in 1500-2000 m alt. range.

CONSERVATION MEASURES TAKEN: Its natural habitats are included in the Nilgiri Biosphere Reserve and Agasthyamalai Biosphere Reserve. Hence the habitat degradation is likely to be prevented.

CONSERVATION MEASURES PROPOSED: Thorough search for the species in natural habitats, introduction in the garden for *ex-situ* cultivation and reintroduction in similar habitats followed by monitoring for successful rehabilitation are suggested.

BIOLOGY AND POTENTIAL VALUE: The epiphytic herbs comprise stout copiously rooting rhizomes. Presence of the species in two different localities away from each other though in Peninsular India, presents biological and distributional interest. This species is close to *Bulbophyllum mysorensis* J. J. Smith which is also narrowly restricted to forests of Mysore which is contiguous with forests of the Nilgiris.

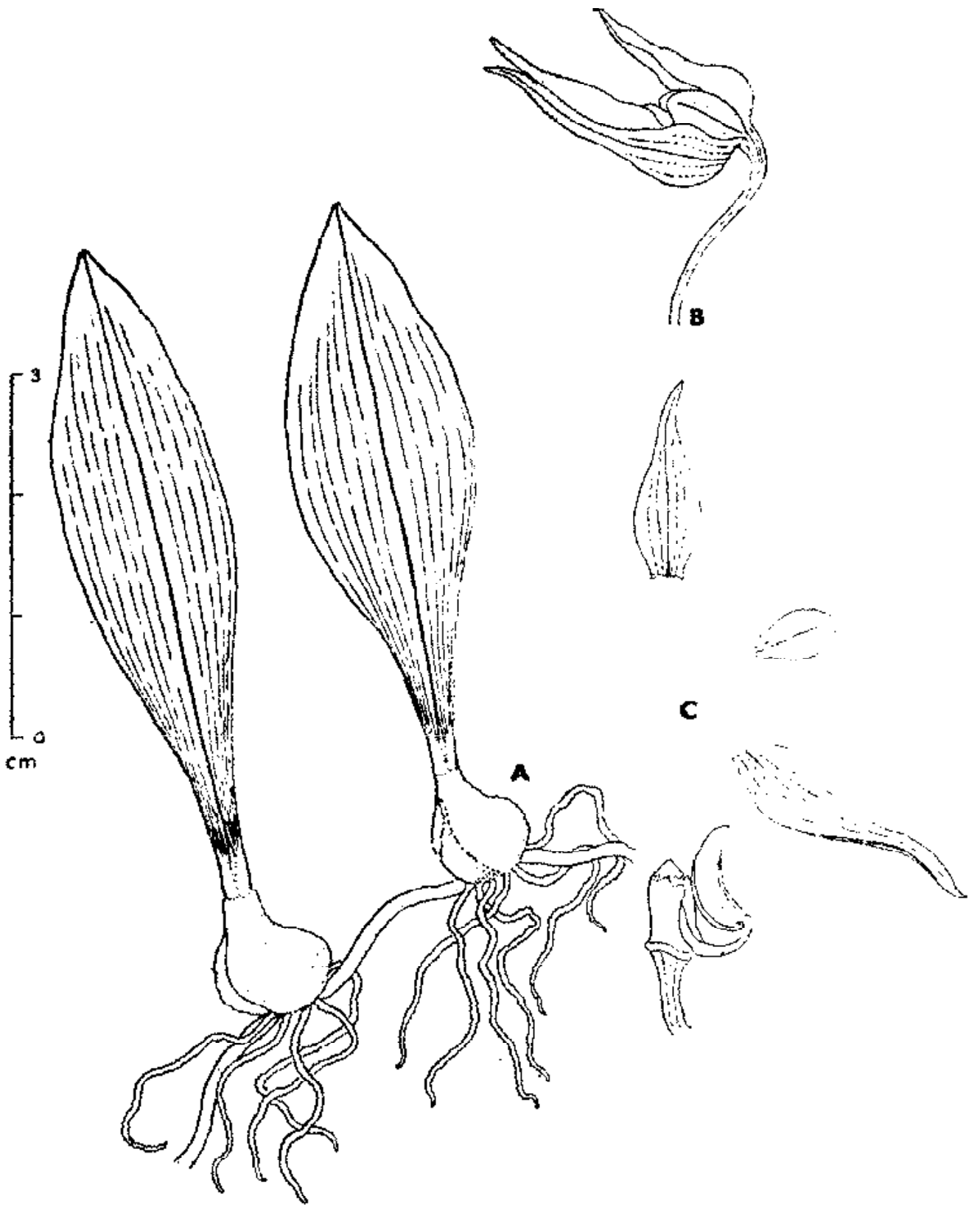
CULTIVATION: Not reported so far.

DESCRIPTION: Epiphytic herb with stout rhizomes. Pseudobulb single-leaved. Scape stout, 2-3-sheathed, umbel 6-8-flowered. Sepals lanceolate, acuminate, 5-nerved, dorsal one-third than the lateral. Petals elliptic oblong, 3-nerved, tip rounded. Lip stipitate, posterior angles acute, recurved. Column shortly toothed. Flowers cream coloured, freckled with pale brown.

REFERENCES:

1. Bose, T. K. & Bhattacharjee, S. K. (1980). *Orchids of India*, p. 83.
2. Fischer, C. E. C. (1928). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras*, p. 1418.
3. Hooker, J. D. (1890). *Fl. Brit. India* 5: 767.
4. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. Pusscef, Botanical Survey of India, Howrah, p. 13.
5. Wight, R. (1854). *Jc. Pl. Ind. Orient.* t. 1653.

Material for this sheet was supplied by A. V. N. Rao, and V. Chitra, Botanical Survey of India, Coimbatore.



Bulbophyllum albidum Hook f. A. Habit. B. Flower. C. Floral parts (after *Wt. Ic.*)

STATUS: Rare; narrowly restricted in distribution; only one collection was made after its first discovery.

DISTRIBUTION: Kerala. Wynaad; Muthukuzhivayal. Narrowly endemic to Wynaad region of Western Ghats.

HABITAT AND ECOLOGY: Epiphytic in evergreen forests receiving high rainfall during south-west and north-east monsoons, in the altitudes of 1300-1800 m.

CONSERVATION MEASURES TAKEN: None for the species, however, its habitat is included in the Nilgiri Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: Thorough search for the species and assessment of its populations followed by *ex-situ* cultivation in gardens are suggested.

BIOLOGY AND POTENTIAL VALUE: Narrow endemism of the species and only one subsequent collection warrants immediate measures for relocation. This is closely related to *Cirrhopetalum neilgherrense* Wight which has wider distribution in Nilgiris and Anamalai hills, Tamil Nadu. This species differs from *C. neilgherrense* in having less than two flowers in an umbel, lateral sepals ovate-oblong, subacute, long, at first cohering, later separate, dorsal sepal sub-orbicular. Petals are as long as the dorsal sepal.

CULTIVATION: Not reported from any source.

DESCRIPTION: Epiphytic, small herbs, pseudobulbs distant on a slender rhizome. Leaf 3.75 cm, linear-oblong. Scape slender, shorter than the leaf. Umbel two flowered. Lateral sepals 2 cm, linear-oblong, acute, incurved, three times as long as the orbicular, ovate, obtuse dorsal sepal. The lateral sepals cohere at first and become free later. Petals oblong, tip tounded, as long as the dorsal sepal. Column with obtuse, spreading arms.

REFERENCES:

1. Fischer, C. E. C. (1928). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras*, p. 1420.
2. Hooker, J. D. (1890). *Fl. Brit. India* 5: 777.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 418.

Material for this sheet was supplied by A. V. N. Rao and V. Chitra, Botanical Survey of India, Coimbatore.

STATUS: Vulnerable. Collected only once from Nilgiris in 1972, away from the type locality (4).

DISTRIBUTION: Karnataka, Coorg (1). Tamil Nadu, Nilgiris, Kudini (4). Endemic to Western Ghats.

HABITAT AND ECOLOGY: Epiphytic (rarely lithophytic) herbs, in semi-evergreen forests in the altitudes of 1200-1450 m receiving high rainfall. The soil is loamy.

CONSERVATION MEASURES TAKEN: One of its natural habitats is included in the Mudumalai Wildlife Sanctuary, Tamil Nadu, where there is possibility of less habitat degradation.

CONSERVATION MEASURES PROPOSED: Thorough assessment of its populations in natural habitats; and monitoring of its populations and habitats; *ex-situ* conservation in gardens, its multiplication and reintroduction in suitable natural habitats; tissue culture for clonal multiplication and cultivation are suggested.

BIOLOGY AND POTENTIAL VALUE: Flowers in August. Being narrowly distributed in the Western Ghats and only once collected so far after discovery away from type locality (4), this species is of distributional and biological interest.

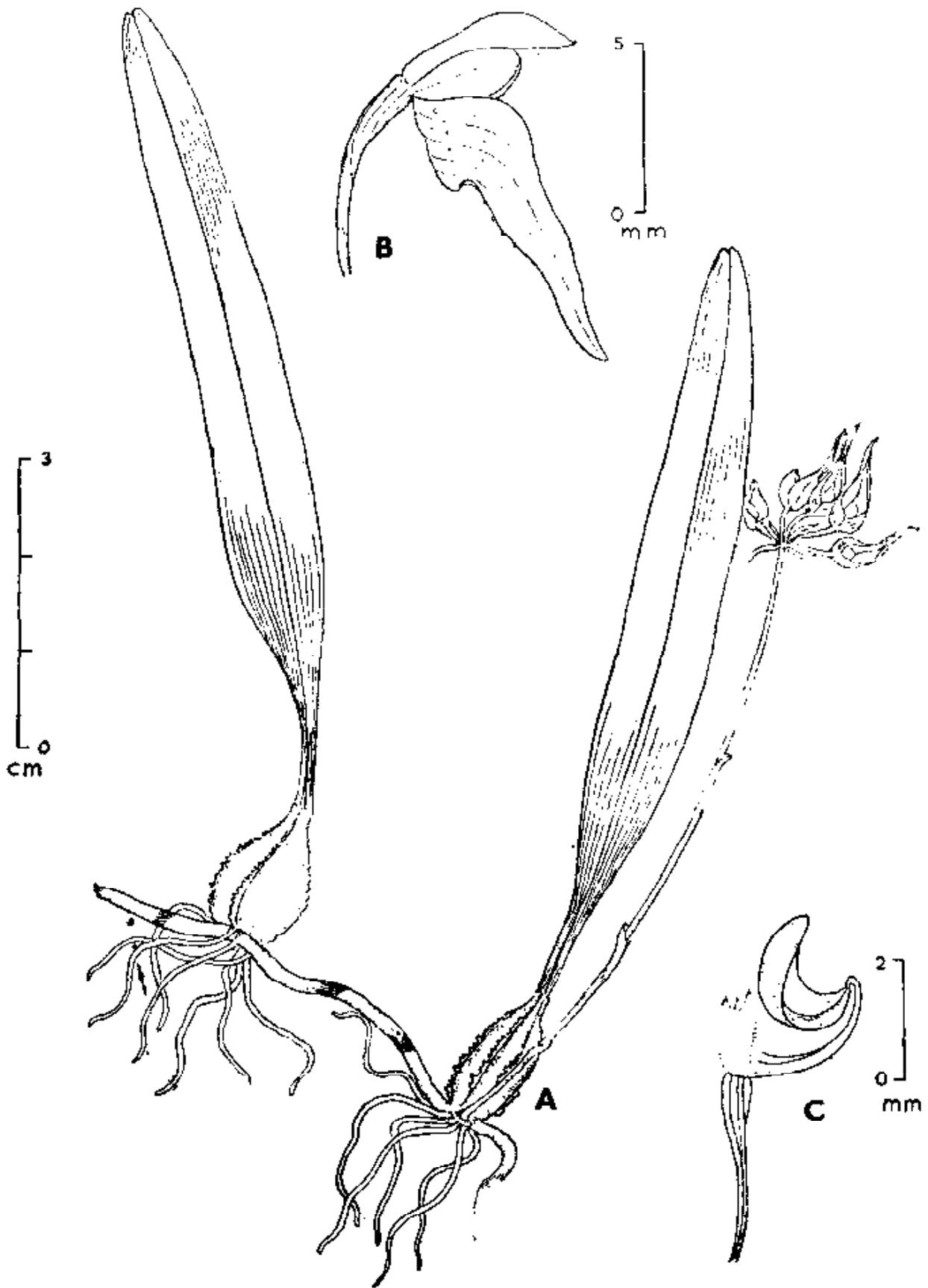
CULTIVATION: This is reported to have flowered in the garden of James O' Brein at "Harrow-on-the Hill" and were sent to Kew Herbarium before original publication of the species (4). There is no other report on its cultivation (3).

DESCRIPTION: Epiphytic (rarely lithophytic) herbs with creeping stems and pseudobulbs at intervals. Leaves 3.5-9.0 × 0.7-1.1 cm, linear-oblong, sessile, narrow at base, obtuse or emarginate. Inflorescence an umbel, peduncle at the base of the pseudobulb, from the creeping rhizome. Flowers upto 6 in an umbel, pale-yellow with maroon stripes. Dorsal sepal oblong-ovate, obtuse, 5-nerved, papillose on outer surface, especially along the median sector. Lateral sepals linear-lanceolate, oblique at base, acute above, cohering along the margins, free below except towards the gibbous base, densely papillose or warted towards base on outer surface, 5-nerved. Lateral petals smaller than sepals, oblong, obtuse, 3-nerved. Lip ca 2 × 1 mm, attached to the foot of the column, ligulate, strongly recurved.

REFERENCES:

1. Fischer, C.E.C. (1928). In Gamble, J. S., & Fischer, C. E. C., *Fl. Pres. Madras*, p. 1421.
2. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22: 95. Botanical Survey of India, Howrah.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 417.
4. Subba Rao, G. V., Kumari, G. R. & Chandrasekaran, V. (1973). Notes on some rare plants collected from Nilgiri District., South India. *Bull. Bot. Surv. India* 15: 275-276. (1976).

The material for this sheet was supplied by A. V. N. Rao and V. Chitra, Botanical Survey of India, Coimbatore.



Bulbophyllum elegantulum (Rolfe) J. J. Sm. A. Habit. B. Flower. C. Column with lip.

STATUS: Vulnerable (1, 2). The species is localized in certain restricted pockets in the evergreen forests of Western Ghats. The main cause for its threat is the fast degradation of the evergreen forests in this region.

DISTRIBUTION: Peninsular India; endemic to Southern Western Ghats. The species was first described by Rolfe based on a collection of John S. Moss from Nilgiris in Tamil Nadu, but subsequent workers could not relocate it there (3). Later, the plant was reported to have been collected from Pulney hills in Tamil Nadu and Idukki District in Kerala (1-3).

HABITAT AND ECOLOGY: Confined to the evergreen forests above 1500 m alt. The plants usually grow as epiphytes on trunks of forest trees or at times on moss-clad rocks along water sources. Profuse flowering is observed during February.

CONSERVATION MEASURES TAKEN: None for the present. However, the family Orchidaceae is included in App. II of the CITES and also the area is recently declared as a Biosphere Reserve and hence the chances of protection of this species in this locality are now assured.

CONSERVATION MEASURES PROPOSED: (a) To implement all possible steps for Nilgiris as a Biosphere Reserve. (b) To ban the collection of this plant or its flowers from the wild. (c) To formulate some protective measures to preserve all the remaining evergreen forests in Western Ghats which as a whole harbour many other rare and endemic plant and animal species.

BIOLOGY AND POTENTIAL VALUE: The members of the genus *Coelogyne* Lindl. are of great horticultural importance. In India about a dozen species are grown for their handsome, large flowers. Among the eleven endemic species/varieties reported from India, six are restricted to Peninsular India. Further, *Coelogyne mossiae* Rolfe is considered to be the largest species of the genus in South India (1 & 3).

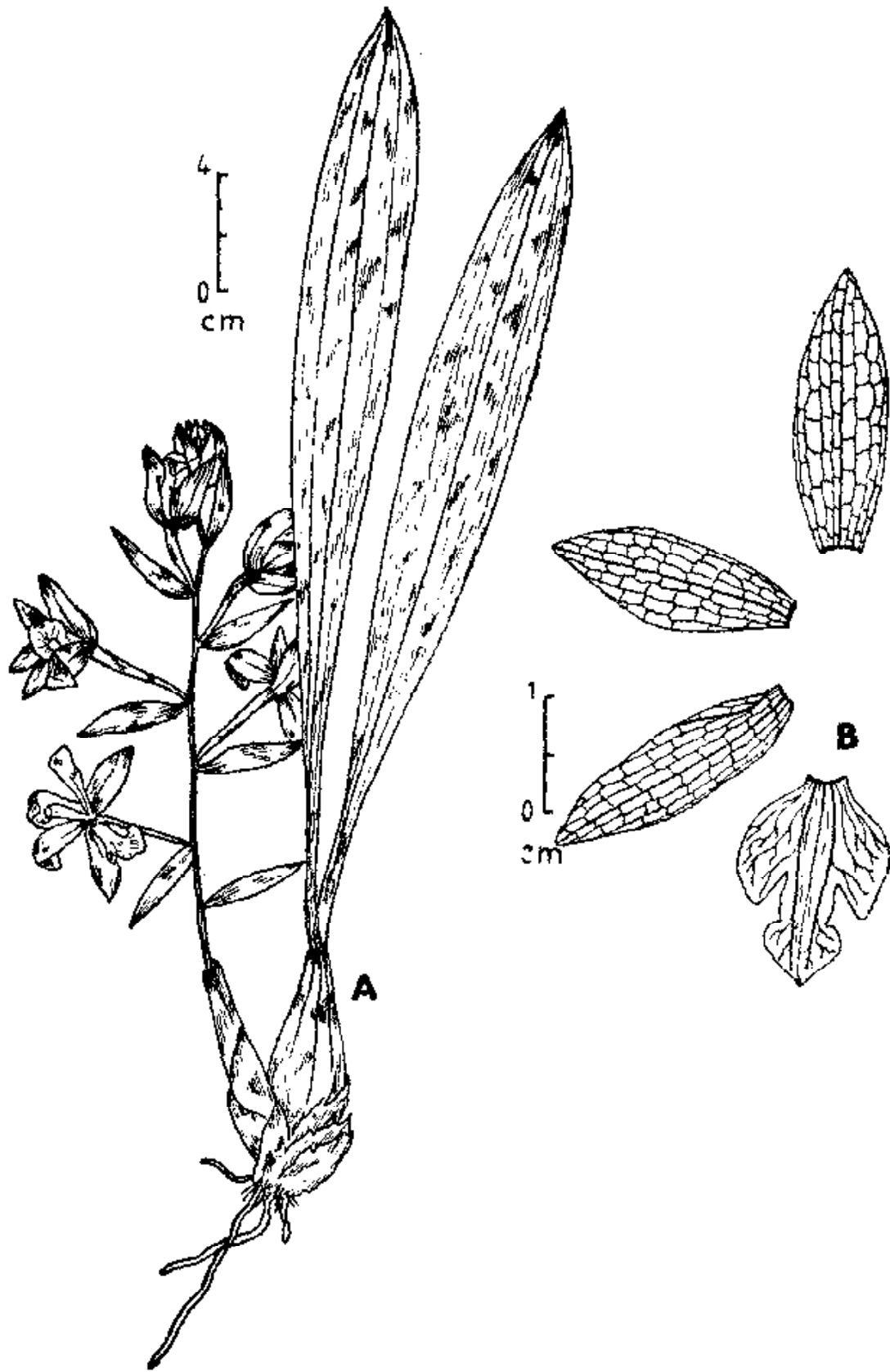
CULTIVATION: Not known in cultivation.

DESCRIPTION: Pseudobulbs ovoid or conical, 4.0-7.5 × 1.5-2.0 cm. Leaves 2 per pseudobulbs, oblong-elliptic, obtuse, 30-35 × 3-4 cm. Racemes lateral to the pseudobulbs, ca 24 cm long. Flowers 6-8, ca 4.5 cm across, white, fragrant. Sepals dorsally keeled. Petals elliptic. Lip 1.8-2.0 cm long, 3-lobed; lateral lobes oblong, obtuse, entire, erect, embracing the column; midlobe broadly elliptic, acute, entire, yellow tinged.

REFERENCES:

1. Das, S. & Jain, S. K. (1980). Orchidaceae: Genus *Coelogyne* Lindl. *Fasc. Fl. India* 5: 18. Botanical Survey of India, Howrah.
2. Henry, A. N., Vivekananthan, K & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
3. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22: 116, t. 99a-99c.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.



Coelogyne massiae Rolfe A. Habit. B. Floral parts.

STATUS: Possibly Extinct. It is represented only by the type specimen in Kew herbarium. It was first collected in 1875 by Treutler from Sikkim Himalaya, on the basis of which J. D. Hooker described the species. Since then it could not be recollected in spite of several botanical expeditions in the area.

DESCRIPTION: Sikkim Himalaya. Endemic.

HABITAT AND ECOLOGY: Not known. Probably epiphytic like the other species of *Coelogyne*.

CONSERVATION MEASURES TAKEN: None for the species; the family Orchidaceae is included in App. II of CITES.

CONSERVATION MEASURES PROPOSED: An attempt should be made to locate the species in wild; if located the natural habitat and its population should be conserved through *in situ* measures; steps for *ex situ* conservation should be taken.

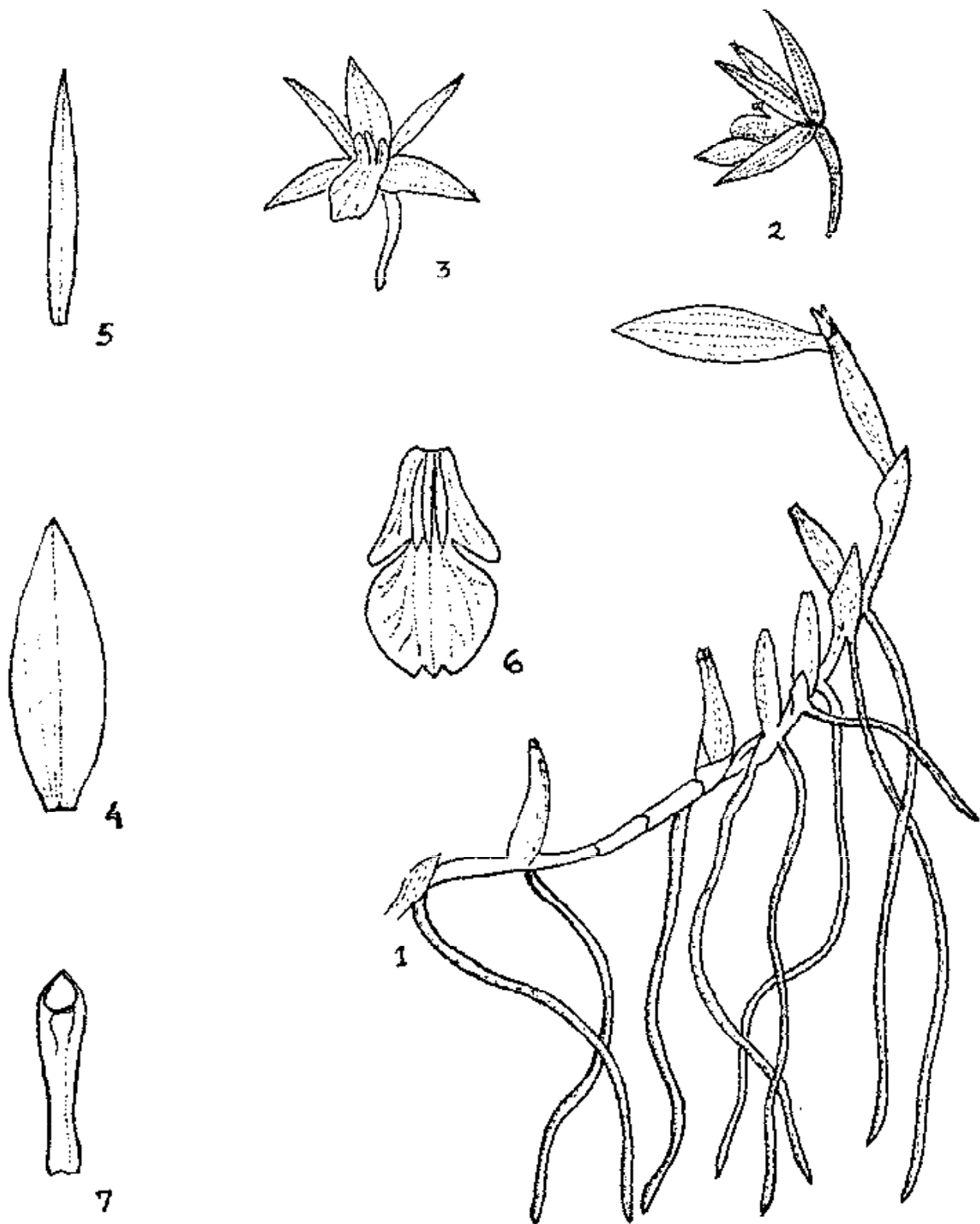
BIOLOGY AND POTENTIAL VALUE: Not known.

DESCRIPTION: Rhizome creeping, slender. Pseudobulbs distant, small, ovoid, curved, 2-leaved. Leaves sessile, small, elliptic-lanceolate. Inflorescence 1-flowered. Flowers ca 3.5 cm across. Sepals lanceolate, acuminate. Petals linear. Labellum 3-lobed, lateral lobes oblong, narrow, midlobe large, orbicular, with a broad cuneate base, obtusely 3-lobed at apex, lamellae 3 on the hypochile.

REFERENCES:

1. Hooker, J. D. (1890). *Fl. Brit. India* 5: 837.
2. Hooker, J. D. (1892). *Icon. Pl.* t. 2105.
3. Pfitzer, E. & Kranzlin, F. (1907). In Engler, A., *Das Pflanzenreich* 32:38.
4. Das, S. & Jain, S. K. (1980). *Fasc. Fl. India*. Botanical Survey of India, Howrah. 5:32.

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



Coelogyne treutleri Hook. f.

1. Habit. 2 & 3. Flower. 4. Dorsal sepal. 5. Petal.
 6. Labellum. 7. Column. (after Hook. f. *lc. Pl.* t. 2105).

STATUS: Indeterminate and Insufficiently known. Known by a single collection of Blatter & Hallberg made in 1917 (1) and remains untraceable till today.

DISTRIBUTION: Peninsular India; endemic to the High Wavy Mountains of Madura District in Tamil Nadu (1-4).

HABITAT AND ECOLOGY: Epiphytic on the trees in dense evergreen forests at 1500 m alt. This species has been reported to flower in the wild during the month of May.

CONSERVATION MEASURES TAKEN: None at present for the wild populations; the family Orchidaceae is included in App. II of CITES.

CONSERVATION MEASURES PROPOSED: To conduct survey in the distribution areas to determine the availability of the species, and if available to study the density and the factors limiting its populations; to ban the collection of the species in the wild; to incorporate safeguards in future developmental programmes to protect the remaining areas of evergreen forests in this region.

BIOLOGY AND POTENTIAL VALUE: The genus *Chrysoglossum* Blume is represented by four species in India of which *C. hallbergii* Blatter is unique in its epiphytic habit. Of the two species occurring in the Western Ghats, *C. maculatum* (Thw.) Hooker, described from Sri Lanka has a wider distribution in Southern Western Ghats, whereas, *C. hallbergii* is restricted to the High Wavy Mountains in Tamil Nadu.

CULTIVATION: Not known in cultivation.

DESCRIPTION: Epiphytes with slender rhizomes. Leaves solitary on the pseudobulbs, ca 18 × 5 cm, prominently 5-ribbed. Scape lateral, about 12-flowered. Sepals and petals obovate-lanceolate to lanceolate, acute, ca 9 mm long, 3-nerved. The lateral sepals united to the upper half of the spur of the lip, forming a small saccate mentum. Lip clawed, 3-lobed; midlobe much longer than the sidelobes, suborbicular, obtuse; sidelobes subrectangular, obtuse; disc with three very distinct lamellae.

REFERENCES:

1. Blatter, E. (1928). List of orchids, with some new species from the High Wavy Mountains (Madura District). *J. Bombay Nat. Hist. Soc.* 32: 519.
2. Fischer, C. E. C. (1928). In: Gamble, J. S., & Fischer, C.E.C., *Fl. Pres. Madras* Part 8, p. 1422.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
4. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed). *Materials for a Catalogue of Threatened Plants of India*, p. 36. Botanical Survey of India, Howrah.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.

STATUS: Rare. Threatened due to habitat degradation in its narrow distribution range.

DISTRIBUTION: Nilgiris, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: In moist, shady places at 2000 m. alt.

CONSERVATION MEASURES TAKEN: The Nilgiri-Wynaad areas are recently declared as a Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: The type locality and neighbouring areas should be searched for this plant. The area be declared as 'protected'. The plant should be propagated through seeds and tissue culture techniques.

BIOLOGY AND POTENTIAL VALUE: The species has attractive large greenish-white flowers which are fragrant and is of horticultural value.

CULTIVATION: None.

DESCRIPTION: 1-2 m tall, terrestrial, leafy herbs, stem rigid; leaves 25-30 × 5-9cm, broadly elliptic-lanceolate, sessile, apex caudate-acuminate, sheaths ridged. Flowers greenish-white, fragrant, in 6-20 cm long panicles, with few flowers; bracts ovate-lanceolate; sepals linear-oblongate, with upper half inflexed edges; petals like sepals, flat and shorter, lip as long as sepals, linear, with lip expanded into orbicular, apiculate-recurved lobe, edges finely erose and minutely undulate.

REFERENCES:

1. Fischer, C. E. C. (1957). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras* 3: 1015. (Repr. ed.).
2. Hooker, J. D. (1890). *Fl. Brit. India* 6: 91.
3. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22:30, t. 18a-e.

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

STATUS: Vulnerable, due to over-exploitation and habitat destruction.

DISTRIBUTION: Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Himalaya; Nepal. Endemic to Eastern Himalayas and N. E. India.

HABITAT AND ECOLOGY: An epiphyte or lithophyte found growing at an elevation of 1000-1500 m, in cool humid forests with moderate rainfall.

CONSERVATION MEASURES TAKEN: It is included in Appendix 2 of 1973 Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES).

CONSERVATION MEASURES PROPOSED: Propagation through seed and meristem culture should be undertaken on priority basis and plants be introduced in Orchid Sanctuaries and Orchidaria.

BIOLOGY AND POTENTIAL VALUE: It is an ornamental species with erect spikes bearing one to three large white, scented flowers of long lasting quality suitable for cut-flowers trade. It has potential in breeding and plant improvement for the production of quality flowers in Orchid industry. Flowers in March-April.

DESCRIPTION: Pseudobulbs short, many leaved. Scape shorter than leaves, erect, 1 to 3 flowered. Flowers 7-10 cm across, with spreading sepals and petals. Lip is 3-lobed, with pubescent, golden-yellow keels.

REFERENCES:

1. Hegde, S. N. (1984). *Orchids of Arunachal Pradesh*. Arunachal Forest Department, Itanagar.
2. Hooker, J. D. (1890). *Fl. Brit. India* 6:11.
3. Katak, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of North-Eastern India*. POSSCEF, B.S.I., Howrah. p. 27, t. 20.
4. King, G. & Pantling, R. (1898). *The Orchids of Sikkim Himalaya*, *Ann. R. Bot. Gdn., Calcutta*.
5. Lindley, J. (1847). *Bot. Reg.* t. 67.
6. Pradhan, U. C. (1979). *Indian Orchids: Guide to identification and culture 2*. Kalimpong, India.

Material for this sheet was supplied by Sadanand N. Hegde, Orchid Research and Development Centre, Forest Department, Tipi, Arunachal Pradesh.

STATUS: Vulnerable. Although the species is distributed from Kumaon Himalaya to Eastern Himalaya, but is sparse in occurrence. The species is threatened due to over-exploitation and habitat destruction.

DISTRIBUTION: Kumaon, Sikkim, Arunachal Pradesh; Nepal and Bhutan.

HABITAT AND ECOLOGY: An epiphyte or lithophyte found in the Himalayas from Kumaon eastwards upto Arunachal Pradesh at elevations ranging from 1700-2500 m. Generally seen on large *Quercus* trees in huge clumps. The species can survive severe winter with snow-fall. During summer months, it can tolerate high humidity and prefers moderate rain fall.

CONSERVATION MEASURES TAKEN: This species is included in Appendix 2 of 1973 Convention on International Trade in Endangered species of Wild Fauna and Flora. The species is also under cultivation in the Orchidaria at Tipi and Dirrang and has also been introduced into the Orchid Sanctuary at Sessa, in Arunachal Pradesh.

CONSERVATION MEASURES PROPOSED: Propagation through seed and tissue-culture should be taken up on priority.

BIOLOGY AND POTENTIAL VALUE: This species is found in sub-tropical and temperate Himalayas, with cool and humid climate. The plants are robust producing large fragrant flowers of long-lasting quality. The species has been used extensively in horticulture for breeding and has ornamental value. Flowering: February, upto May.

DESCRIPTION: Pseudobulbs about 8 cm long with linear-oblong leaves measuring upto 60 cm. Inflorescence 60-120 cm long, arching, bearing 10-20 flowers of 10 cm across each. Sepals and petals spreading, apple-green; lip three-lobed, white tinged, yellow with purple spots towards the margin and in the centre.

REFERENCES:

1. Hegde, S. N. (1984). *Orchids of Arunachal Pradesh*. Arunachal Forest Department, Itanagar.
2. Hooker, J. D. (1890). *Fl. Brit. India* 6:11.
3. Katak, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of North-Eastern India*. POSSCEF, Botanical Survey of India, Howrah. p. 28, t. 21.
4. King, G. & Pantling, R. (1898). The Orchids of Sikkim Himalaya. *Ann. R. Bot. Gdn., Calcutta*, 8: 192, t. 256.

The material for this sheet was supplied by Sadanand N. Hegde, Orchid Research and Development Centre, Forest Department, Tipi, Arunachal Pradesh.

STATUS: Endangered; known from only few scattered sites within an area of 10 km. sq.; rapid urbanisation has already damaged the original site of discovery. The remaining sites are under considerable pressure as a result of developmental activities.

DISTRIBUTION: India; endemic to Sikkim in North-Eastern Himalayas. This species was originally discovered in Gangtok at 1700m., by Mrs. Claude White and named after her. The original habitat no longer exists, though it is known to occur sporadically around Rhumtek.

HABITAT AND ECOLOGY: An epiphyte usually inhabiting trees of *Schima wallichii* and rarely on *Castanopsis*, at elevations of 1500-1700m., in association with other species of *Cymbidium* and *Bulbophyllum*. *S. wallichii* forest indicates poor soil and moisture condition (dry winters) and occur facing the southern aspect.

CONSERVATION MEASURES TAKEN: On 8 July 1910, the then Chogyal of Sikkim under Forest Notification Memo. No. 375, banned the collection of Orchids in Sikkim. All species of *Orchidaceae* are in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. However, a major threat to this species is habitat destruction owing to rapid urbanisation.

CONSERVATION MEASURES PROPOSED: Complete cessation of felling in the area of its occurrence, and replenishing of original site. This species is self-fertile and hence can be easily propagated in cultivation by seeds in aseptic cultures and by meristem tissue culture. That a well ripe pod contains over 50,000 seeds per capsule, gives this species excellent chance of regenerating itself if the present habitat can be protected and planted.

BIOLOGY AND POTENTIAL VALUE: It is a unique species in the genus *Cymbidium* in having purple-red dotted petals and could have great horticultural value in breeding "spotted" *Cymbidium*. Flowering time: November. A species closely resembling *C. cochleare* Lindl., in the vegetative parts and easily confused.

CULTIVATION: In cultivation in a few nurseries and hobbyists in Kalimpong and Gangtok.

DESCRIPTION: Perennial herb with short pseudobulbs, 5-15 cm long; leaves linear, acuminate, 60-90 cm. × 1.6 cm at the broadest part. Inflorescence from base of pseudobulb, 35-45 cm long, pendulous, the peduncle covered throughout with scarious oblong-lanceolate, acuminate bracts, 2.5-12.5 cm long. Raceme 15-20 cm, 10-12-flowered. Flowers 4.5 cm long, yellowish-green, flushed with purple and spotted with red; labellum translucent white or pinkish spotted profusely on sides and apex, and bearing two pubescent lamellae near the apices of the lateral lobes. Capsule 4-5 cm long, ellipsoid.

REFERENCES:

1. Katakai, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic orchids of Sikkim and North-eastern India*. BOSSCEF, Botanical Survey of India, Howrah. p. 36.
2. King, G. & Pantling, R. (1898). The Orchids of the Sikkim Himalayas. *Ann. R. Bot. Gdn. Calcutta* 8: 193-194 t. 258.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: p. 478.

The material for this sheet was supplied by U. C. Pradhan, Kalimpong.

STATUS: Rare. This species is known only from a few scattered populations and is becoming rare due to habitat destruction and over-grazing in the high altitude region.

DISTRIBUTION: Uttar Pradesh (Garhwal), Sikkim, Nepal; Bhutan; S. E. Tibet, in the alt. of 3300-4200 m.

HABITAT AND ECOLOGY: In shady places or on open hill slopes, near springs along with species of *Cotoneaster*, *Saxifraga*, *Lactuca*, etc.

CONSERVATION MEASURES TAKEN: Nanda Devi National Park and the Valley of Flowers National Park include some of the habitats of the species, and are protected. Its export has been banned under CITES.

CONSERVATION MEASURES PROPOSED: Multiplication by tissue culture method and subsequent reintroduction in its habitats where it is depleted are proposed.

BIOLOGY AND POTENTIAL VALUE: An attractive ground orchid and is of scientific and horticulture interest. Flowers in June.

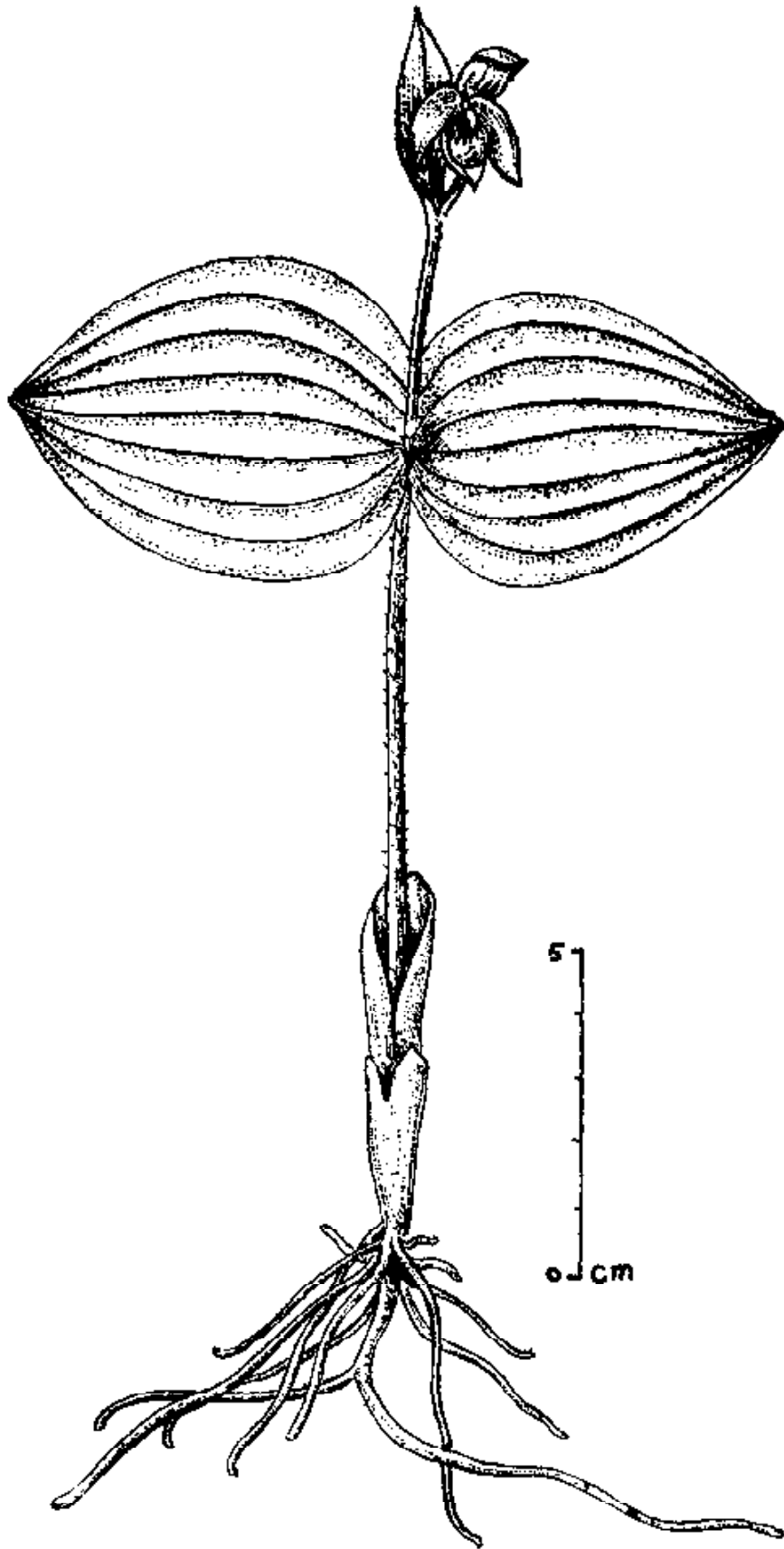
CULTIVATION: Not known. Possibly grown in some European gardens.

DESCRIPTION: Herbs 10.0-30.0 cm high, pubescent; leaves opposite and almost orbicular or ovate, *ca* 5.0 cm across. Floral bracts *ca* 3.0 cm long, ovate-lanceolate. Flowers solitary, brownish, with darker lines, 1.0-2.0 cm across; dorsal sepal narrowly ovate, lateral pair united under lip; petals lanceolate, concave, spreading; lip shorter than sepals, depressed. Column short; anthers 2, globose.

REFERENCES:

1. Hajra, P. K. (1983). *Botany of Nanda Devi National Park*. POSSCEF, Botanical Survey of India, Howrah. p. 30, f. 3A.
2. Katak, S. K. (1984). *The Lady's slipper orchids of India*. POSSCEF, Botanical Survey of India, Howrah.
3. King, G. & Pantling, R. (1898). The orchids of Sikkim Himalaya. *Ann. Roy. Bot. Gard., Calcutta* 8:341, t. 446.
4. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1:34.
5. Rao, A. S. (1979). *Orchids of India*, p. 34. New Delhi.
6. Rau, M. A. & Rao, T. A. (1960). *Bull. Bot. Surv. India* 2:425.
7. Seidenfaden, G. & Arora, C. M. (1982). An enumeration of the Orchids of Northwestern Himalayas. *Nord. Journ. Bot.* 2:12.

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



Cypripedium elegans Reichb.f.

STATUS: Rare. This species is known from a few scattered populations only.

DISTRIBUTION: India: Uttar Pradesh (Garhwal, Kumaon), Sikkim; Nepal; Bhutan; S. E. Tibet; at 3000-4300 m alt.

HABITAT AND ECOLOGY: On open hill slopes or amidst *Cotoneaster*, *Parnassia* bushes in the subalpine and alpine meadows.

CONSERVATION MEASURES TAKEN: Its export has been restricted as Orchidaceae is in Appendix 2 of CITES; declaration of Nanda Devi as a National Park has given protection to some of its habitats.

CONSERVATION MEASURES PROPOSED: Conservation of its habitats for *in situ* protection; tissue culture for multiplication of the species; and cultivation in National Orchidaria are proposed.

BIOLOGY AND POTENTIAL VALUE: Flowers during July-Aug., and it is of horticultural and botanical interest.

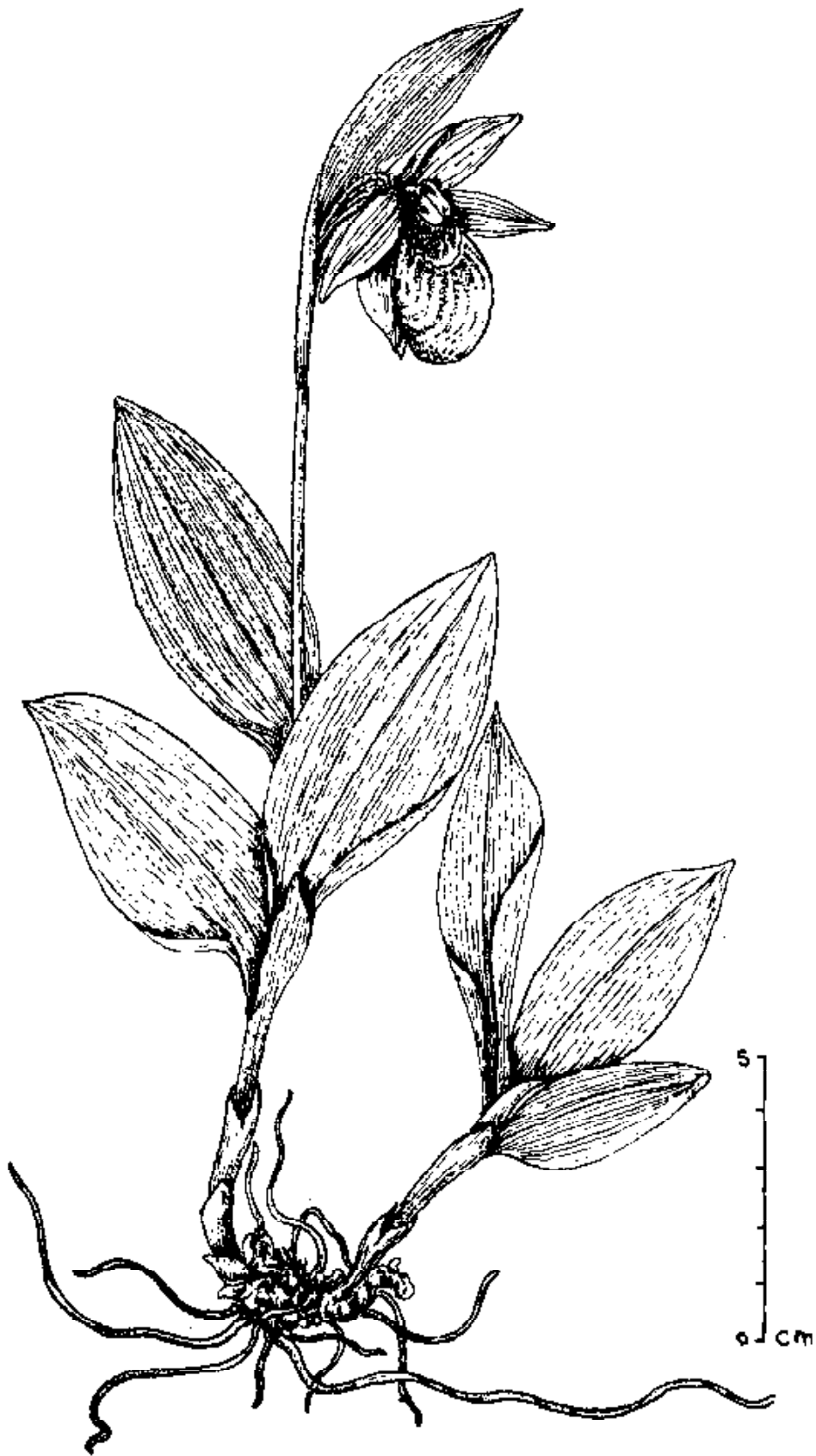
CULTIVATION: Only a few plants are being cultivated in Orchidaria and orchid nurseries.

DESCRIPTION: Terrestrial, 20-40 cm high; stem clothed with 3-4 loose tubular acute sheaths. Leaves usually 3, upto 8.5 cm long, ovate-elliptic or oblong. Peduncle pubescent. Flowers purplish-red; floral bracts longer than flowers; dorsal sepals broadly ovate, lateral pair narrower, connate; petals spreading, longer than dorsal sepal; lip sub-globose, much inflated, many-nerved. Column short; anthers 2, globose, hidden under a large staminode.

REFERENCES:

1. Hajra, P. K. (1983). *Botany of Nanda Devi National Park*. POSSCEF, Botanical Survey of India, Howrah. p. 30, t. 3b.
2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened plants of India. A state-of-the-Art Report*. BSI & MAB., New Delhi. p. 19.
3. Katakai, S. K. (1984). *Lady's slipper Orchids of India*. Botanical Survey of India, Howrah.
4. King, G. & Pantling, R. (1898). Orchids of Sikkim Himalayas. *Ann. Roy. Bot. Gard., Calcutta* 8:342. t. 448.
5. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1:35.
6. Rao, A. S. (1979). *Orchids of India*. p. 34. New Delhi.
7. Seidenfaden, G. & Arora, C. M. (1982). An enumeration of the orchids of Northwestern Himalaya. *Nord. Journ. Bot.* 2:12.

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



Cyripedium himalaicum Rolfe

STATUS: Endangered. This plant has been collected after a lapse of seven decades from Garhwal Himalaya, after its original discovery in Sikkim.

DISTRIBUTION: Sikkim (Lachen Valley), Uttar Pradesh (Garhwal), in the alt. of ca 4,000 m. Endemic to the Himalayas.

HABITAT AND ECOLOGY: In sub-alpine to alpine Himalayas.

CONSERVATION MEASURES TAKEN: The recent declaration of Valley of Flowers as a National Park now offers protection to some of the habitats of the species.

CONSERVATION MEASURES PROPOSED: Cultivation in the National Orchidaria, multiplication by tissue culture method and subsequent reintroduction in its natural habitats.

BIOLOGY AND POTENTIAL VALUE: An interesting monotypic orchid of botanical interest. Flowers in July.

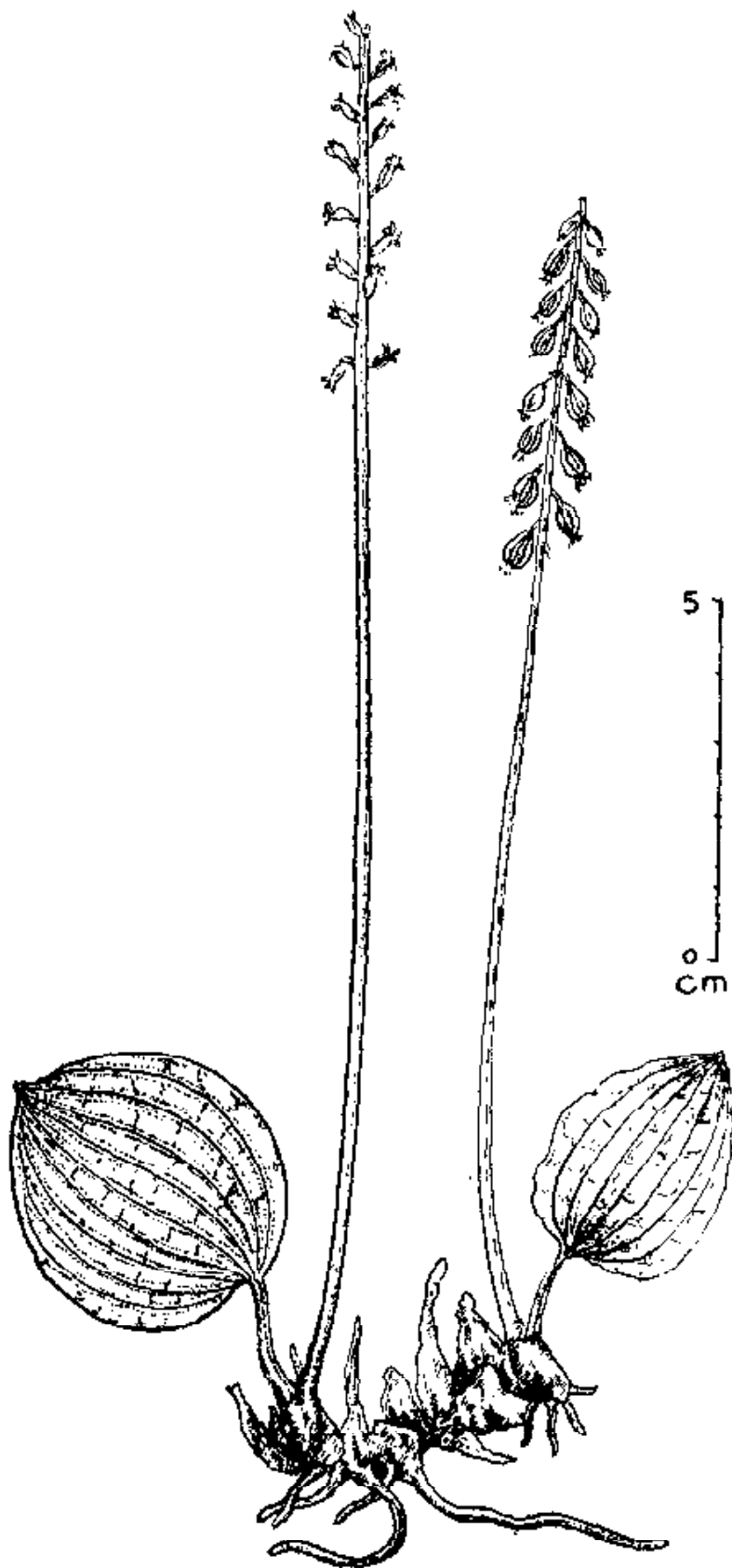
CULTIVATION: Not known.

DESCRIPTION: Pseudobulbs ca 1.0 cm long, with a solitary leaf, leaf ca 4.0 × 2.5 cm, broadly ovate, petiole 1.5 cm long, channelled. Inflorescence erect, 12-22 cm long. Flowers ca 2 mm long; sepals and petals oblong, blunt, spur very short, pointed. Column half as long as the sepals and lip, wingless. Anther terminal, 2-celled, convex, rather broad. Pollinia 4, free, waxy, and without appendages, unequal in size, obovoid.

REFERENCES:

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art Report.* BSI & MAB., New Delhi.
2. Kataki, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-eastern India.* POSSCEF, Botanical Survey of India, Howrah. p. 48.
3. King, G. & Pantling, R. (1898). The orchids of Sikkim Himalayas. *Ann. Roy. Bot. Gard. Calcutta* 8:38. t. 50.
4. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 437.
5. Rau, M. A. & Bhattacharyya, U. C. (1966). *Bull. Bot. Surv. India* 8: 94. t. 1-7.
6. Seidenfaden, G. & Arora, C. M. (1983). An enumeration of orchids of Northwestern Himalaya. *Nord. Journ. Bot.* 2: 14.

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



Didickea cunninghamii King et Prain ex King et Pantl.

STATUS: Vulnerable. This species is known only from a few scattered populations; the known natural habitats being near the road sides, the plants are vulnerable and likely to disappear soon due to landslides, and habitat encroachment.

DISTRIBUTION: Himalaya: Uttar Pradesh (Kumaon), West Bengal (Darjeeling), Arunachal Pradesh (Kameng); Nepal, Bhutan.

HABITAT AND ECOLOGY: On moist rocks along with mosses and liver-worts in cool, shady places.

CONSERVATION MEASURES TAKEN: Its export has been banned under CITES as the family Orchidaceae is included in Appendix 2; this species has been included in the IUCN Plant Red Data Book.

CONSERVATION MEASURES PROPOSED: Multiplication of plants by tissue culture method, and reintroduction of the plants in similar type of habitats in its distribution range.

BIOLOGY AND POTENTIAL VALUE: A delicate plant with white flowers and is of horticultural value and botanical interest.

CULTIVATION: Reported to be cultivated in some private orchid nurseries.

DESCRIPTION: Terrestrial, small herbs with globose underground tubers. Leaves solitary, radical, pendulous, 5.5-8.5 × 1.0-3.0 cm, acute at apex, cordate at base with stiff hairs. Flowers white, usually solitary, ca 2.5 cm across; floral bracts pubescent, ovate, acute; sepals ovate-oblong; petals orbicular, reniform; lip broad, emarginate, spur ca 4.5 cm long, slender. Column short.

REFERENCES:

1. King, G. & Pantling, R. (1898). The Orchids of the Sikkim Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 8:337, t. 443.
2. Pradhan, U. C. (1974). *Diplomeris hirsuta* (Lindl.) Lindl. A survey. *Am. Orch. Soc. Bull.* 43(6): 525-528.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 1:43.
4. Rau, M. A. & Arora, C. M. (1972). On the Occurrence of *Diplomeris hirsuta* Lindl. (Orchidaceae) in Western Himalaya. *Bull. Bot. Surv. India* 15:138-139.

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

STATUS: Vulnerable. It was earlier recorded from two localities, i.e., Cherrapunjee (Khasi Hills), Balphagram R. F. (Garo Hills) in Meghalaya. But recent surveys in these localities failed to find it. On the other hand, it is recently recorded from Namdapha Reserve Forest in Tirap District of Arunachal Pradesh, where a small population of about 100 individuals has been seen. There is every possibility that the area may be disturbed and the species may be reduced further.

DISTRIBUTION: Cherrapunjee in Khasi Hills, Balphagram in Garo Hills, of Meghalaya and Tirap District of Arunachal Pradesh.

HABITAT AND ECOLOGY: It grows on moist moss covered rocks or on old tree stumps covered with moss near water sources which ensure humidity.

CONSERVATION MEASURES TAKEN: The areas, i.e., Balphagram in Garo Hills and Namdapha in Tirap District are now Wild Life sanctuaries; all the species of Orchidaceae are included in the Appendix 2 of the 1973 Convention on International Trade in Endangered species of Fauna and Flora (CITES). The IUCN Plant Red Data Book includes *D.hirsuta* from India.

CONSERVATION MEASURES PROPOSED: It is proposed that the plants be brought under cultivation in similar protected places and also to discourage people from collecting this species.

BIOLOGY AND POTENTIAL VALUE: A beautiful white-flowered species of botanical interest and restricted occurrence. Flowers during August-September.

CULTIVATION: Not known in cultivation.

DESCRIPTION: Terrestrial herbs. Roots tuberous. Stems slender. Leaves 1 or 2, linear or linear-lanceolate. Scape arising from middle of the leaves, 1-2-flowered. Flowers large, white with a long spur.

REFERENCES:

1. Hooker, J. D. (1890). *Fl. Brit. India* 6:167.
2. Katak, S. K., Jain, S. K., & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-eastern India*. POSSCEF, B.S.I., Howrah. p. 49, t. 38.

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

STATUS: Rare. Known only from its type locality.

DISTRIBUTION: Endemic to Kumaon in Uttar Pradesh, at ca 1550 m altitude.

HABITAT AND ECOLOGY: Epiphytic, in *Quercus* forests

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Its distribution area should be declared as an orchid sanctuary, and the species should be introduced into the National Orchidaria

BIOLOGY AND POTENTIAL VALUE: A species of botanical and distributional interest. Flowers from July-August.

DESCRIPTION: Epiphytes, pseudobulbs clustered, narrow-conical, 3-4 cm long, surrounded by large sheaths when young, each 2-6 leaved. Leaves 8-10 cm long, 10-12 mm broad at middle. Inflorescence erect, sub-terminal, from young pseudobulbs, often 2 together, scape about 2.5 cm long, rachis ca 3.0 cm, thinly stellate hairy, 7-10-flowered. Floral bracts ca 5 mm long, pedicels ca 5 mm long. Sepals and petals ca 4 mm long

REFERENCE:

1. Seidenfaden, G. In: Seidenfaden, G. & Arora, C. M. (1982) An enumeration of orchids of the North Western Himalaya. *Nord. Journ. Bot.* 2: 15

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

STATUS: Rare; loss of habitats is the main causative factor for its decline in nature.

DISTRIBUTION: Uttar Pradesh, Madhya Pradesh.

HABITAT AND ECOLOGY: In shady places of forest floors.

CONSERVATION MEASURES TAKEN: None so far. All species of Orchidaceae are included in the Appendix 2 of the CITES.

CONSERVATION MEASURES PROPOSED: Attempts should be made to locate the species; its distribution range and habitats should be preserved, and plants be multiplied by tissue culture.

BIOLOGY AND POTENTIAL VALUE: Flowers reddish-brown, could be of horticultural interest; flowers in July.

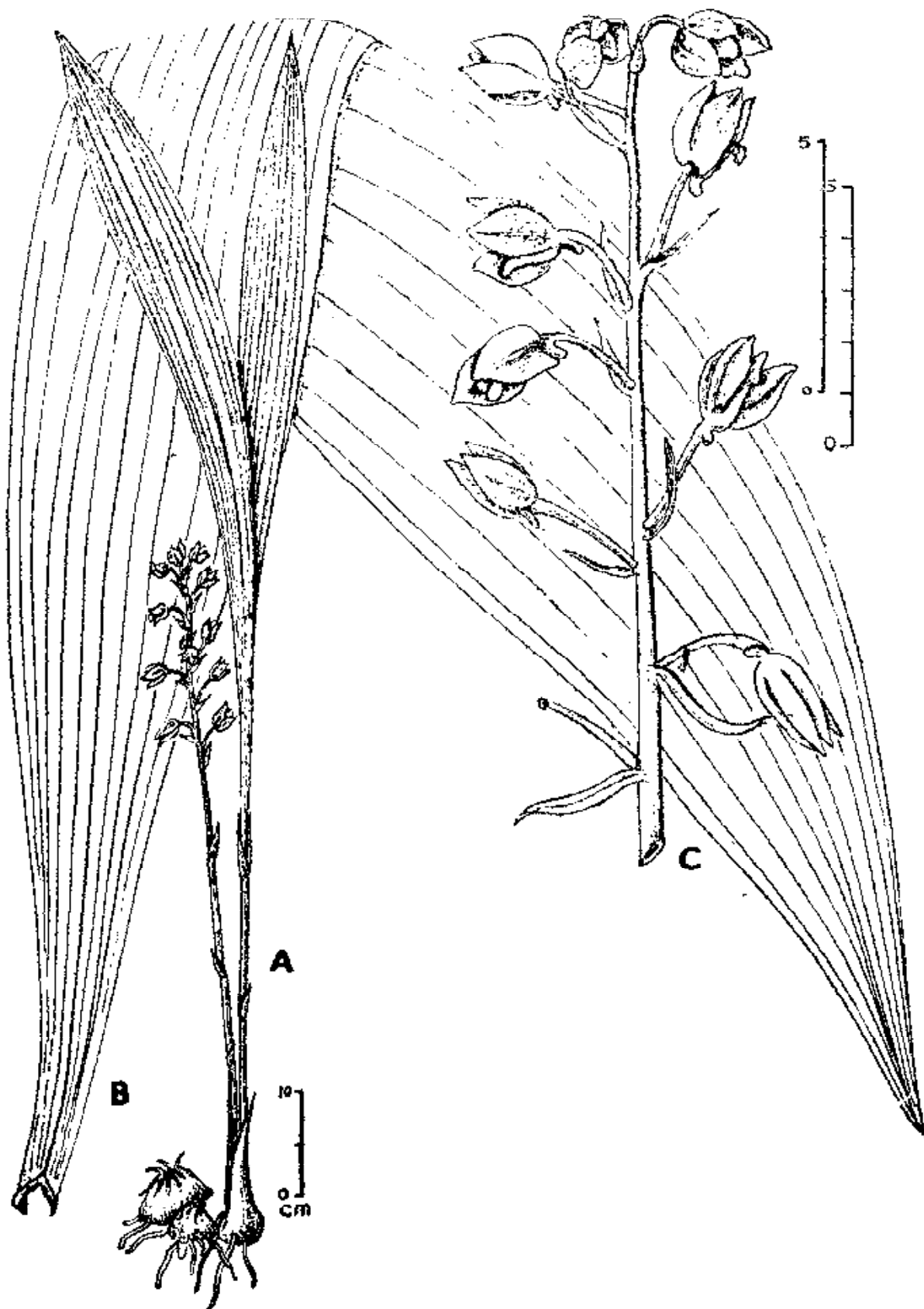
CULTIVATION: Not known.

DESCRIPTION: Plants terrestrial. Rhizomes flattened, triangular-shaped. Pseudo-stem ca 20 cm long. Leaves usually two, appearing with the flowers, 70-80 cm long. Scape shorter than leaves; dorsal sepals yellowish, ovate, 9 veined; petals shorter than sepals; lip 3-lobed with 5-7 parallel purple coloured ridges, and a short geniculate spur; column broadly winged.

REFERENCES:

1. Duthie, J. F. (1906). The Orchids of North Western Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 9(2): 120. t. 107.
2. Duthie, J. F. (1920). *Fl. Upper Gangetic Plains* 3: 197.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 451.
4. Raizada, M. B., et al. (1981). *Orchids of Mussoorie*, Dehra Dun. p. 34.
5. Raizada, M. B. (1959). *Ind. For.* 85(11): 684.

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



Eulophia mackinnonii Duthie A. Habit. B. Leaf. C. Flowering scape (after Duthie)

STATUS: Endangered. The species is known from a few scattered populations in its distribution range.

DISTRIBUTION: Kumaon, Uttar Pradesh. Endemic.

HABITAT AND ECOLOGY: Usually epiphytic on *Englehardtia spicata*, in forests.

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: The Gouri River valley in Pithoragarh district, Uttar Pradesh should be declared as an orchid sanctuary as the locality is rich in orchids and is very near to human settlements. Lopping and felling of the trees should be totally banned in these forests.

BIOLOGY AND POTENTIAL VALUE: The species is of distributional importance due to its endemism and rarity. Flowers during August-September.

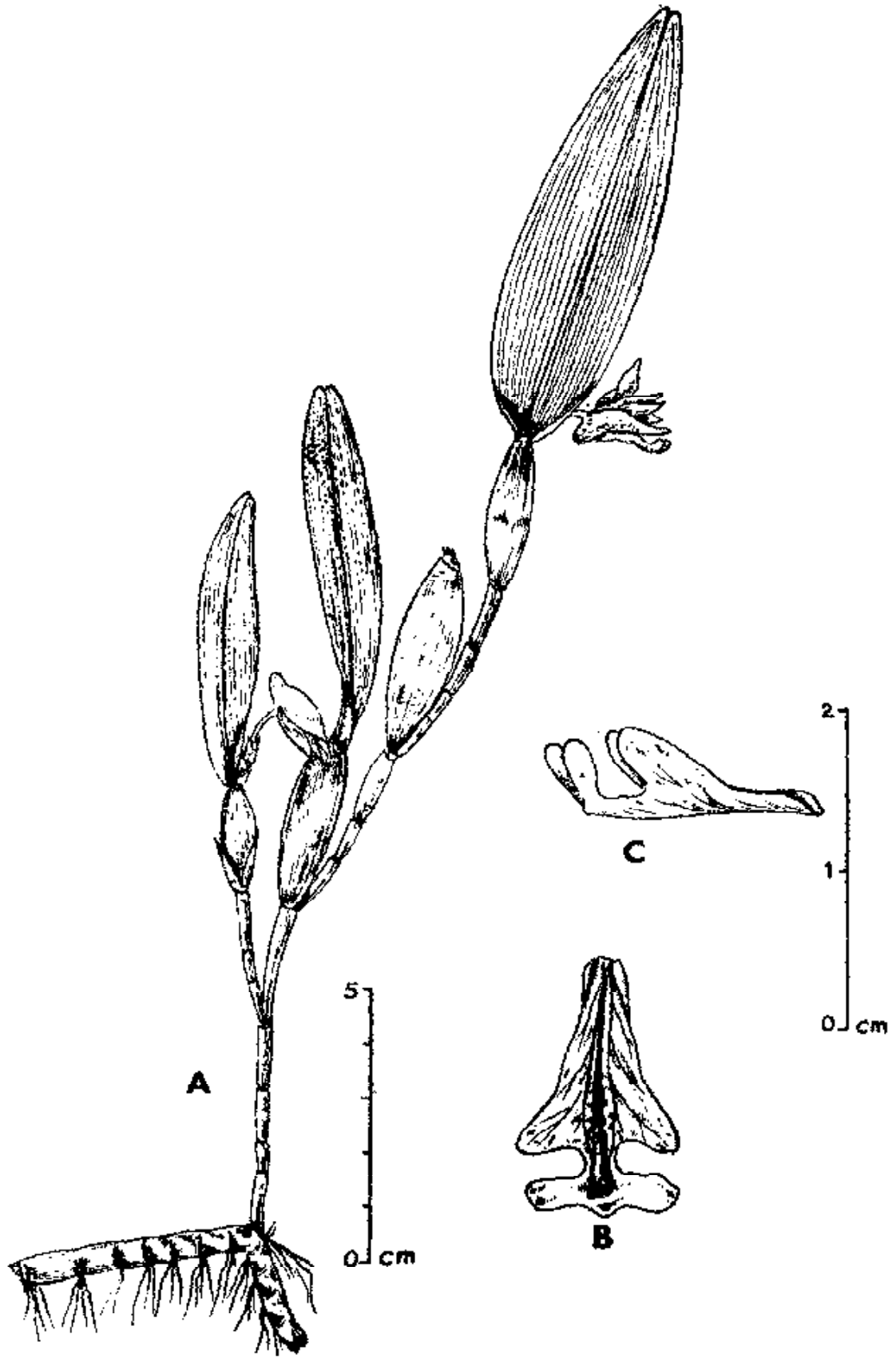
CULTIVATION: The plant is recently brought under cultivation into the Orchid House of the Botanical Survey of India, Dehra Dun.

DESCRIPTION: Epiphytes, stems 30-60 cm high. Pseudobulbs 2.5-4.0 cm long. Leaves 8-11 × 1.5-2.0 cm, minutely bilobulate at apex. Inflorescence one-flowered. Flowers small; dorsal sepal ca 1.0 cm long; lateral sepals oblique, triangular; petals linear-lanceolate; midlobe of lip narrow, transversely elliptical on a short neck.

REFERENCE:

1. Scidenfaden, G. In: Scidenfaden, G. & Arora, C. M. (1972): An enumeration of orchids of the North Western Himalaya. *Nord. Jour. Bot.* 2:15.

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



Flickingeria hesperis Seid. A. Habit. B. & C. Front and lateral view of lip.

STATUS: Rare (1, & 7). Only very few plants of this species could be seen in the wild.

DISTRIBUTION: Peninsular India; endemic to the Southern Western Ghats. Reported from two distant localities in Idukki District, Kerala and in the Nilgiris, Tamil Nadu.

HABITAT AND ECOLOGY: In open grasslands on wet rocky areas in the alt. range of 1500 to 2000 m. It is rather difficult to recognise the species in the field primarily due to its very small size (generally will not grow above the level of the grasses among which it occurs) and due to the small unattractive greenish-yellow flowers. The plants start flowering by the end of July and will bear flowers upto September.

CONSERVATION MEASURES TAKEN: None so far; however the Nilgiri region is recently declared as a Biosphere Reserve, by which protection of this species in this locality is anticipated.

CONSERVATION MEASURES PROPOSED: (a) To implement protection measures in the Nilgiris so that a large number of such rare and threatened plant (as well as animal) species of this region could be protected. (b) For Idukki District, it is suggested to locate its populations and to urge the local authorities to protect the area from biological interference such as grazing, cutting of grasses for fodder, etc.

BIOLOGY AND POTENTIAL VALUE: Habenarias are typical terrestrial orchids having underground tubers. The genus is represented by about 30 species in South India of which 21 are endemic to the region (2). The allied species, *Habenaria heyneana* Lindl., differs from *H. barnesii* mainly by the white flower colour and the clawed lip.

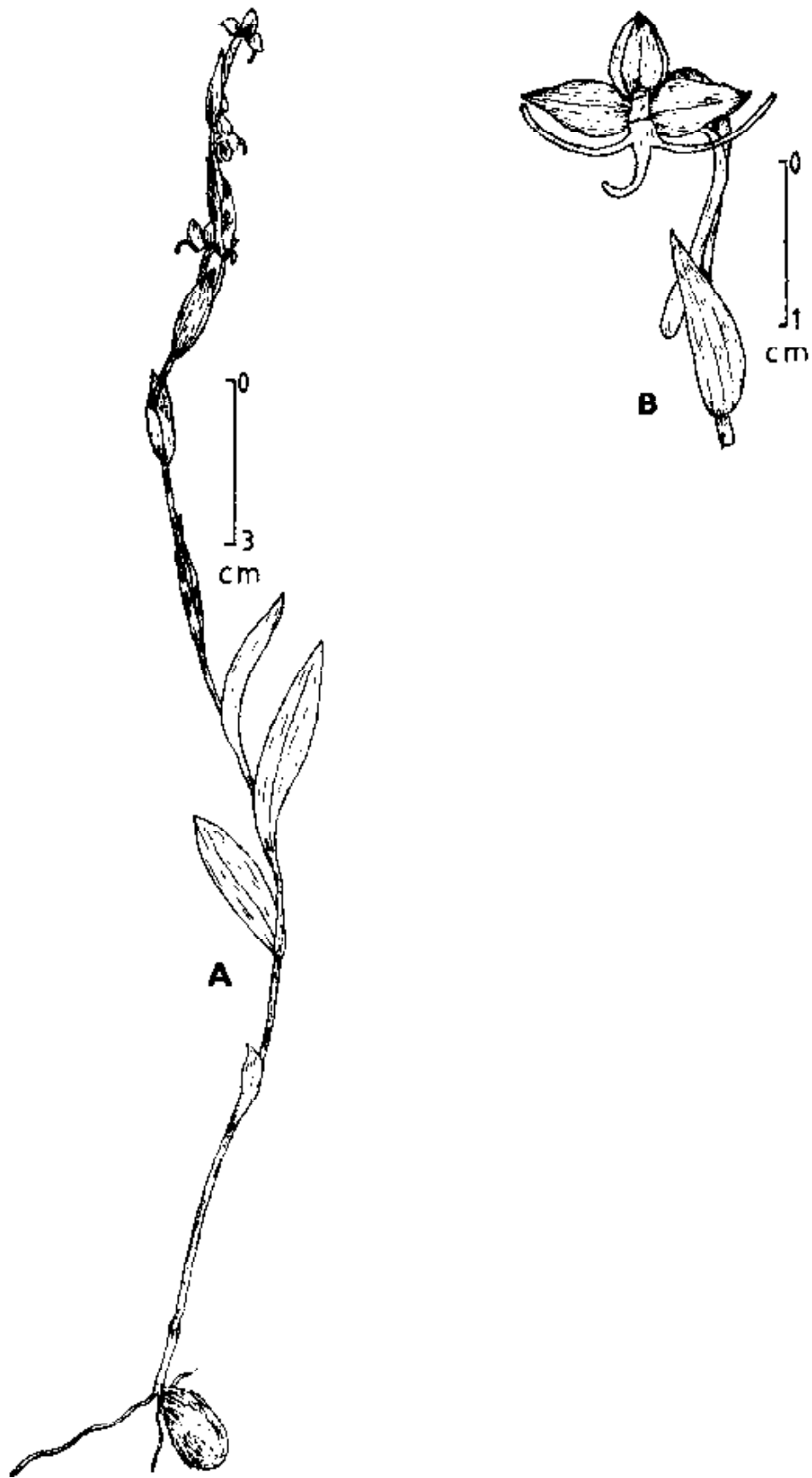
CULTIVATION: It is not known in cultivation.

DESCRIPTION: Slender tuberous herbs, 10-20 cm tall. Leaves 2 or 3, scattered from the middle. lanceolate-oblong, acute, 3.5-6 × 1-3 cm. Flowers 1-3 in racemes, ca 2 cm across, greenish-yellow. Dorsal sepal ovate, united with the falcately lanceolate petals to form a hood; lateral sepals obliquely lanceolate, acute, longer than the dorsal sepal, spreading, 2-nerved. Lip trilobed upto the base; lobes linear, ca 1 mm broad; spur ca 1.5 cm long, shorter than the ovary and pedicel.

REFERENCES:

1. Abraham, A. & Vatsala, P. (1981). Introduction to Orchids with illustrations and description of 150 South Indian Orchids. p. 236. t. 33.
2. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. Botanical Survey of India Howrah. pp. 68-76.
3. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22: 63. t. 45.
4. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1:82.
5. Summerhayes, V. S. (1936). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras*, Part 11, p. 1887.
6. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.). *Materials for a Catalogue of Threatened Plants of India*. POSSCEF, Botanical Survey of India, Howrah. p. 36.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.



Habenaria barnesii Summerh. A. Habit. B. Flower with bract.

STATUS: Endangered. It was believed to be extinct until 1979 when botanists could relocate a small population of it along the banks of Kunthipuzha in Silent Valley (2, 4). The collections of *N. C. Nair* 64275 (deposited in MH) and *Satish Kumar* 10836 (deposited in CALI) are the only herbarium specimens available in Indian Herbaria.

DISTRIBUTION: Southern Peninsular India; endemic to 'Malabar region' of Kerala State (1, 2 and 4-6). It was first collected by Jerdon in 1852 and remained untraced till Manilal and Satish Kumar (4) reported its find in Silent Valley, Palghat District—a part of Malabar, in 1983.

HABITAT AND ECOLOGY: Confined to the grasslands along the moist rocky slopes of the river banks in the altitudes of 800 to 1000 m. During the vegetative phase it is difficult to recognise the plants in the field due to grass-like appearance. Flowers from October to December.

CONSERVATION MEASURES TAKEN: Silent Valley is very recently declared as a National Sanctuary imposing restrictions on further destruction of wild flora and fauna of the area. Complete protection to this vulnerable taxon is believed to be not yet assured.

CONSERVATION MEASURES PROPOSED: (a) Absolute conservation of Silent Valley area which is the habitat of many such rare, endangered/ interesting taxa of both flora and fauna, (b) to ban collection of the species from the wild. (c) to engage some authorised institutions to gather the seeds from the field and to grow them in laboratories and to reintroduce them in similar habitats in the region to enrich its meagre population.

BIOLOGY AND POTENTIAL VALUE: A very striking genus of the family Orchidaceae, popularly known as the 'Daffodil orchid'. When in flower, it presents an eye-catching aspect with its bright daffodil-yellow flowers amidst the grasses. The genus is represented by only two species of which *Ipeea speciosa* Lindl., is endemic to Sri Lanka (3) and *I. malabarica* (Reichb. f.) Hooker to Peninsular India. *I. malabarica* can be differentiated from the former by the middle lobe of the lip with emarginate-denticulate margins and 5-6 serrated lamellae.

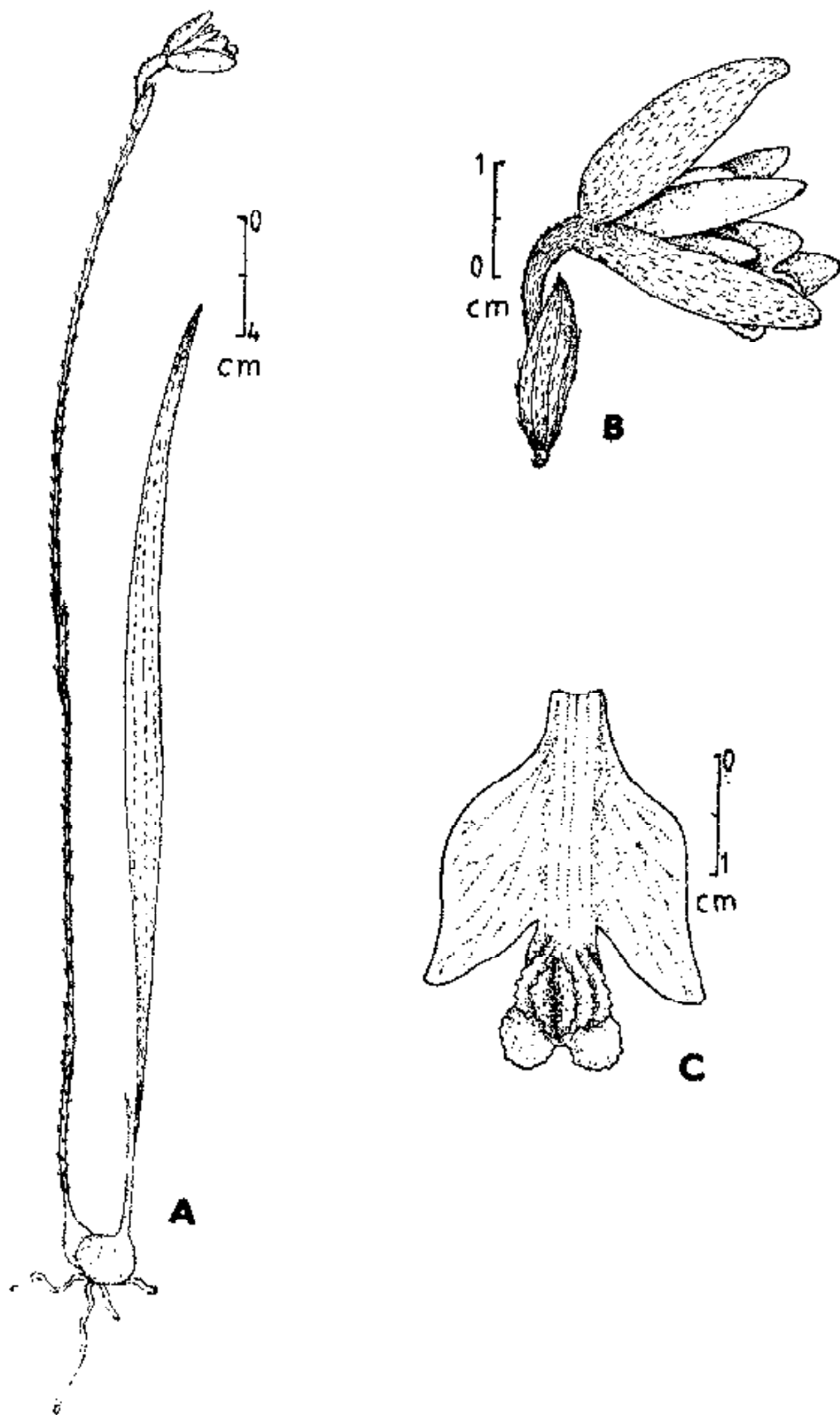
CULTIVATION: It is not known in cultivation.

DESCRIPTION: Terrestrial tuberous herbs. Tubers depressed, 1-1.5 cm in diameter. Leaves 1 or 2, linear-lanceolate, tapering at apex, 10-45 × 0.4-1.5 cm, prominently 3-ribbed. Scape 18-34 cm long, puberulous, with 2-4 sheaths. Flowers solitary or rarely two, 2.5-3.5 cm across, gloden-yellow. Dorsal sepal oblong, 2.5-3 × 1-1.3 cm, puberulous outside, 7-nerved; lateral sepals ovate-oblong, 3-3.5 × 0.9-1.2 cm, 7-nerved, adnate at base to the foot of the column. Petals oblong-lanceolate, 2.8-3.5 × 1-1.3 cm, 7-nerved. Lip oblong in outline, 3-3.3 × 2.5-2.7 cm, 3-lobed; lateral lobes ovate-lanceolate, subacute at apex, puberulous outside; midlobe obovate, emarginate, denticulate along margins; disc with 5-6 serrated lamellae. Column ca 1.5 cm long, pubescent; foot ca 7 mm long. Pollinia 8, in two pairs of 4 each, waxy. Ovary puberulous.

REFERENCES:

1. Hooker, J. D. (1890). *Fl. Brit. India* 5: 812-813.
2. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. Botanical Survey of India, Howrah. p. 120. (as *Spathoglottis malabarica*).
3. Jayaweera, D. M. A. (1981). In: Dassanayake, M. D. & Fosberg, F. R. (ed.) *A Revised Handbook to the Flora of Ceylon* 2: 150-152. (for *Ipsea speciosa*)
4. Manilal, K. S. & Satish Kumar, C. (1983). Rediscovery of *Ipsea malabarica* (Reichb. f.) Hooker, f., an endemic orchid species from Silent Valley, Kerala. *Bull. Pure Appl. Sci.* 2C: 38-41.
5. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 702. (as *Spathoglottis malabarica*).
6. Reichenbach, H. G. (1861). In: Walpers, W. G., *Annales Bot. Syst.* 6: 462. (as *Pachystoma malabaricum*).

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.



Ipsea malabarica (Reichb. f.) Hook. f. A. Habit. B. Flower. C. Lip.

STATUS: Vulnerable; endemic to Nilgiris (3 & 5). It has been collected from Nilgiris in 1972 and there are no previous or subsequent collections in MH.

DISTRIBUTION: Tamil Nadu, Nilgiris: Kollimund (4).

HABITAT AND ECOLOGY: A small, pseudobulbous herb in grassy slopes at an altitude of ca 2225 and also nesting among moss on the branches of trees. (6). The area is often blanketed in thick fog and receives heavy rainfall.

CONSERVATION MEASURES TAKEN: *Ex situ* conservation is being tried in the National Orchidarium, Botanical Survey of India, Southern Circle, at Yercaud, Tamil Nadu. Its natural habitat is included in the Nilgiri Biosphere Reserve which ensures safety of habitat from further degradation.

CONSERVATION MEASURES PROPOSED: Clonal multiplication of the species through tissue culture and reintroduction to suitable habitats in the region are suggested.

BIOLOGY AND POTENTIAL VALUE: The habit of the species is both epiphytic (6) and terrestrial (4). It is found in the relict Shola vegetation and therefore of great scientific interest. This species is closely allied to *Liparis atropurpurea* Lindl., which has wider distribution and differs from it in having dark purple flowers and bilobed lip. Often the entire plant is purple (1) and is of horticultural importance. Flowers: July-August.

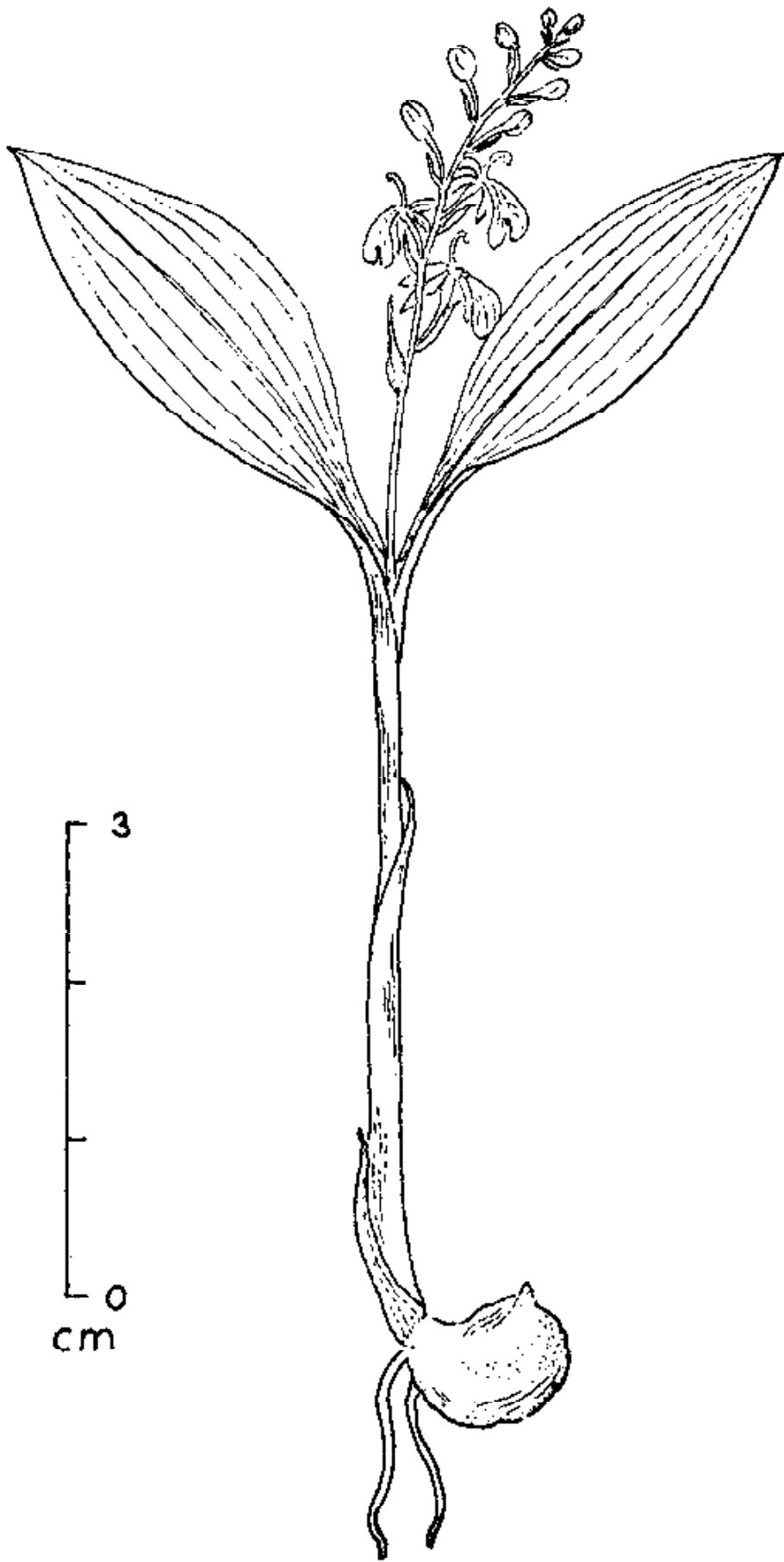
CULTIVATION: Plants collected from Kollimund are being cultivated in the National Orchidarium, Botanical Survey of India at Yercaud (ca 1360 m).

DESCRIPTION: Small pseudobulbous herbs. Fresh shoots lateral from the old pseudobulb, 7.0-9.5 cm tall with inflorescence. Leaves membranous, 3.0 - 4.7 x 0.5 - 1.3 cm, ovate-elliptic, narrowed into a long sheathing petiole, acute, margin closely and obscurely wavy. Racemes terminal, 3-5 cm long. Flowers purple, few, more or less dense. Dorsal sepal oblong-lanceolate, obtuse, 3-nerved, lateral sepals similar to dorsal, a little shorter. Lateral petals linear, obtuse. Lip conspicuous, spreading, ca 3.5 mm long, 2.5 mm broad towards the distal end, shortly clawed at base with 2 calli on the dorsal side, distal margin obscurely crenulate (2).

REFERENCES:

1. Fischer, C.E.C. (1928). In: Gamble J. S., & Fisher, C.E.C., *Fl. Pres. Madras*, p. 1410.
2. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22: 43.
3. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 223.
4. Shetty, B. V. & Vivekananthan, K. (1981). Endemic, primitive, temperate elements and the relict vegetation of Kundah Range, Nilgiris, Tamil Nadu. *Bull. Bot. Surv. India* 23: 259.
5. Vajravelu, E. & Daniel, P. (1983). In: Jain, S. K. & Sastry A. R. K. (ed.) *Materials for a Catalogue of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 37.
6. Wight, R. (1851). *Icon. Pl. Ind. Orient.* t. 1933.

The material for this sheet was supplied by A. V. N. Rao and V. Chitra, Botanical Survey of India, Coimbatore.



Liparis biloba Wt.

STATUS: Endangered. Rarity due to restricted distribution, limited number of individuals in populations and deforestation for timber extraction and rehabilitation purposes.

DISTRIBUTION: Appears to be Endemic to Andaman Islands. Only twice collected from Hutbay in Little Andaman Island and Miletilak in South Andamans.

HABITAT AND ECOLOGY: Epiphytic in dense inland evergreen and littoral forests. Prefers hot humid climate with diffused sunlight.

CONSERVATION MEASURES TAKEN: No specific measures taken. All orchids are included in Appendix 2 of the Convention on International Trade in Endangered Species of Fauna and Flora and hence its export from India is banned.

CONSERVATION MEASURES PROPOSED: The species should be located again in wild and brought under cultivation. Their habitat requirements should be studied and various cultivation and propagation methods should be tried in order to multiply them in cultivation and reintroduce in natural habitats. Preserving natural habitats as Biosphere Reserve should also be taken up.

BIOLOGY AND POTENTIAL VALUE: A botanically interesting species bridging the distribution of the genus between Peninsular India-Sri Lanka in the west and Thailand-Malesia in the east. Flowers in July-August, each flower lasting several days. Useful for cultivation in gardens and for hybridisation purposes.

CULTIVATION: Can be grown on tree trunks or charcoal mixed with bricks and humus medium in hot humid environment in partial shade.

DESCRIPTION: Epiphytic, 6-10 cm long; leaves narrowly lanceolate; inflorescence perforating leaf sheaths; rachis 2.5-7.5 cm long, densely 10-30-flowered; flowers 8-9 mm across, white or creamy white with crimson stripes on sepals and petals; lip spurred, immovably jointed to the base of column, tinged with purple; midlobe porrect, triangular, subulate; spur cylindrical, widened towards mouth, fleshy, ca 2 mm long, ca 1 mm broad at base.

REFERENCE:

1. Balakrishnan, N. P. & Bhargava, N. (1979). *Malleola andamanica* Balakr. & Bhargava (Orchidaceae)—A new species from Andaman Islands. *Proc. Indian Acad. Sci. (Plant Sci.)* 88B (Pt. II): 317-319, ff. 1-12.

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

STATUS: Endangered or Possibly Extinct in the wild; over collection of the natural populations and degradation of its habitats are the prime causative factors for decline of the species. The species was originally collected by Col. Drury in 1865 from Travancore hills and later collected by R. H. Beddome from Kalakkad hills in 1875(1). Recent attempts to locate the species in its habitats have not been fruitful (5).

DISTRIBUTION: Travancore and Kalakkad hills in South-Western Ghats in Kerala. In the subsequent years, the species has been collected only from Kalakkad hills. Endemic to very limited areas.

HABITAT AND ECOLOGY: In sunny forest floors amidst grasses, sedges, etc., and is often found in close association with *Aerides maculosum* Lindl; sometimes reported to be epiphytic on *Enphorbia* sp. The soil is hard limey.

CONSERVATION MEASURES TAKEN: None for the habitats and populations, if existing. The family Orchidaceae is included in the Appendix-2 of CITES and is listed in the threatened plants lists of the Botanical Survey of India (3) and is included in the IUCN Plant Red Data Book (5).

CONSERVATION MEASURES PROPOSED: Intensive field survey should be undertaken in its natural habitats and likely areas in the hill ranges to locate the plants that may still be surviving; to declare its habitats as protected sanctuaries; to attempt for germination and multiplication through seeds and tissue culture methods, and to attempt reintroduction of its plants from nurseries/conservatories into its natural habitats.

BIOLOGY AND POTENTIAL VALUE: A very much sought of member of the genus *Paphiopedilum* in horticulture for its attractive flowers. This is the only member of the genus found in the south, others being Eastern Himalayan and N. E. Indian in distribution (4). It is characteristic in its long creeping rhizomes. Flowers in March-April.

CULTIVATION: It is known to be in cultivation in some botanical gardens/private orchid nurseries round the world. In India about a dozen plants are reportedly grown in some private orchid nurseries (6). One plant is being cultivated in the National Orchidarium of the Botanical Survey of India at Yercaud.

DESCRIPTION: Perennial herbs, rhizomes upto 1m long, stout, producing 5 - 6 shoots, stems purplish, upto 30 cm long; leaves strap shaped, 20 - 30 x 3 - 5 cm, glossy green. Flowers solitary, ca 7.5 cm across, yellow-green to golden yellow, with purple stripes; upper sepal broadly ovate with a broad median band, and hairy margins; later sepals fused to the apex, pointing downwards, yellow with brown streaks; lateral petals spreading or slightly drooping, with maroon median lines; lip slipper like, 3.5 - 4.5 cm long, bright yellow, finely reddish-purple spotted.

REFERENCES:

1. Beddome, R. H. (1869-74). *Jc. Pl. Ind. Orient.* 1: 23 t. 112. (as *Cypripedium druryi*)
2. Cribb, P. J. (1978). *Paphiopedilum duryi*. *Curtis Bot. Mag.*, p. 182, t. 764.
3. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of the-Art Report*. BSI & MAB, New Delhi. p. 28.
4. Katakai, S. K. (1984). *Lady's Slipper Orchids of India*. POSSCEF, Botanical Survey of India, Howrah. p. 15, t. 6.
5. Pradhan, U. C. (1978).. *Paphiopedilum druryi* (Bedd.) Stein, In: Lucas, G. & Synge, H. (ed.) *The Plant Red Data Book*. IUCN, Morges. p. 377-378.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Endangered. Lindley described the species (as *Cypripedium fairieanum*) from a cultivated plant put on exhibition before the Horticultural Society in 1857 by R. Fairrie of Liverpool. Thereafter the species and its place of origin remained unknown for over 50 years and finally a tempting offer of £1000 by Frederick Sander led to its rediscovery by G. C. Searight, from Torsa or Amuchu Valley, Chumbi district in Western Bhutan. An excellent account on the history, correct spelling of the species epithet, ecology, distribution and taxonomy of the species together with a beautiful colour plate has been published by P. Cribb (1). The species has been collected from steep cliffs at 1530 m above the Rangit River in Sikkim by U.C. Pradhan in the year 1963. Overcollection of its natural populations, forest fires and grazing have led to the decline of the species in its natural habitats.

DISTRIBUTION: Endemic to the Eastern Himalayas and is restricted to small pockets in Sikkim, Bhutan and Arunachal Pradesh.

HABITAT AND ECOLOGY: It is reported to grow on crystalline limestone outcrops in sheltered grassy slopes, on moss-covered boulders in oak forest floors and on gneiss ledges amongst grasses in open well-drained gravelly areas near streams and rivers in the altitudes: 1400-2200 m. The area receives high rainfall during monsoon and is dry and cool for the rest of the year (1).

CONSERVATION MEASURES TAKEN: None for the wild plants; the family Orchidaceae is included in Appendix 2 of the CITES which restricts its export; it is also included in the threatened plants publications of the Botanical Survey of India (2 & 3).

CONSERVATION MEASURES PROPOSED: Protection of its natural populations and habitats; *ex situ* conservation, multiplication and reintroduction of plants into original habitats are suggested.

BIOLOGY AND POTENTIAL VALUE: A very elegant Lady's slipper orchid much valued in horticulture. It flowers during Oct.-January and the flowers have lasting quality. Some varieties and a natural hybrid (*P. × pradhanii*) have been reported (4). It is popularly called the 'Asian Lady's Slipper Orchid' and the 'Lost Orchid'.

CULTIVATION: It is being cultivated in several orchidaria and botanic gardens of the world and in some private nurseries. Some plants of this are in cultivation in the National Orchidaria of the Botanical Survey of India at Shillong and Yercaud.

DESCRIPTION: Terrestrial clump forming herbs. Leaves 4-8, linear-ligulate, apex obtuse or rounded, 9-25 × 2.5-3.5 cm, dark green above, paler beneath. Peduncles erect, upto 40 cm long, slender, hairy, usually 1-flowered; bracts elliptic obtuse, 1-4 × 1 cm, whitish, purple-pubescent. Flowers attractive, 6-8 cm across; sepals white, green and purple veined; dorsal sepal elliptic, obtuse, 3.5-8 × 3-7 cm, ciliate, margins wavy; petals reflexed-decurved, narrowly oblong, acute, 4-5 × 1-1.5 cm, margins ciliate, wavy; lip slipper-shaped, shortly apiculate, 2-4 × 1.4-2.5 cm; staminode elliptic, 3-dentate at apex, ca 9 × 7 mm.

REFERENCES:

1. Cribb, P. (1985). *Paphiopedilum fairrieanum*. *Kew Bull.* 2(4): 351-354. t. 47.
2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art Report*. Botanical Survey of India & MAB Committee, New Delhi. p. 63.
3. Katak, S. K. (1984). *Lady's Slipper Orchids of India*. POSSCEF, Botanical Survey of India. p. 18.
4. Pradhan, U. C. (1979). *Indian Orchids : Guide to Identification and Culture* 2:674.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Vulnerable. The species occurs sporadically in Meghalaya in N.E. India. It was first discovered by Wallich in 1819 in Sylhet, Bangladesh. Later, Griffith collected it in Khasi Hills, Meghalaya. The species was once reported to be fairly common but has now become very rare due to large scale collections of its natural populations and destruction of its distribution localities.

DISTRIBUTION: In India the species occurs only in the Khasi Hills, Meghalaya. Also reported from Sylhet (Bangladesh) and Nepal.

HABITAT AND ECOLOGY: Grows along open hilly slopes and in rock crevices in open forest floors. Its distribution areas receive high or moderately high annual rainfall. The soils are rich in humus and are well drained.

CONSERVATION MEASURES TAKEN: None for its natural habitats; the family Orchidaceae is included in the Appendix 2 of the CITES. A few plants are being reared in the National Orchidaria of the Botanical Survey of India at Shillong and Yercaud.

CONSERVATION MEASURES PROPOSED: Immediate steps to declare its distribution localities in India (also in Nepal and Bangladesh) as protected sanctuaries be taken up; its plants be multiplied through seed germination and meristem culture in the Orchidaria and reintroduced into its natural habitats; complete ban on collection of its natural populations be enforced.

BIOLOGY AND POTENTIAL VALUE: A very beautiful Slipper orchid of horticultural value. The flowers appear during October-December. Paphiopedilums have been in demand in horticulture and several hybrids have been developed.

CULTIVATION: The species is in cultivation in several orchidaria and in orchid nurseries all over the world. A few plants have been introduced into the National Orchidaria of the Botanical Survey of India at Shillong and Yercaud and are thriving well.

DESCRIPTION: Terrestrial clump forming herbs. Stems short. Leaves linear, ligulate, green, 10-25 cm long, ca 3 cm broad. Scapes slender, 10-15 cm long, purplish pubescent, 1-flowered, rarely 2-flowered. Bracts oblong, 3-4 cm long, light green, as long as the ovary. Flowers spreading, upto 12 cm across; dorsal sepal orbicular-ovate, ca 5 x 3.5 cm, white and undulate along the margins, irregularly brown-purple dotted in the centre; lateral sepals smaller, light greenish or purplish-white; petals linear-oblong, spreading, ca 5 mm long, yellowish-green or greenish-white with purple veins, margins undulate; lip slipper-like, ca 5 cm long, 3-lobed, yellowish-green with brownish shade or greenish-purple, shiny.

REFERENCES:

1. Katak, S. K. (1984). *Lady's Slipper Orchids of India*. POSSCEF, Botanical Survey of India, Howrah. p. 13, t. 4.
2. Katak, S. K., Jain, S. K., & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India*. POSSCEF, Botanical Survey of India, Howrah.
3. Katak, S. K. (1986). *Orchids of Meghalaya*. Govt. of Meghalaya, Shillong. p. 227.
4. King, G. & Pantling, R. (1898). *The Orchids of Sikkim Himalaya*. *Ann. Roy. Bot. Gard. Calcutta* 8.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Vulnerable. The fact that it occurs in isolated colonies in an area hardly covering 500 sq kms and exists nowhere else in the world, except in cultivation, makes the existence of this species in nature extremely precarious. In May, 1884, an astounding 40,000 plants of this species were sent by Fostermann to Frederick Sander who offered the plants for sale in Steven's Auction Room in London. The plants were obviously overcollected—may be the entire habitat was ransacked making its distribution in Bhutan a myth (1). Collecting for horticulture in the early sixties has also resulted in the depletion of the natural habitats to some extent, but has served to introduce this species into cultivation (4 and 6), thereby reducing the risk of losing this exceedingly important and beautiful species in the event of major natural catastrophes, like earthquakes and landslips, quite frequent in this area; should wipe out the natural population.

DISTRIBUTION: Reported to occur in Bhutan (1 & 9) but locality possibly overcollected and hence lost. It is endemic to the flanks of the Rivers Barak and Sonai near Silchar in the State of Manipur, at 750-1000 m. It is also reported from Lushai Hills (*W. L. Wenger, 224, K.!*) In Burma, it is reported from the hills west of Tang Hapre, ca 360 m (*J. Keenan, 3994, K.!*).

HABITAT AND ECOLOGY: Usually seen on calcareous limestone formations in shady situations in association with *Globba* sp. and ferns. The roots run on the surface of the rocks and also penetrate the substratum in places having humus, and where water has softened the substratum. In exposed places, the roots are covered by algae, and in such instances, often one can find seedlings growing along the roots. The area comes under heavy monsoon and receives torrential rains from July-September. From October-May, it derives moisture from mists arising from the rivers and pre-monsoon thundershowers. It grows on the limestone ledges with its leaves hanging down—most likely to drain off excess precipitation during the heavy monsoon period. It is pollinated in nature by hoverflies. (6 & 7).

CONSERVATION MEASURES TAKEN: None whatsoever for the natural habitat. All species of *Orchidaceae* are in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. It is in cultivation.

CONSERVATION MEASURES PROPOSED: (a) To declare the areas of its occurrence as protected places of scientific interest, and to restrict all human encroachment—specially *jhuming* in surrounding areas. It is also necessary to inculcate awareness among the armed forces and border security forces, so that its habitat may not be used for any kind of exercise. (b) To obtain all plants henceforth from seeds which are fairly easy to raise in the laboratory, or from divisions of the existing stocks. (c) Except for bonafide scientific research, no further collection should be allowed.

BIOLOGY AND POTENTIAL VALUE: An important parent of nearly all modern *Paphiopedilum* Hybrids, this species has great horticultural significance in the fact that it has contributed its hardness and bold dorsal sepal to most of hybrid *Paphiopedilums*. Its biology is not yet properly understood. Since some *Paphiopedilum* species like *P. villosm* (Lindl.) Pfitz., are known to contain alkaloids, this species too needs investigation. Flowers durig October-December.

CULTIVATION: Cultivated by hobbyists around the world as a favourite species among *Paphiopedilums*.

DESCRIPTION: A stemless species with straplike, leathery green leaves, appearing varnished on the upper side and dull greyish-green on the underside. Leaves 3-5, linear-lanceolate to linear-oblong, 15-30 cm x 2.5-4.5 cm, spotted purplish-red at the base, margins crenulate at base. Flowers are borne singly or rarely in twos, on slightly arched stems, 20-40 cm long; dorsal sepal orbicular-elliptic, 3.8 x 4.5 cm, pure white with yellowish-green base and a broad purple longitudinal median band, deflexed at the basal margins, pointed at the apex and curved forwards slightly to form a hood-like structure; petals green-spotted and flushed with purple and brown, margins crenulate. Lip 4.5 cm long, slipper shaped, brownish-green and shiny.

REFERENCES:

1. Fowlie, J. A. (1970). *Paphiopedilum spicerianum*—Lady Spicer's Slipper orchid. *Orchid Digest* 34(2):56-57.
2. Hooker, J. D. (1900). *Paphiopedilum spicerianum*. *Bot. Mag.* t. 6490.
3. Katak, S. K. (1984). *Lady's Slipper Orchids of India*. POSSCEF, Botanical Survey of India Howrah.
4. Katak, S. K., Jain, S. K. & Sastry, A. R. K. (1984) *Threatened and Endemic Orchids of Sikkim and North-Eastern India*. POSSCEF, Botanical Survey of India, Howrah, p. 71. t. 58.
5. Pfitzer, E. (1984). *Paphiopedilum spicerianum* (Reichb. f.) Pfitz. In : Engler's, *Bot. Jahrb.* 19:41.
6. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1:38.
7. Pradhan, U. C. (1976). Natural Hybrids of Indian Paphiopedilums. *Orchid Digest* 40(5): 185-190.
8. Riechenbach, H. G. (1980). *Cypripedium spicerianum*. *Gard. Chron.* 2:40, 363c.
9. van Delden, R. J. (1969). *Paphiopedilum spicerianum* (Reichb.f.) Pfitz., *Orchid Digest* 33(3):97.

The material for this sheet was supplied by U. C. Pradhan, Kalimpong.

STATUS: Vulnerable. It is fast depleting in the wild due to its habitat destruction and over-collection of plants.

DESCRIPTION: Meghalaya, Sikkim; Bangladesh.

HABITAT AND ECOLOGY: It grows in moist shady areas preferably near water sources. It is seen growing together with *Selaginella* sp.

CONSERVATION MEASURES TAKEN: Specifically none. The family Orchidaceae is included in Appendix 2 of the 1973 Convention on International Trade in Endangered species of wild Fauna and Flora.

CONSERVATION MEASURES PROPOSED: The species is rather difficult to cultivate unlike the other species of *Paphiopedilum*. The destruction of its habitats has been the main causative factor for its fast depletion. An effort has to be made to protect its natural habitats for multiplication and self propagation.

BIOLOGY AND POTENTIAL VALUE: A delicate, ornamental species; flowers during December—February.

CULTIVATION: Plants are seen under cultivation in some gardens. It thrives best in the media of leaf mould, sand and powdered charcoal in the proportion of 8:1:1. Frequent watering is essential to keep the media moist.

DESCRIPTION: This species is very distinct even in vegetative condition due to its variegated leaves. Leaves few, elliptic-oblong, acute or acutely bifid, mottled with dark green above. Scape usually 1-flowered. Flowers large, greenish-white with dark green veins; dorsal sepal erect, broadly ovate, ciliate; lateral sepals connate, oblanceolate, ciliate; lip greenish-white, reticulate.

REFERENCES:

1. Hooker, J. D. (1890). *Fl. Brit. India* 6: 173.
2. Katak, S. K. (1984). *Lady's slipper orchids of India*. POSSCEF, Botanical Survey of India, Howrah.
3. Katak, S. K., Jain, S. K., & Sastry, A. R. K. (1984) *Threatened and Endemic Orchids of Sikkim and North-Eastern India*. POSSCEF, Botanical Survey of India, Howrah. p. 75, t. 60.
4. Katak, S. K. (1986). *Orchids of Meghalaya*. Government of Meghalaya, Shillong. p. 227.
5. Pradhan, U. C. (1976). *Indian Orchids : Guide to Identification and Culture* 1 : 40.

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

STATUS: Vulnerable. Large scale collection of the species from the wild and habitat loss due to conversion of the forests are the main causative factors that led to the decline of the species. The species was first discovered by Thomas Lobb in 1853 near Moulmein in Burma.

DISTRIBUTION: In India the species is reported only from Mizoram; also distributed in Burma.

HABITAT AND ECOLOGY: In dense forests on cool humus rich forest floors or sometimes on moss covered rockboulders and on trees as an epiphyte, in the alt. of 1200-1700 m. The area receives an annual rainfall of ca 250 cm on an average and is humid for a major part of the year.

CONSERVATION MEASURES TAKEN: None for the wild populations and natural habitats; however the family Orchidaceae is included in the Appendix 2 of the Convention on International Trade in Endangered species of wild Fauna and Flora (CITES). The species has been listed in threatened plant lists of India and has also been recommended by the Botanical Survey of India, for inclusion in the schedules of the Wildlife Act of the Government of India.

CONSERVATION MEASURES PROPOSED: *In situ* conservation of the wild populations and protection of its natural habitats; multiplication and propagation in orchidaria through seed germination, vegetative propagation and tissue culture method are suggested.

BIOLOGY AND POTENTIAL VALUE: It is one of the beautiful species among the Lady's slipper orchids and is much sought of in horticultural trade for the long lasting quality of the flowers. The species has also been used for developing hybrids.

CULTIVATION: From a few plants collected from Mizoram a few decades ago, the species has been vegetatively propagated and successfully multiplied in good numbers in pots and in plots, in the National Orchidaria of the Botanical Survey of India at Shillong and Yercaud.

DESCRIPTION: Terrestrial or epiphytic, clump forming herbs. Stems very short or absent. Leaves upto 25 cm long, ca 5 cm broad, linear, ligulate, green, apex acute or bifid, scape hirsute, 1-flowered. Bract oblong, ca 5 cm long, as long as the ovary. Flowers spreading, ca 15 cm across, dorsal sepal broadly orbicular-ovate, revolute, ca 6×4 cm, greenish-white and white along the margins towards apex, brownish-purple and ciliate at base; lateral sepals spreading upto 6 cm long, green; petals brownish-purple; lip slipper shaped, upto 5 cm long, 3-lobed, purplish-brown with light yellow tinge, light pink veined, smooth, shiny.

REFERENCES:

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art Report.* BSI & MAB, New Delhi. p. 31.
2. Katakai, S. K. (1984). *Lady's Slipper Orchids of India.* POSSCEF, Botanical Survey of India, Howrah. p. 14. t. 5.
3. Katakai, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India.* POSSCEF, Botanical Survey of India, Howrah.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Endangered. It is not known after its first record from its type locality in Arunachal Pradesh, India. Even, it is not known under cultivation. Much of the Arunachal Pradesh is affected due to jhumming and consequent degradation of habitats.

DISTRIBUTION: Lohit District of Arunachal Pradesh. Endemic.

HABITAT AND ECOLOGY: Reported to grow in open, on granitic rocky surfaces covered with mosses and leaf-litter.

CONSERVATION MEASURES TAKEN: None. All the species of Orchidaceae are included in Appendix 2 of the 1973 Convention on International Trade in Endangered species of wild Fauna and Flora.

CONSERVATION MEASURES PROPOSED: Intensive search has to be made to relocate this species in wild, in Lohit district and in other possible adjoining regions.

BIOLOGY AND POTENTIAL VALUE: An ornamental species flowering in winter months (December-February).

CULTIVATION: Not known under cultivation.

DESCRIPTION: Terrestrial. Leaves oblong-elliptic, acute at apex. Scape 1-flowered. Flowers medium-sized; dorsal sepal ovate, pale greenish with dark green lines, margin ciliate; lip green with reddish spots.

REFERENCES:

1. Katak, S. K. (1984). *Lady's Slipper Orchids of India*. POSSCEF., Botanical Survey of India, Howrah. p. 6.
2. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1:40.

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

STATUS: Endangered. Causes for its depletion are its restricted distribution, limited number of individuals in each population and destruction of natural forest areas for rehabilitation purposes.

DISTRIBUTION: Endemic to Andaman and Nicobar Islands. During recent intensive explorations in these islands since 1972, the species was noticed only at three places, i.e., Middle Andaman Island, Katchal Island and Great Nicobar Island. In these places, only one population each with very few plants were discovered.

HABITAT AND ECOLOGY: Epiphytic in dense inland and littoral forests. Prefers partially shaded places.

CONSERVATION MEASURES TAKEN: No specific measures taken. A few plants are under cultivation in the Botanic Garden of the Botanical Survey of India, at Port Blair. There are proposals to create a Biosphere Reserve in Great Nicobar Island, which would protect the species. All orchids are included in Appendix 2 of the Convention of International Trade in Endangered Species of wild Fauna and Flora and hence its export from India is banned.

CONSERVATION MEASURES PROPOSED: Detailed studies on the cultivation and propagation of the species should be undertaken. Proposals for the Biosphere Reserves in Great Nicobar Island and other islands should be taken up on priority basis.

BIOLOGY AND POTENTIAL VALUE: A very beautiful ornamentally and horticulturally important species of the genus with many species. This is the only species of the genus in these islands. It flowers in May to August and fruits in August to October. The flowers are long lasting and useful in cut-flower trade.

CULTIVATION: The species can be grown on tree trunks or in charcoal mixed with bricks and humus in pots. High humidity and good sunlight are necessary. Pollination and seed propagation should be studied. Multiplication by meristem and seed propagation should be tried.

DESCRIPTION: Epiphytic with long aerial roots; leaves lanceolate, glossy, 15-20 cm long, 2-4 cm wide; inflorescence 15-30 cm long; flowers 3.5-4.5 cm wide, white to pinkish-white, crowded at the top portion of the stalk; sepals and petals elliptic-lanceolate; lip with deep purple or reddish tinge, side lobes linear-oblong, truncate, toothed, midlobe laterally compressed, fleshy, tip dilated, papillose.

REFERENCES:

1. Hooker, J. D. (1890). *Fl. Brit. India* 6: 30;
2. Hore, D. K. & Balakrishnan, N. P. (1984). Orchids of Great Nicobar Island and their conservation. *J. Bombay Nat. Hist. Soc.* 81: 630.
3. Sweet, H. R. (1971) *Phalaenopsis speciosa* Reichb.f. var *tetraspis*. *Orch. Digest* 35(7): 201-204.
4. Reichenbach, H. G. (1881) *Gard. Chron.* (n. s.) 1: 562.; (1882). *Ibid.* 2: 744-745, ff. 130-132.

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

STATUS: Rare; known to occur only in two localities in the North-eastern India. It was first collected from Assam by Dr. George Watt in 1897 but exact locality is not known. Recently it was collected in 1961 from Subansiri in Arunachal Pradesh and in 1982 from North Cachar Hills in Assam.

DISTRIBUTION: Arunachal Pradesh and Assam. Endemic to North-eastern India.

HABITAT AND ECOLOGY: Epiphytic on moss-covered trees along with other orchids like *Pholidota imbricata*.

CONSERVATION MEASURES TAKEN: None for the species and its wild habitats. The family Orchidaceae is included in Appendix 2 of the 1973 Convention on International Trade in Endangered Species of wild Fauna and Flora.

CONSERVATION MEASURES PROPOSED: Intensive search in its distribution range to locate the species; protection of its habitats.

BIOLOGY AND POTENTIAL VALUE: A little known species mainly of botanical interest; flowers: May-June.

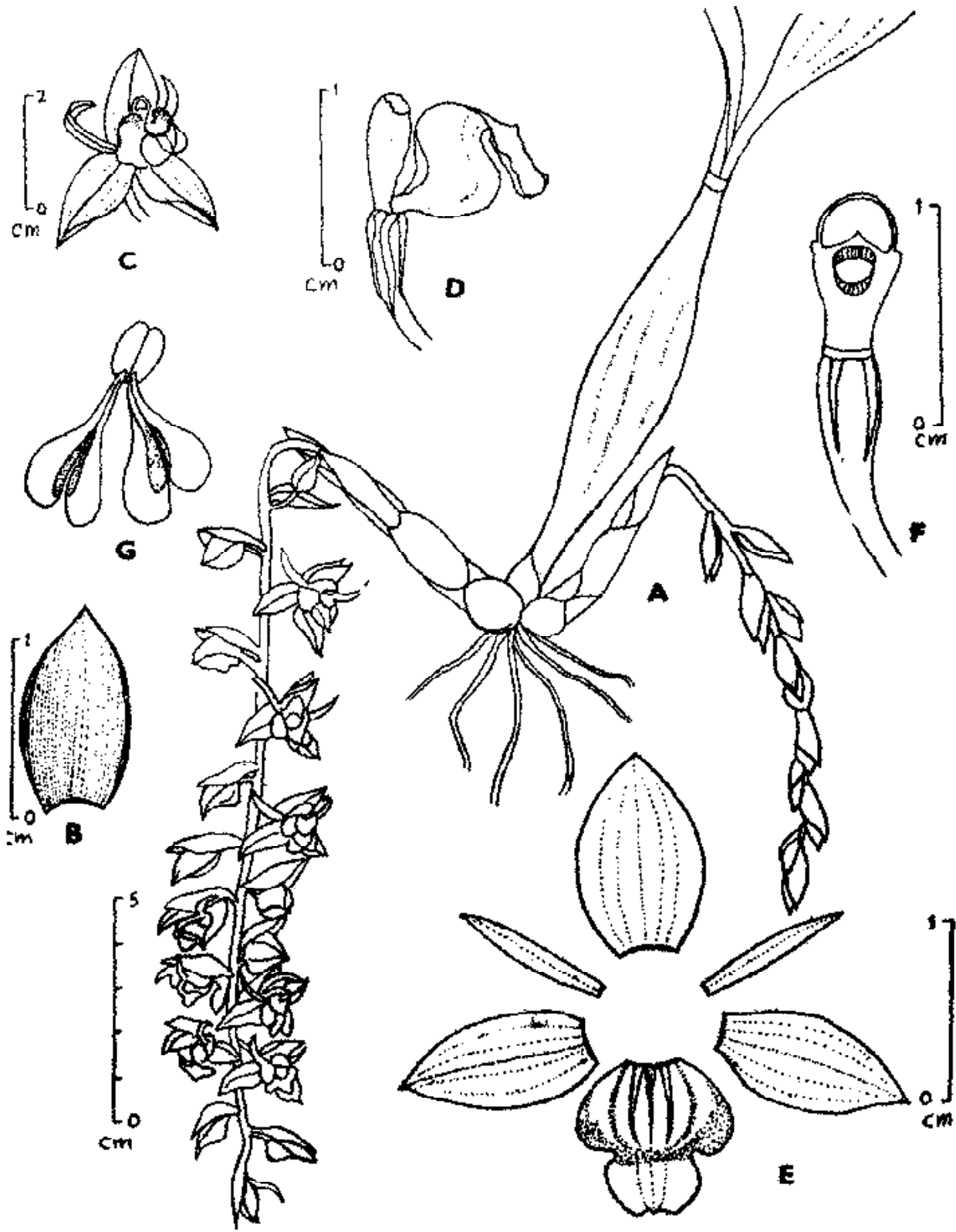
CULTIVATION: The species grows well in charcoal filled pots or on wooden blocks and is under cultivation in the National Orchidarium, Botanical Survey of India, Shillong.

DESCRIPTION: Rhizome creeping, stout. Pseudobulbs narrowly ovoid or fusiform, 2-leaved. Leaves petioled, narrowly-elliptic or oblanceolate, plicate. Inflorescence arising from the young shoot, 10-25 cm long, many-flowered. Flowers 1.5-2 cm across, pale green, becoming straw coloured with age. Sepals spreading, unequal, ovate. Petals linear. Labellum 3-lobed, brown tinged, hypochile deeply saccate, 3-ridged, epichile recurved.

REFERENCES:

1. King, G. & Pantling, R. (1898). *J. Asia. Soc. Bengal* 66:590.
2. Pfitzer, E. & Kranzling, F. (1907). *In: Engler, A. (ed.) Pflanzenr.* 32:150.

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



Pholidota wattii King et Pantl. A. Habit. B. Bract. C. Flower. D. Column with lip. E. Floral parts. F. Column. G. Pollinia.

STATUS: Presumed Extinct. It was first discovered by Thomas Lobb in 1849 from Khasi Hills (Meghalaya) reportedly restricted to one or two localities of very limited extent. Recent visits to different places in Khasi Hills failed to find it.

DISTRIBUTION: Meghalaya, N. E. India. Endemic.

HABITAT AND ECOLOGY: Like other species of *Pleione*, it also grows as an epiphyte on trees or as an epilith on moss covered rocks.

CONSERVATION MEASURES TAKEN: None so far, except that Orchidaceae is included in the Appendix 2 of CITES Convention which bans export of wild orchids.

CONSERVATION MEASURES PROPOSED: Repeated search has to be made to locate this species in wild, particularly during its flowering time, i.e., in October-November.

BIOLOGY AND POTENTIAL VALUE: After its introduction in England, it has earned the highest repute amongst orchid amateurs on account of its beautiful flowers.

CULTIVATION: Not known in this region.

DESCRIPTION: Epiphytes, or sometimes epiliths. Pseudobulbs ca 2.5 cm long, somewhat bottle-shaped, green-mottled with blackish-brown speckles; leaves oblanceolate, ca 20 cm long. Flowers rose coloured; lip oblong, emarginate, rose coloured outside, purple with pale purple streaks and blotches inside, margins white.

REFERENCES:

1. Hooker J. D. (1890). *Fl. Brit. India* 5: 841.
2. Katakai S. K., Jain, S. K., & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India*. POSSCEF, Botanical Survey of India, Howrah, p. 82. t. 67.

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

STATUS: Endangered, due to indiscriminate collection of its plants and loss of its habitats.

DISTRIBUTION: In India the species occurs in the hills of Manipur, Nagaland and Mizoram; extends into Burma and S. E. Asia.

HABITAT AND ECOLOGY: In nature this species grows as an epiphyte on large broad leaved tree trunks in the alt. of 1000-2000 m high, preferably in sunny areas. Its distribution areas in India receive moderate to high rainfall of ca 250 cm.

CONSERVATION MEASURES TAKEN: None for the wild populations or its habitats; the species has been included in the threatened plants lists of India; the family Orchidaceae is included in the Appendix 2 of the CITES. A few plants have been introduced into the National Orchidaria of the Botanical Survey of India at Shillong and Yercaud.

CONSERVATION MEASURES PROPOSED: Some of its distributional localities/areas in India should be conserved as a means of its *in situ* conservation; steps should be taken to check the possible removal of its natural populations; attempts should be made for large scale multiplication in orchidaria and botanical gardens to meet trade demands.

BIOLOGY AND POTENTIAL VALUE: A beautiful climbing orchid of much ornamental value; popularly called the 'Red Vanda', for its large, attractive, showy yellow-orange yellow, red-spotted petals and red-flushed lateral sepals.

CULTIVATION: A few plants are in cultivation in the National Orchidarium of the Botanical Survey of India, at Shillong, and reportedly in several other orchid nurseries and botanic gardens in India and abroad. The species grows well in pots and on ground in soil mixed with brick pieces, charcoal and humus and watered regularly during dry periods.

DESCRIPTION: Epiphytes; stems long, semi-erect, upto 90 cm long, covered with imbricating sheaths; leaves short, 8-10 × 1.5-2 cm, oblong. Inflorescence ca 30 cm long, branched, 15-30 flowered. Flowers bright red, ca 5 cm long; dorsal sepal linear-lanceolate, ca 20 × 4 mm, lateral sepals diverging, 25-30 × 15-20 mm, margins undulate, elliptic-ovate, clawed; petals spatulate, rounded, ca 14 × 2 mm, orange coloured with reddish spots; lip small, ca 5 mm long, 3-lobed with a short spur, bright red.

REFERENCES:

1. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art Report.* BSI & MAB, New Delhi.
2. Katakai, S. K. (1976). Indian orchids—A note on their conservation. *Amer. Orch. Soc. Bull.* 45: 912-913.
3. Katakai, S. K., Jain, S. K. & Sastry, A. R. K. (1984). *Threatened and Endemic Orchids of Sikkim and North-Eastern India.* POSSCEF, Botanical Survey of India, Howrah.
4. Pradhan, U. C. (1979). *Indian Orchids: Guide to Identification and Culture* 2: 523.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Endangered. Depletion and rarity due to miniature size, restricted distribution, limited number of individuals in populations and deforestation for extraction of timber and rehabilitation purposes.

DISTRIBUTION: Endemic to Baratang Island of Andaman Islands. Known only from type collection of 1977. Recent intensive explorations have not located this species again.

HABITAT AND ECOLOGY: Epiphytic, associated with liverworts. Loves sunny locations with high humidity.

CONSERVATION MEASURES TAKEN: No specific measures taken. All orchids are included in Appendix 2 of the Convention on International Trade in Endangered Species of wild Fauna and Flora and hence its export is banned from India.

CONSERVATION MEASURES PROPOSED: The species should be searched again in the forests of Baratang and adjacent islands. Selected plants should be brought under cultivation in Botanic Garden at Port Blair. Their biology and habitat requirements should be studied and various propagation methods should be tried to multiply them. Once they are successfully multiplied, efforts should be made to reintroduce them in wild habitats. Proposal for permanent preservation of the natural habitats as Biosphere Reserve should also be initiated.

BIOLOGY AND POTENTIAL VALUE: A member of the curious leafless, stemless tiny orchid genus distributed in Peninsular India, N. E. India to Malesia. The only species of the genus found in these islands. Botanically and biologically interesting.

CULTIVATION: Can be grown on tree trunks or charcoal mixed with bricks pieces and humus. Loves hot humid climate with good sunlight.

DESCRIPTION: Epiphytic, leafless, stemless, tiny orchids; roots 3-5 per plant, 4-9 cm long, 1-2 mm thick, subtrigonous in cross-section, greyish-green; inflorescence erect, arising from rootstock, 1-3 cm long; flowers 7-15 per inflorescence, ca 4 mm long, light green, turning to yellowish, persisting for 4-5 days; sepals and petals united into a tube; lip free, narrowly lanceolate, ca 3 mm long, saccate at base with a V-shaped slit; spur globose, nerved, hyaline; capsules oblong, ca 1 cm long.

REFERENCE:

1. Balakrishnan, N. P. & Bhargava, N. (1978). *Taeniophyllum andamanicum* Balakr. et Bhargava (Orchidaceae)—An interesting new species from Andaman Islands. *Bull. Bot. Surv. India* 20: 154-156. ff. 1-9.

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

STATUS: Possibly Extinct (2, 5). There is no record of its re-location in the wild ever since Reichenbach described the species in 1861 based on the collection of Wight from Nilgiris. The main cause for its possible extinction is believed to be the indiscriminate felling of trees in Nilgiris, on which many epiphytic orchids grow. However, the chances of the existence of this epiphytic orchid on the branches of some tall trees in Nilgiris cannot be ruled out.

DISTRIBUTION: Peninsular India; endemic to Nilgiri Hills of the Western Ghats in Tamil Nadu (1-6). The only collection known so far is that of Wight. The subsequent workers on the flora of this area have hence considered this to be a 'little-known' or 'threatened' plant species (1-5).

HABITAT AND ECOLOGY: The habitat and ecology of the species in particular is not clearly known. However, the genus *Vanda* R. Br. which is represented by three other species in Nilgiris, perch on the branches of rough-barked trees at an altitude of 500-1900 m. The roots are firmly attached to the surface. The peak period of flowering in this group of plants is from March to June.

CONSERVATION MEASURES TAKEN: None for the species. However, the Nilgiris have been recently declared as a Biosphere Reserve, and protection to the plants, if existing and to the area is expected.

CONSERVATION MEASURES PROPOSED: Intensive search and if it is rediscovered in the wild, no collection should be made unless it is for research purpose.

BIOLOGY AND POTENTIAL VALUE: The members of the genus *Vanda* R. Br. are much known in orchid hybridization. Out of the four species available in the Peninsular Indian region, *Vanda wightii* is a narrow endemic. According to available literature the subquadrate side-lobes of the lip, the broadly ovate and obtusely 2-lobed midlobe and the slender column form the distinguishing features of this species from others.

CULTIVATION: Not known in cultivation.

DESCRIPTION: Epiphytes. Leaves narrowly ligulate, unequally and acutely 2-lobed, more than 30 cm long. Scapes few-flowered. Lip 3-lobed; sidelobes subquadrate; midlobe broadly ovate, obtusely 2-lobed; disc with 2 thick ridges, pilose at the base of the ridges and sidelobes; spur conical. Column slender.

REFERENCES:

1. Fischer C. E. C. (1928). *In: Gamble, J. S. & Fischer, C.E.C., Fl. Pres. Madras*, p. 1445.
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.
3. Hooker, J. D. (1890). *Fl. Brit. India* 6:54.
4. Jain, S. K. & Mehrotra, A. (1984). *A Preliminary Inventory of Orchidaceae in India*. POSSCEF, Botanical Survey of India, Howrah. p. 128.
5. Joseph, J. (1982). Orchids of Nilgiris. *Rec. Bot. Surv. India* 22:132.
6. Reichenbach, H. G. (1861). *In: Walpers, W. G., Ann. Bot. Syst.* 6:932.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.

STATUS: Rare. Main cause for its rarity is the destruction of habitat and cutting of the trees on which the plants climb over. It was believed for about three decades that the species no longer existed in the wild ever since Fischer (2) reported the collections of Wight, Calder and Ramaswami.

DISTRIBUTION: Endemic to the southernmost part of the Western Ghats (1-5). It was first reported by Lindley in 1840 based on a collection of Wight from 'Travancore'. Recent gatherings include those of Vatsala (1964) from Tinnevely which are in cultivation in the Kerala University Botanical Gardens (1) and of Henry (1981) from Kanyakumari which is under cultivation in the National Orchidarium of the Botanical Survey of India at Yercaud. All these data confirm that the species has restricted distribution in the southernmost part of Western Ghats.

HABITAT AND ECOLOGY: Climbs on forest trees especially along river-banks. Flowers from February to March.

CONSERVATION MEASURES TAKEN: None for the wild habitats. However, all species of Orchidaceae are included in Appendix 2 of the Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES, 1973).

CONSERVATION MEASURES PROPOSED: (a) To ban the felling of those trees on which this rare or vulnerable plants climb over. (b) To obtain seeds and stem cuttings and to multiply them by culture methods and to replant in their original habitats.

BIOLOGY AND POTENTIAL VALUE: *Vanilla* Mill. is a unique genus of the family Orchidaceae in having a climbing stem. The genus includes about 90 species scattered all over the tropical regions. Four species occur in India and among them *Vanilla wightiana* Lindl. and *V. walkeriae* Wight are leafless. *V. wightiana* can be distinguished from the latter by the barbate hairy disc in the lip. Being a species of the commercially important genus *Vanilla* (*Vanilla* of commerce is obtained from *Vanilla planifolia* Andr.—indigenous to Tropical America), it may have some useful chemical constituents.

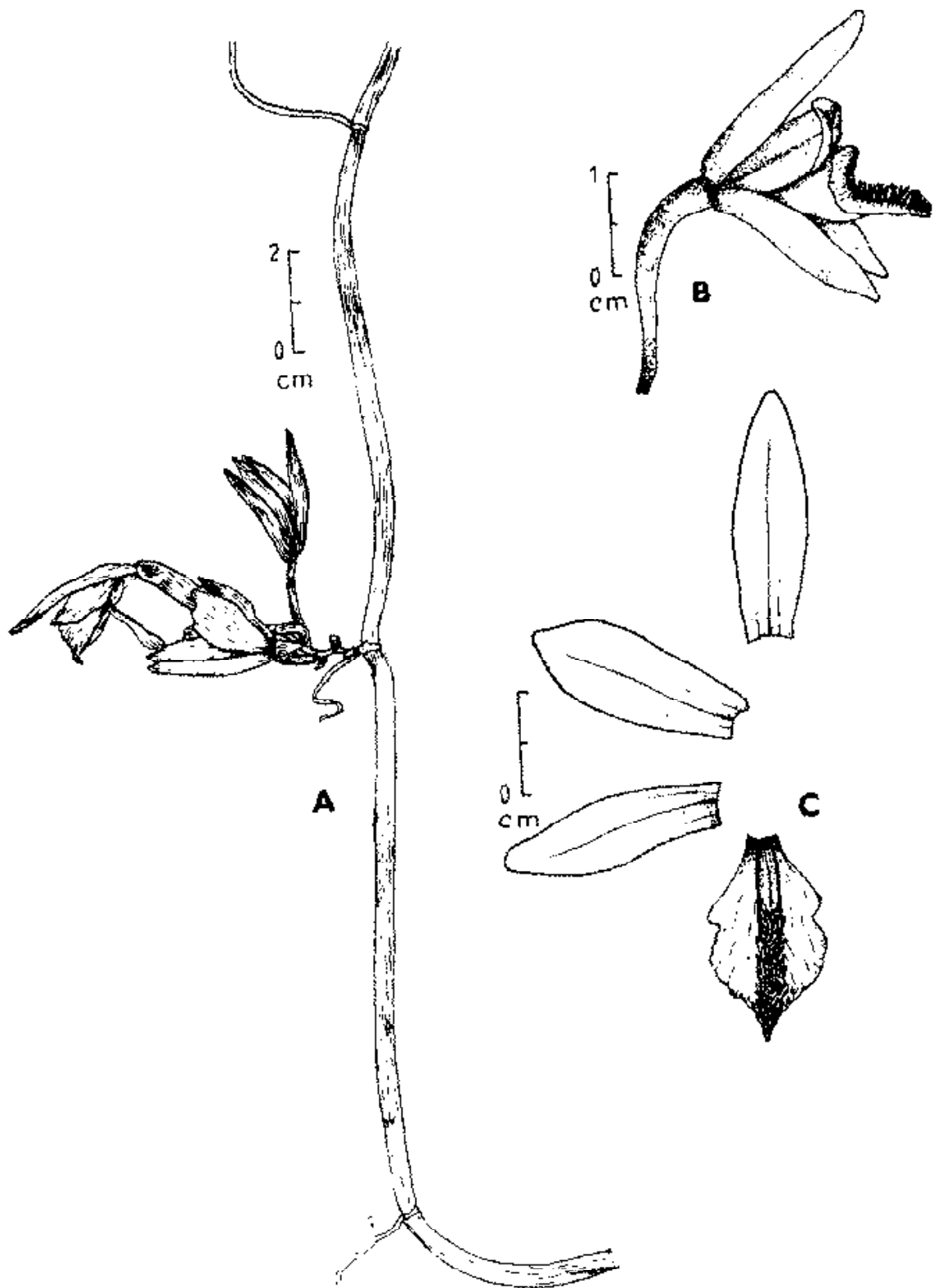
CULTIVATION: It is not much known in cultivation. However, a few plants are in cultivation in the Kerala University Botanical Gardens at Kariyavattom and in the National Orchidarium, B.S.I., at Yercaud (Tamil Nadu) and are growing well.

DESCRIPTION: Scandent herbs climbing by means of aerial roots from the nodes. Stems fleshy, green; internodes 5-12 cm long, 3-5 mm thick. Scape arising from the nodes, 2-3 cm long, 3-5-flowered. Flowers cream coloured with a pale-green tinge, ca 3 cm across. Sepals oblong-ovate, obtuse or subacute at apex, 1.7-2.7 × 0.8-0.9 cm. Petals oblong, obtuse at apex, ca 2.2 × 1 cm. Lip trumpet-shaped, ca 2 cm long; disc barbate-hairy.

REFERENCES:

1. Abraham, A. & Vatsala, P. (1981). *Introduction to Orchids with Illustrations and Description of 150 South Indian Orchids*, p. 500-502, t. 160.
2. Fischer, C. E. C. (1928). *In: Gamble, J. S. & Fischer, C.E.C., Fl. Pres. Madras*, p. 1451.
3. Hooker, J. D. (1890). *Fl. Brit. India* 6: 90-91.
4. Lindley, J. (1840). *The Genera and Species of Orchidaceous Plants*, p. 436.
5. Nayar, M. P. (1984). *Key Works to the Taxonomy of Flowering Plants of India* 4: 191. Botanical Survey of India, Howrah.

The material for this sheet was supplied by N. C. Nair and R. Ansari, Botanical Survey of India, Coimbatore.



Vanilla wightiana Lindl. A. Habit. B. Flower. C. Floral parts.

STATUS: Endangered, or Possibly Extinct; King and Pantling, as far back as 1898 reported only two specimens as being collected. In 1974, after nearly eighty years, some plants of this species came to my collection surprisingly from Khasia Hills from which colour photographs were made. Since then it has not been seen again. The Genus *Zeuxine* comprises of highly delicate terrestrial plants living under specific habitat conditions. Slight alteration, degradation, clearing of forests, would bring the plants easily to extinction, as they are not adaptable or hardy like most of the epiphytic species of orchids.

DISTRIBUTION: India, Lachung Valley in North Sikkim at 2,500 m and Khasia Hills in Meghalaya at ca 2000 m. Only two specimens were collected by King and Pantling from Lachung, Sikkim, in 1898. Thereafter, it was also collected in one instance from Khasia Hills in 1974.

HABITAT AND ECOLOGY: Jewel Orchids inhabit cool shady nooks close by streams and rivers, usually under thick undergrowth of shrubs and trees.

CONSERVATION MEASURES TAKEN: No specific measures taken, habitat destruction, natural calamities like landslides, etc. could cause major damages.

CONSERVATION MEASURES PROPOSED: (1) This species should be located in its habitat and the areas be given special protection. (2) It should be brought into cultivation and propagated artificially from seeds and cuttings. (3) Seeds should also be distributed to reputed international institutes who have facilities to store them at low temperatures.

BIOLOGY AND POTENTIAL VALUE: A highly ornamental species with dark velvety brown leaves having a white mid-rib. The leaves are coriaceous and glisten in light. Its biology has not been properly understood. Flowering Time: August.

CULTIVATION: When some plants of this were received in my collection from Meghalaya in 1974, after nearly eight decades since its first discovery, I tried to maintain by providing cultural conditions as best as I could. However, the plants could not be kept for more than a year under greenhouse conditions.

DESCRIPTION: Small terrestrial herbs, hardly exceeding 15 cm; leaves 3-4, 2-2.5 cm. x 1.5-2 cm., crowded, ovate, coriaceous and blackish to brownish-purple on the surface with a distinct white mid-rib. Spike with a peduncle of ca 7.5 cm, covered with white hairs, 2-3-flowered. Flowers ca 7-8 mm long, pale brown, the apical lobes of lip divergent, white in colour.

REFERENCES:

1. King, G. & Pantling, R. (1898). Orchids of Sikkim Himalaya. *Ann. Roy. Bot. Gard. Calcutta* 8 : 286. t. 380.
2. Pradhan, U. C. (1976). *Indian Orchids: Guide to Identification and Culture* 1: 117.
3. Pradhan, U. C. (1983). *Himal. Plant Journ.* 2(3): 17-19.

The material for this sheet was supplied by U. C. Pradhan, Kalimpong.

STATUS: Vulnerable; an endemic restricted to a small, mountainous area in the Kashmir Himalaya. The species has diminished in the wild partly due to natural causes and partly due to loss of its habitats. Its monocarpic habit (i.e., it dies after flowering and has no means of vegetative reproduction) is another factor which inhibits natural regeneration.

DISTRIBUTION: India, confined to Kashmir Himalaya.

HABITAT AND ECOLOGY: A rock loving plant, seeding in the spaces between the rocks (4). It grows in the crevices of rocks or among loose piles of stone debris, on stone slides and below cliffs in the altitudes of 2200 to 4600 m. It prefers sunny areas near water springs for full growth after the snow melts off, while the ground is still damp (5).

CONSERVATION MEASURES TAKEN: None for the wild habitats.

CONSERVATION MEASURES PROPOSED: A detailed search should be made in the adjoining areas to see if it occurs elsewhere and to recommend suitable protection measures. It should be cultivated and re-established in its natural habitats.

BIOLOGY AND POTENTIAL VALUE: A very striking member of the genus *Meconopsis*, and widely admired in horticulture for its attractive flowers. Flowers appear in July to August and fruits in September to October. It is of scientific interest because of its very restricted distribution. Taxonomically it is very close to *Meconopsis aculeata* Royle of the Western Himalaya and *M. sinuata* Prain of the Eastern Himalaya.

CULTIVATION: Originally described from a plant cultivated at Kew raised from seeds sent by Lt. Col. Appleton in 1906. Horticulturists regard this species as one of finest in cultivation and it is certainly a plant of high merit which has not become as common in gardens as one would have expected (6).

DESCRIPTION: Bristly herbs, 30-100 cm tall, clothed with patent, yellowish-brown or golden-brown bristles of 2-8 mm long. Leaves 8-30 × 2-6 cm long, ovate-lanceolate, sinuate-lobed or deeply incised-serrate, rarely pinnatifid. Petioles 2-10 cm long. Flowers axillary or terminal, forming leafy racemes. Pedicels 1-4 cm long. Sepals 1.0-1.5 cm long, broadly oblong, sparsely, bristly. Petals 4, 2-4 cm long, blue or white, obovate or suborbicular. Stamens numerous, anthers yellowish. Ovary ovoid, bristly; styles 1.5-3.0 mm long. Capsules ellipsoid-oblong, bristly, dehiscent by 4-7 valves, 1.0-1.5 cm long. Seeds 0.1 cm long, sub-reniform.

The species is taxonomically intermediate between *Meconopsis aculeata* Royle and *M. sinuata* Prain. It is distinguished from *M. sinuata* in having broader leaves, shorter capsules and more flowered inflorescence. It differs from *M. aculeata* in having shorter pedicels and less dissected leaves (2).

REFERENCES:

1. Chittenden, Fred J. (1956). *Dictionary of Gardening* 3: 1270-1272. Clarendon Press, Oxford.
2. Debnath, H. S. & Nayar, M. P. (1984). *Fasc. Fl. India* 17: 20-21. Botanical Survey of India, Howrah.
3. Debnath, H. S. & Nayar, M. P. (1986). *The Poppies of Indian Region*. Botanical Survey of India, Calcutta. p. 67. t. 23.
4. Evans, A. (1959). *Meconopsis* species and hybrids. *J. Roy. Hort. Soc.* 84: 505.
5. Prain, D. (1915). Some additional species of *Meconopsis*. *Bull. Misc. Inf. Kew* 1915, p. 146-147.
6. Taylor, G. (1934). *An Account of the genus Meconopsis*. New Flora and Silva, London. p. 97 & 125.

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

STATUS: Indeterminate. Possible causes of its rarity are forest degradation and habitat loss due to large scale lime quarrying. It has not been collected recently though a number of visits have been made to its type locality.

DISTRIBUTION: India: endemic to Garhwal-Kumaon Himalayan region. As from the literature and herbarium records, the species was frequently collected till 1963 from Dehra Dun, Musoorie and Sahastradhara (type locality). But recent collectors could not trace the plant which indicates either the plant has become extremely scarce or is left in very small pockets which need thorough combing.

HABITAT AND ECOLOGY: A small tree or a large shrub, grows in rocky slopes in hot places and has been collected within the altitudes ranging from 1200 to 2400 m.

CONSERVATION MEASURES TAKEN: No conservation measure has been taken to protect the species in its wild habitat so far.

CONSERVATION MEASURES PROPOSED: It is proposed that before disappearance of this species, adequate measures be taken to protect them in its distribution localities. Thorough investigation be made to rediscover the plant in the wild state and it is necessary to collect seeds to propagate this beautiful small tree in gardens and road side avenues.

BIOLOGY AND POTENTIAL VALUE: This beautiful species is characterised by tomentose stem, leaves and branches; ovate-oblong to oblong-lanceolate leaves; paniculate-corymbs, densely tomentose 2-valved capsules. The bark, aromatic when freshly cut is said to possess narcotic properties and is used locally in chronic bronchitis.

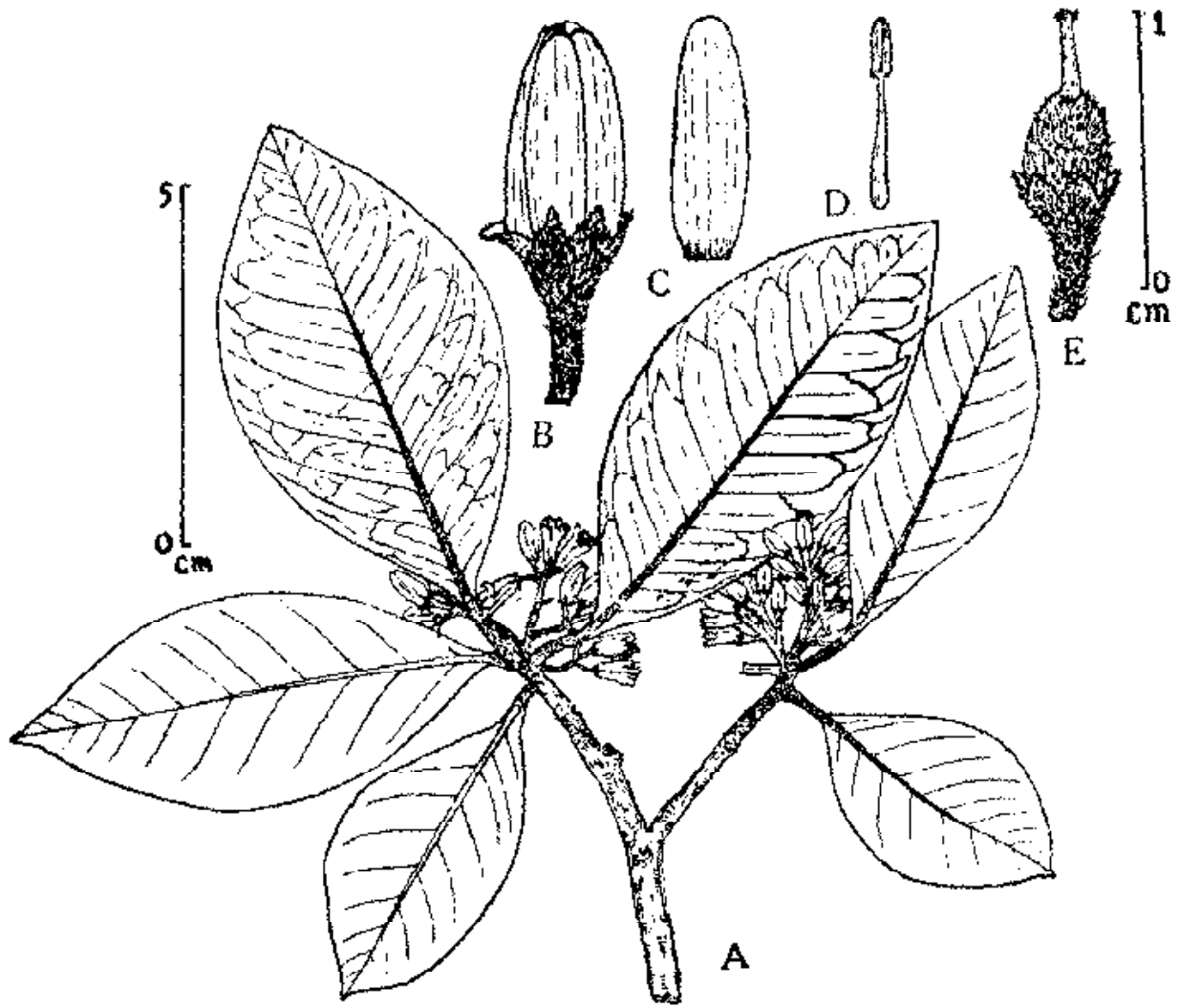
CULTIVATION: The species is not known so far in cultivation but may be introduced in gardens for the beautiful yellow flowers.

DESCRIPTION: Shrubs or small trees, branches densely tomentose, leaves broadly obovate-oblong or oblanceolate-oblong, 6-18 × 3-5 (9) cm, apex acute to acuminate, base cuneate, margins entire, under surface densely brownish tomentose; petioles 15-20 mm long, tomentose. Sepals triangular, 2 × 1 mm, pilose. Petals oblong, 9-10 × 2.2.5 mm. Filaments slender, 5 mm long, anthers 2-2.5 mm long. Ovary 2 mm long, ovoid, densely tomentose; style 3 mm long, stigma capitate, papillose. Capsules 12-15 mm in diam., 2-valved, densely tomentose particularly when young. Seeds many, blackish-red.

REFERENCES:

1. Brandis, D. (1874). *For. Fl. India*, p. 19.
2. Duthie, J. F. (1903). *Fl. Upper Gang. Pl. I*: 61.
3. Hajra, P. K. (1983). In: Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 35.
4. Hooker, J. D. & Thomson, T. (1872). *Fl. Brit. India* 1: 199.
5. Royle, J. F. (1834). *Illustr. Bot. Himal.* 1: 77.

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



Pittosporum eriocarpum Royle A. Habit. B. Flower bud. C. Petal. D. Stamen. E. Gynoecium.

STATUS: Rare. Originally collected in 1919 from Lonavala, Pune district by Bhide. Re-collected twice afterwards from two different places: Bombay and Ratnagiri (Sindhudurg). Also known from North Kanara, Karnataka State.

DISTRIBUTION: Lonavala (Pune Distt.) Bombay, Malwan, (Sindhudurg) Ratnagiri Distt. Maharashtra State. In Ratnagiri it is frequent while in Bombay and Pune it is rare. Hallberg and McCann too collected this in the year 1919 from North Kanara, Karnataka State.

HABITAT AND ECOLOGY: Annual, in dry places, on rocky plains alongwith other annual grasses like *Dimeria*, *Glyphochloa* spp., etc. It grows gregariously and is a pioneer on cleared patches of ground or in abandoned fields.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED: *In situ* conservation through protection of its habitats.

BIOLOGY AND POTENTIAL VALUE: This genus is exclusively distributed in India.

DESCRIPTION: Annual, erect grass, 8-10 cm high. Leaves basal, linear, ca 4.5 cm. Inflorescence of 2 racemes, spatheate. Racemes 1.0-5.2 cm long. Sessile spikelets ca 6.5 mm long; lower glume oblong, 2-nerved, winged at apex; upper glume 4 mm long, 2-4 lobbed and awned between the lobes, glabrous; upper lemma 2-lobed and awned from the sinus. Pedicelled spikelets ca 4 mm long.

REFERENCES:

1. Bor, N. L. (1949). *Bhidea* Stapf ex Bor: A new genus of Indian grasses. *Kew Bull.* 445-447 figs. 1-13.
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 103. fig. 2.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Rare. The species was described by Bor (1) in 1961 from a specimen collected by Santapau in 1958. Since then only three specimens are recorded in Indian herbaria.

DISTRIBUTION: Western ghats, endemic to Maharashtra : Mahabaleshwar (Satara distt.), Amboli (Ratnagiri distt.), and Aurangabad plateau, in the alt. of 650-1375 m.

HABITAT AND ECOLOGY: Grows in open, rocky, moist grasslands with species of *Utricularia*, *Eriocaulon*, *Murdannia* and *Isachne*.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: It is recommended that surveys be made to determine the exact localities, population sizes and critical habitats of this species.

BIOLOGY AND POTENTIAL VALUE: Adaptability of the plant to varied ecological conditions in high rainfall area of Mahabaleshwar and Amboli as well as in the drier parts of Maharashtra at Aurangabad is interesting.

DESCRIPTION: Tufted annual, 5-15 cm high, culms very slender. Leaf blades 0.5-3.0 cm, lanceolate, acute. Panicle 2-8 cm long, effuse, with spreading capillary branches. Spikelets 1.0 - 1.3 mm long, globose-ovoid. Glumes glabrous or with few bristles; lower glume ca 0.25 - 0.5 mm, nerveless or 1-3 nerved; upper 0.5 - 1.0 mm long, nerved; lower lemma 1.0 - 1.2 mm long, folded, nerveless or obscurely 5-nerved; upper lemma 0.8 - 1.0 mm long, lanceolate, 2-keeled, hairy along keels and on dorsal surface.

REFERENCES:

1. Bor, N. L. (1961). A new grass from Bombay. *J. Bombay Nat. Hist. Soc.* 58: 317-318, t. 1.
2. Ved Prakash & Jain, S. K. (1984). Poaceae : Tribe Isachneae. *Fasc. Fl. India* 14 : 5, figs 1-13. Botanical Survey India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Presumed Extinct. It has not been collected after its type collection made in 1886 from Simla (Himachal Pradesh) by Col. D. M. Strong.

DISTRIBUTION: Known from a single locality near Simla in Himachal Pradesh.

HABITAT AND ECOLOGY: Nothing specific is known, except that its habitat falls in the temperate region in the Western Himalaya.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Thorough search in the type locality and other adjoining areas for study of this grass and to suggest suitable conservation measures.

BIOLOGY AND POTENTIAL VALUE: Not known.

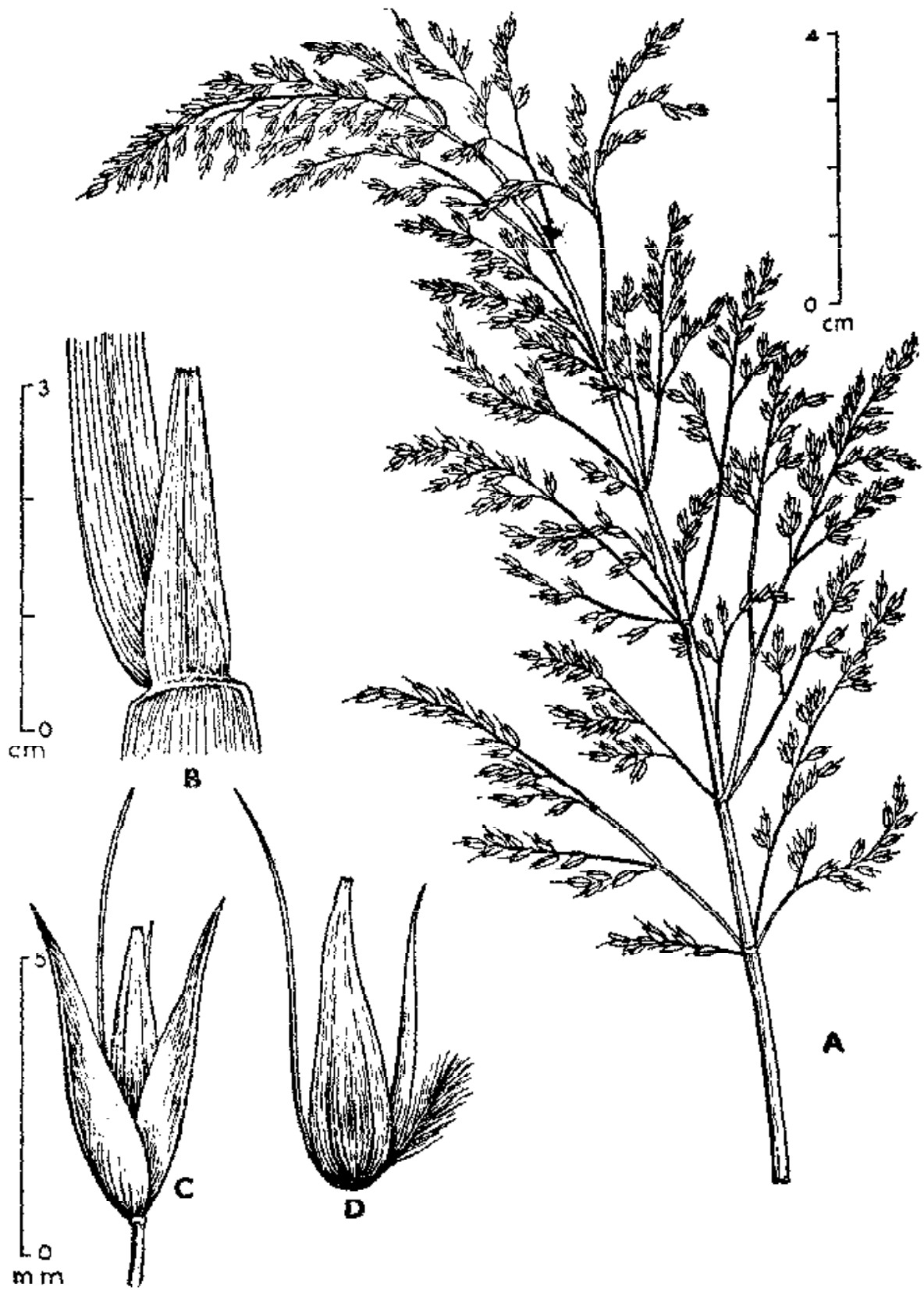
CULTIVATION: Not known in cultivation.

DESCRIPTION: Perennial, stout grass, culms upto 150 cm high, terete, glabrous, unbranched, erect and covered at the base with the remains of old sheaths. Leaf blades very narrow, upto 33 cm long, rough on both the sides, margins scabrid, midrib prominent, sheaths very long, somewhat rough to glabrous, striate. Ligule extraordinarily long, membranous, lacerate at the top, upto 2.5 cm long. Panicles upto 23 cm long, very lax, branches in whorls, rough, capillary, shortly stalked; branchlets capillary, scabrid. Spikelets lanceolate, numerous, crowded on short, scabrid, pedicels. Lower glume 4 mm long, lanceolate, 1-nerved, rough on the back, scabrid on the keel. Upper glume 4.5 mm long, lanceolate, recurved at the apex, closely 3-nerved, somewhat hyaline on the margins, slightly rough on the back, scabrid on the keel. Lemma 3.5 mm, truncate at the top, faintly 5-nerved, awned from just above the base; callus hairs short, upto 1.5 mm long; awn 6 mm long, exerted, straight. Palea 3 mm long, hyaline; rachilla produced, penicillately ciliate; hairs 1-1.5 mm long. Stamens 3, anthers 2 mm long.

REFERENCES:

1. Bor, N. L. (1941). *Ind. For. Rec. (N.S.) Bot.* 3(5): 149-150.
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 400.

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



Deyeuxia similensis Bor A. Panicle. B. Ligule. C. Spikelet. D. Lemma, palea, awn with rachilla (after Bor).

STATUS: Rare; though collected from a few localities in Maharashtra but it is not common at any place.

DISTRIBUTION: Western Ghats in Maharashtra. It was first collected by Stocks from Konkan and then by others from Pune (Junnar, Bhimashankar and Khandala), Satara (Panchgani) and Nasik (Kalsubai hill) districts. It appears that it is endemic to a small area of Sahyadri ranges in Maharashtra State.

HABITAT AND ECOLOGY: Annual, usually found on exposed hill-tops among other grasses and herbs on rather hard and stony soils of the Sahyadris.

CONSERVATION MEASURES TAKEN : None.

CONSERVATION MEASURES PROPOSED : *In situ* conservation of its habitats ; collection of seeds and seeding them in its distribution range to raise new populations are suggested.

BIOLOGY AND POTENTIAL VALUE: A small grass growing in hard and stony soils on hill tops, but getting scarce due to soil erosion and their poor retention capacity of moisture.

DESCRIPTION: Tufted, erect, annual, 15 - 45 cm high. Leaf blades 10 - 15 cm long, linear, bulbous hairy on both surfaces. Inflorescence sub-digitate, racemes 1-5, simple; peduncles capillary with a whorl of long hairs in the axils. Sessile spikelets 3.0 - 3.5 mm long; lower glume elliptic, pitted. Pedicelled spikelets slightly longer than the sessile spikelets; lower glume armed with marginal bulbous based bristles.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses* 5: 91-92. t. 59.
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 134.
3. Deshpande, U. R. (1984). *Fasc. Fl. India* 15: 6. t. 3-4. Botanical Survey of India, Howrah.
4. Hooker, J. D. (1897). *Fl. Brit. India* 7: 197. (as *Andropogon armatus*).

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Rare. This aromatic grass occurs at Lonavala and Khandala in Pune district, Maharashtra, where it forms a few scattered patches. Though Woodrow (1) collected it from Mawal, later workers could not recollect it from this place.

DISTRIBUTION: In the plains at Lonavala and Khandala of Pune district in Maharashtra state. Recently, this has been collected from Bhimashankar area in Pune district. Endemic to Maharashtra.

HABITAT AND ECOLOGY: It grows in gravelly soils.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: *In situ* conservation through protection of its habitats in its distribution range; collection of seeds for storage in seed banks; seeding of suitable habitats in its range are suggested.

BIOLOGY AND POTENTIAL VALUE: This aromatic grass may be a potential source for extraction of an essential oil.

DESCRIPTION: Densely tufted perennial, 1.0 m high. Leafblades linear, lanceolate, finely acuminate. Inflorescence upto 7.5 cm long. Sessile spikelets 4.0 - 5.0 mm long, ovate-oblong; lower glume hairy or sparsely hairy below middle. Pedicelled spikelets linear-oblong, as long as the sessile but narrower.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses*, p. 83-84, t. 53 (as *Amphilophis compressa*).
2. Bar, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 106.
3. Deshpande, U. R. (1984). *Fasc. Fl. India* 15: 10, 20-21. Botanical Survey of India, Howrah.
4. Hooker, J. D. (1897). *Fl. Brit. India* 7: 182. (as *Andropogon compressus*).

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Vulnerable. The species was first collected by McCann (1) in 1925; it was recollected in 1968, after a lapse of 53 years. However, its populations have been found to be critically low in the distribution localities.

DISTRIBUTION: Restricted to a small locality at Panchgani, Satara district, Maharashtra State. This species was collected by Naik in 1968 from Daulatabad, Aurangabad district, Maharashtra State.

HABITAT AND ECOLOGY: Annual, growing in gravelly soils in open grasslands on hill tops. It is interesting to find the plant in high rainfall area like Panchgani and also in drier parts of Maharashtra i.e., Aurangabad district, which indicates wide ecological amplitude for the species.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: A search should be made in the areas for *in situ* conservation measures, collection of seeds for seed banks, and seeding in its habitats.

DESCRIPTION: Tufted annual, ca 45 m high, nodes densely bearded. Leafblades bulbous hairy all over, upto 10 cm long. Racemes solitary or two. Sessile spikelets upto 4 mm long; lower glume 7-nerved. Pedicelled spikelets upto 5 mm long; glume 10-nerved, with spinous stiff hairs on margins and at apex.

REFERENCES:

1. Blatter, E. & McCann, C. (1927). Two new species of grasses from Panchgani (Satara district). *J. Bombay Nat. Hist. Soc.* 32: 357-358.
2. Blatter, E. & McCann, C. (1935). *The Bombay Grasses* 5: 92, t. 60.
3. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 135.
4. De Wet, J. M. & Harlan, J. R. (1968). Taxonomy of *Dichanthium*; section *Dichanthium* (Gramineae). *Bot. Soc. Arg. Bot.* 12: 219.
5. Deshpande, U. R. (1984). *Fasc. Fl. India* 15: 19-20, t. 31-32. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Vulnerable. The species was collected only twice from Mawal in Pune district, first in 1894 by Woodrow, after whom the species is named, and then in 1960 by J. Harlan from the same locality. Efforts were made to recollect the species from its type locality in 1975-1976 but in vain. This species is represented at Kew by 5 sheets and at BLAT by one sheet.

DISTRIBUTION: Paud, Mawal taluka, Pune district, Maharashtra State, is the only known locality. Endemic.

HABITAT AND ECOLOGY: In the plains in low rainfall area.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Its type locality should be searched again to relocate and for *in situ* conservation measures.

BIOLOGY AND POTENTIAL VALUE: According to Woodrow it has camphor-like odour.

DESCRIPTION: Tufted grass with woody rootstock, ca 1.5 m high. Leafblades 30-60 cm, scaberulous on both surfaces. Racemes 3-5, ca 2.5 cm long. Sessile spikelets ca 4.0 mm long, oblong-lanceolate. Pedicelled spikelets as long as the sessile but narrower.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses*, p. 84. (as *Amphilophis woodrowii* (Hook. f.) A. Camus).
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 110.
3. Deshpande, U. R. (1984). *Fasc. Fl. India* 15: 26. Botanical Survey of India, Howrah.
4. Hooker, J. D. (1897). *Fl. Brit. India* 7: 173. (as *Andropogon woodrowii*).

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Rare. This species was collected by Woodrow (date not known) from Ratnagiri district and was described by Stapf in 1894. After Woodrow, Bhide and Talbot collected it from Marmagao; Hallberg and McCann collected it from N. Kanara. After a long lapse of 79 years this is recollected recently from Sindhudurg, Ratnagiri district, Maharashtra State, where it is found to be very rare.

DISTRIBUTION: Maharashtra, Goa and Karnataka. Though collected from 2-3 places, its occurrence in all areas is rare. Endemic.

HABITAT AND ECOLOGY: Annual, in open rocky plains along coastal hilly areas, with herbs like *Pulicaria angustifolia* DC. and *Lepidagathis prostrata* Dalz.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: *In situ* conservation through protecting its habitats; collection of seeds for seed storage and seeding in its natural habitats to help propagation of the species are suggested.

BIOLOGY AND POTENTIAL VALUE: An interesting species in which rachis of each raceme is coiled into a loop.

DESCRIPTION: Annual, 7.6-15.0 cm high, leafy. Leaf-blades 3.8-7.5 cm, linear, finely acuminate, glabrous. Racemes 2, 2.0-2.5 cm long, at first erect and then circinate incurved. Spikelets 4 mm long, sublinear, lower glume ca 3 mm long, linear, acute, folded, upper glume slightly longer than the lower glume, acute, narrowly keeled and thickened at the back, margins hyaline; lower lemma narrowly linear, hyaline; upper lemma bifid, awned in the sinus, hyaline.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses*, p. 8-7, t. 6.
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 144.
3. Hooker, J. D. (1897). *Fl. Brit. India* 7: 104.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Presumed Extinct. It is known only from its type (K). Attempts to relocate it from the type locality were not successful. The locality as such is a flat area with much disturbance due to human habitation and agricultural operations.

DISTRIBUTION: On the east coast at Tranquebar, S. India (1, 2, 3).

HABITAT AND ECOLOGY: Coastal plains.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: The first priority is clearly to find out if it still survives. If relocated, the feasibility of conserving the area may be studied and seeds may be collected to grow them in its distribution areas.

BIOLOGY AND POTENTIAL VALUE: *Eragrostis rottleri* is scientifically very interesting. It has viscid stem below the panicle as in the case of *E. viscosa* (Retz.) Trin., and at the same time the spikelets are quite different in that the rachilla is persistent and the florets break from below upwards as in the case of *E. minor* Host (4).

DESCRIPTION: Annual herbs. Culms viscid below the panicle. Leaves 2.5-20 cm, flat or more or less convolute, margins eglandular; mouth of sheath naked. Panicles 5-15 cm, oblong, open, rather stiff; branches filiform to capillary, solitary or lower geminate, branching from near the base; pedicels of lateral spikelets very short; pedicels and branches with glandular spots. Spikelets 4-5 mm, linear, pale-brown or white, 6-12-flowered, breaking up from below upwards; glumes subequal, ca 1 mm; rachilla tough; lemma 1-1.8 mm, oblong, subacute; palea slightly shorter than the lemma, persistent, keels scaberulous; stamens 3; anthers ca 0.25 mm; grains ca 0.4 mm (2, 4).

REFERENCES:

1. Bor, N. L. (1961). *The Grasses of Burma, Ceylon, India and Pakistan*. p. 513.
2. Fischer, C. E. C. (1934). In: Gamble, J. S. & Fischer, C.E.C., *Fl. Pres. Madras*, p. 1827.
3. Karthikeyan, S. (1983). Endemic grasses of India with emphasis on rare, indeterminate and extinct species. In: Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 240-250.
4. Stapf, O. (1897). *Eragrostis*. In: Hooker, J. D. *Fl. Brit. India* 7: 321.

The material for this sheet was supplied by V. J. Nair and P. V. Sreekumar, Botanical Survey of India, Coimbatore.

STATUS: Presumed Extinct. It was collected only once in 1900 from a single area at about 1800 m (Type in K). A dam and a hydro-electric project now exist in the area and is also visited by many tourists. However, it is difficult to ascertain whether the exact type locality is lost due to the man-made changes. The species has not been reported in the nearby hilly areas either.

DISTRIBUTION: Paikara in Nilgiri district, Tamil Nadu (2, 3). Endemic.

HABITAT AND ECOLOGY: It is a tufted perennial grass growing in hilly areas at ca 1800 m. No additional information is available.

CONSERVATION MEASURES TAKEN: So far none.

CONSERVATION MEASURES PROPOSED: Thorough explorations should be conducted in the area and similar areas of the Western Ghats to relocate the plant; if relocated seeds may be collected, plants be grown and reintroduced in the wild habitats.

BIOLOGY AND POTENTIAL VALUE: Scientifically, a very interesting species in that, it is so far the only representative in India of the otherwise tropical African and American genus (1).

DESCRIPTION: Tufted perennial; culms erect, 12-30 cm, 3-noded, nodes softly villous. Leaf sheaths tight, sulcate, increasingly white villous upwards; ligule short, rounded, shortly ciliate; leaf-blades very narrow with involute margins above, acute, upto 21×0.5 cm. Panicle narrow, 3.5-6.5 cm long, dense; racemes 3-4, sessile, upto 3 cm long; spikelets binate, one sessile and the other pedicelled. Sessile spikelets narrowly lanceolate, 5.5-6.2 mm long, surrounded by rufous hairs; lower glume narrowly lanceolate, flat on the back, involute at margins, surrounded by rufous hairs; upper glume nearly as long as the lower, thinner, boat-shaped, distinctly keeled, acuminate; lower lemma hyaline, oblong or lanceolate, obtuse or acute, flat, margins narrowly involute, softly white hairy, 4-4.3 mm, epaleate and empty; upper lemma thinly hyaline, linear or lanceolate, more or less concave, subacute, 2-2.3 mm, with an apical tuft of hairs, epaleate. Lodicules 2. Stamens 3; anthers linear, 2.7 mm long, apex shortly acutely 2-lobed, base deeply 2-lobed, reddish-brown; styles 2, stigmas plumose. Pedicelled spikelets narrowly lanceolate, 4-4.5 mm long; glumes subequal; lower lemma hyaline, lanceolate or oblong, acute or obtuse, 3-4.2 mm, softly hairy, margins narrowly involute, epaleate and empty. Upper lemma more or less boat-shaped and keeled, epaleate with an apical tuft of hairs. Lodicules, stamens and pistil similar to those in sessile spikelet (2, 3).

REFERENCES:

1. Bor, N. L. (1961). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 152.
2. Fischer, C. E. C. (1932). New or little known plants from South India. *Kew Bull.* 1932: 246-247.
3. Fischer, C. E. C. (1934). *In: Gamble, J. S. & Fischer, C.E.C., Fl. Pres. Madras*, p. 1710.

The material for this sheet was supplied by V. J. Nair and P. V. Sreekumar, Botanical Survey of India, Coimbatore.

STATUS: Rare. The Type of this species was collected by Huegel probably in 1832 (exact date of collection and locality not known) in Mysore. Nearly after 135 years, Rao (2) collected another specimen of this species from Mercara, Karnataka State. This species was confused with *Manisuris forficulata* Fisch., till Jain (1967) clarified its identity. These are the only collections so far known of this species.

DISTRIBUTION: Mercara, Coorg district, Karnataka State. Endemic.

HABITAT AND ECOLOGY: Along water margins in cool shady forest floors.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Protection of its known distribution localities; collection of seeds and propagation through seeds in its natural distribution range.

BIOLOGY AND POTENTIAL VALUE: The genus *Glyphochloa* Clayton (1) is exclusively endemic to India and out of the 10 taxa, 8 are confined to Peninsular India. This is one of the species which is extremely rare.

DESCRIPTION: Annual, ca 10-17 cm high; leaves basal and cauline; lower leaves 8-10 cm long, reaching almost to the top of the culms, upper leaves 3-4 cm long, flat, surfaces and margins pilose. Racemes 1.75-2.5 cm long; joints of the rachis ca 1.5 mm long, linear, subclavate, obtusely keeled outside, margins of cavities ciliate at top. Sessile spikelets 2.5-2.75 mm long; lower glume 2.0-2.5 mm, bifid, lobes awned; keels unequal with broad hyaline wings in the upper half; lower half of the glume pitted with bearded, tubercled margins; upper glume 2 mm long, ovate-acute, membranous; pedicelled spikelet equal to sessile spikelet, lanceolate, pedicel fused with joint; lower glume oblique, awned, keeled, keel winged from base to apex; upper glume equal to lower one, mucronate, boat-shaped.

REFERENCES:

1. Clayton, W. D. (1970). Notes on the tribe Andropogoneae. (Poaceae). *Kew Bull.* 35(4): 815.
2. Jain, S. K. (1967). Notes on Indian grasses—VIII, *Manisuris divergens* (Hook.) Kuntze, collected after thirteen decades. *Bull. Bot. Surv. India* 9 (1-4): 293-294, figs. 1-17.
3. Jain, S. K. (1970). The genus *Manisuris* L. (Poaceae) in India. *Bull. Bot. Surv. India* 12 (1-4): 12, fig. 3.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Vulnerable. This species was collected by Talbot in 1891 and described by Hooker, f. in 1896 (4). Since 1891 till date, this species has been collected only four times and was last collected in 1964 from Usgao, Goa and was found to be scarcely distributed.

DISTRIBUTION: Goa, on West coast of Peninsular India. Endemic.

HABITAT AND ECOLOGY: Along hilly grassy slopes. The area receives high rainfall.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: The Konkan-Ratnagiri ghat area is rich in several endemic plants and needs to be protected.

BIOLOGY AND POTENTIAL VALUE: This is a species restricted to Goa only and does not occur anywhere else in India, as is known presently.

DESCRIPTION: Annual, 15-30 cm high. Leaves 3-8 cm long, linear. Racemes 2-7 cm, rather stout; joints of the rachis very tumid, almost saccate. Sessile spikelets ca 13 mm long (including awn), closely imbricate, lower glume with 2-3 transverse ridges, ridges sometimes more or incomplete or entirely absent; glume broadly winged on both margins in the upper part and prolonged into a long awn. Pedicelled spikelets equal to the sessile spikelets; lower glume winged on one margin, long-awned; upper glume with winged keels.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses*, p. 35 (as *Peltophorus talbotii* (Hook. f.) Camus).
2. Bor, N. L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 192, t. 10, 4.
3. Clayton, W. D. (1970). Notes on the tribe Andropogoneae (Poaceae). *Kew Bull.* 35 (4): 816.
4. Hooker, J. D. (1896). *Fl. Brit. India* 7: 155 (as *Rottboellia talbotii* Hook. f.)
5. Jain, S. K. (1970). The genus *Manisuris* L. (Poaceae) in India. *Bull. Bot. Surv. India* 12 (1-4): 16, fig. 9.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Presumed Extinct, due to loss of its habitat and ecological change in its distribution area, namely, the Gersoppa waterfalls and its vicinity in South India. The diversion of the river water for the Hydroelectric Scheme seems to have reduced the flow of the waterfalls and resulted in partial dryness.

DISTRIBUTION: Endemic to Gersoppa falls of the Sharavati river, North Canara district, Karnataka.

HABITAT AND ECOLOGY: Presumably an annual grass found in between rocks moistened with spray of the waterfalls. It requires a special niche surcharged with water spray in the neighbourhood of the falls.

BIOLOGY AND POTENTIAL VALUE: It is the only representative of the tribe Hubbardiaceae. Bor (1) remarks "Nothing like the structure of the spikelets is to be found in any known genus of grasses". It is of immense botanical interest.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: A thorough search in the type locality as well as in the nearby areas; if it is traced, either live plants or seeds may be introduced in green houses, and steps for protecting the habitats, should be considered.

DESCRIPTION: Trailing or pendulous annual grass with slender stems, rooting at the nodes with translucent, pale green, exceedingly thin leaves. Leaves 2-3 cm, elliptic to oblong-elliptic, rough on the margin, with short sheathing base without ligule. Panicles slender, numerous from nodes; spikelets ellipsoid, 2-3 mm, with 2 glumes, as long as the spikelets, oblong-acute and marked with (5-) 7 conspicuous longitudinal veins. Grains spindle-shaped, about 1.25 mm long.

REFERENCES:

1. Bor, N. L. (1951). A new genus of Indian grasses. *Kew Bull.* 3, 1950: 385-388. t. 4.
2. Bor, N. L. (1970). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 572-573, 685.
3. Karthikeyan, S. (1983). Endemic grasses of India with an emphasis on Rare, Indeterminate and Extinct species. In: Jain, S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah. p. 240-250.
4. Lucas, G. & Synge, H. (1978) (ed.). *The IUCN Plant Red Data Book*, p. 227.

The material for this sheet was supplied by M. P. Nayar and A. R. K. Sastry, Botanical Survey of India, Calcutta.

STATUS: Rare. Bor (1) described this species based on a collection made by E. Barnes in September, 1933. Thereafter, it was collected only twice, once in 1965 from the type locality (3, 5) and recently from another area of the district (in MH). In none of these areas it is common.

DISTRIBUTION: Kerala. Endemic to Idukki district and has been collected only from two localities, namely, Anaimudi and Eravikulam Wildlife sanctuary.

HABITAT AND ECOLOGY: Low-growing annuals found on moist moss-covered rocks along grassy slopes of high mountains and hills at ca 2500 m.

CONSERVATION MEASURES TAKEN: Eravikulam, one of its distribution localities is a Wildlife sanctuary and is a protected area. The other locality is also comparatively undisturbed because of its inaccessibility.

CONSERVATION MEASURES PROPOSED: More concerted action to study and protect the flora and vegetation of Anaimudi slopes and Eravikulam area is highly desirable. Anaimudi (2695 m), the highest peak south of the Himalayas is the type locality for a large number of very interesting, rare and endemic plants. Similarly, Eravikulam area also will prove to be botanically very interesting and important. Both these areas need to be protected from deforestation.

BIOLOGY AND POTENTIAL VALUE: The genus *Isachne* is scientifically very important in that it shows a very high degree of endemism in our country. Out of the 28 species reported from our country, 18 are endemic. Out of these 18 endemic elements, 13 species are restricted to the Western Ghats. *Isachne fischeri* itself is very important scientifically because of its niche-specificity and very rare occurrence (4, 6, 7).

DESCRIPTION: Annuals; culms upto 5 cm, erect or ascending. Leaves 5-8 x 1.0-3.5 mm, lanceolate or elliptic, hirsute on both sides. Inflorescence racemose or at times paniculate, upto 1.5 cm, laxly few-flowered. Spikelets 2.7-3 mm long, obovoid-oblong, geminate on unequal pedicels. Glumes 1.8-2.8 mm long, cuspidate-acuminate, setose on dorsal side. Florets: lower 2.5-3.0 mm, upper 1.5-2.0 mm, shortly stipitate, plano-convex, indurate. Lemmas: lower elliptic, thinly coriaceous, nerves obscure, pubescent on back; upper ovate-elliptic, concave, coriaceous, nerves obscure, pubescent on back. Paleas similar to respective lemmas, but flat. Caryopsis chocolate-brown in colour, often with black markings, ellipsoid, plano-convex, enclosed by the hardened lemma and palea (5, 7).

REFERENCES:

1. Bor, N. L. (1949). *Kew Bull.* 1949: 69-70.
2. Bor, N. L. (1961). *The Grasses of Burma, Ceylon, India and Pakistan*, p. 850.
3. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.

4. Karthikeyan, S. (1983). Endemic grasses of India with special emphasis on Rare, Indeterminate and Extinct species. *In: Jain, S. K. & Rao, R. R. (ed.) An Assessment of Threatened Plants of India.* B.S.I., Howrah. pp. 240-250.
5. Shetty, B. V. & Vivekananthan, K. (1972). New or little-known taxa from Aniamudi and surrounding regions, Devicolam, Kerala-IV: Notes on some rare species. *Bull. Bot. Surv. India* 14: 19-23.
6. Ved Prakash & Jain, S. K. (1983). Tribe Isachneae (family Poaceae)—its endemism and rarity in India. *In: Jain, S. K. & Rao, R. R. (ed.) An Assessment of Threatened Plants of India.* B.S.I., Howrah. pp. 256-264.
7. Ved Prakash & Jain, S. K. (1984). Poaceae: Tribe Isachneae. *Fasc. Fl. India* 14: 1-42. Botanical Survey of India, Howrah.

The material for this sheet was supplied by V. J. Nair and P. V. Sreekumar, Botanical Survey of India, Coimbatore.

STATUS: Localised in Maharashtra at Mahabaleshwar and Panchgani only, and the populations of this species seem to be decreasing (3).

DISTRIBUTION: Panchgani and Mahabaleshwar, Satara district, Maharashtra. It has also been collected only once from Bababudan hills, Karnataka. Endemic to Western Ghats in Maharashtra and Karnataka.

HABITAT AND ECOLOGY: A subgregarious prostrate grass near marshy places, often becoming erect and leaf-less when in water (1).

CONSERVATION MEASURES TAKEN: None so far.

CONSERVATION MEASURES PROPOSED: Panchgani plateau and Mahabaleshwar area in Maharashtra, which are the type localities of many other endemic plants, should be declared as protected reserves.

BIOLOGY AND POTENTIAL VALUE: Not known.

DESCRIPTION: Annual, prostrate or ascending with creeping base and long wiry roots, 6-23 cm long. Leafblades 1.0-3.5 cm long, lanceolate (elliptic), amplexicaul, thin, soft, hirsute above, margins pectinately ciliate with long tubercle-based hairs. Panicle 1.5-6.0 cm long, lax, few-flowered. Spikelets globose. Glumes 2-3 mm long, distinctly longer than the florets, obtusely-cuspidate, densely setose on back. Lemmas hemispherical, glistening, punctulate.

REFERENCES:

1. Blatter, E. & McCann, C. (1935). *The Bombay Grasses* 5: 187. t. 120.
2. Hooker, J. D. (1897) *Fl. Brit. India* 7: 22.
3. Ved Prakash & Jain, S. K. (1984). Poaceae: Tribe Isachneae. *Fasc. Fl. India* 14: 30-31. Botanical Survey of India, Howrah.

The material for this sheet was supplied by Miss U. R. Deshpande, Botanical Survey of India, Pune.

STATUS: Vulnerable. It is known only from three localities. Meebold first discovered this species in 1910. It was the only known collection of it until C. D. K. Cook relocated it in 1973 and 1979 from a different area. This population contained several hundred plants and occupied an area of about 100×300 m in a vast flood-plane. Cook, however, could not find any additional plants in the surrounding areas. In 1982 a third but much smaller population of it was observed in an entirely different area (4). In this area, the plants are under great threat because of coconut plantations. Even otherwise, the plants are niche-specific and are hence threat-prone (1, 2, 4, 5, 6).

DISTRIBUTION: Kerala State, in Ernakulam, Kasaragod and Trichur districts (one locality each in these districts; 4, 5, 6).

HABITAT AND ECOLOGY: It is found in aquatic situations like tanks, flood-planes, water-logged marshy areas near tidal rivers, etc. The plants form a thick mass of tangled stems on the surface of the water. They are extremely rare but wherever they have been spotted, a few hundred plants were seen to grow together (1, 4, 5, 6).

CONSERVATION MEASURES TAKEN: So far none.

CONSERVATION MEASURES PROPOSED: Detailed surveys of similar areas be undertaken to locate additional niches, and feasibility of conservation of such suitable area be studied.

BIOLOGY AND POTENTIAL VALUE: This species is scientifically very important because this is the only species representing the tribe and the genus to which it belongs. Moreover, it is endemic and is so far known only from three localities in the world. Henry *et al* (2) included it in their list of threatened and endemic plants of South India. Some other author (3) considers it as an indeterminate species, the taxonomy of which is yet to be fully understood.

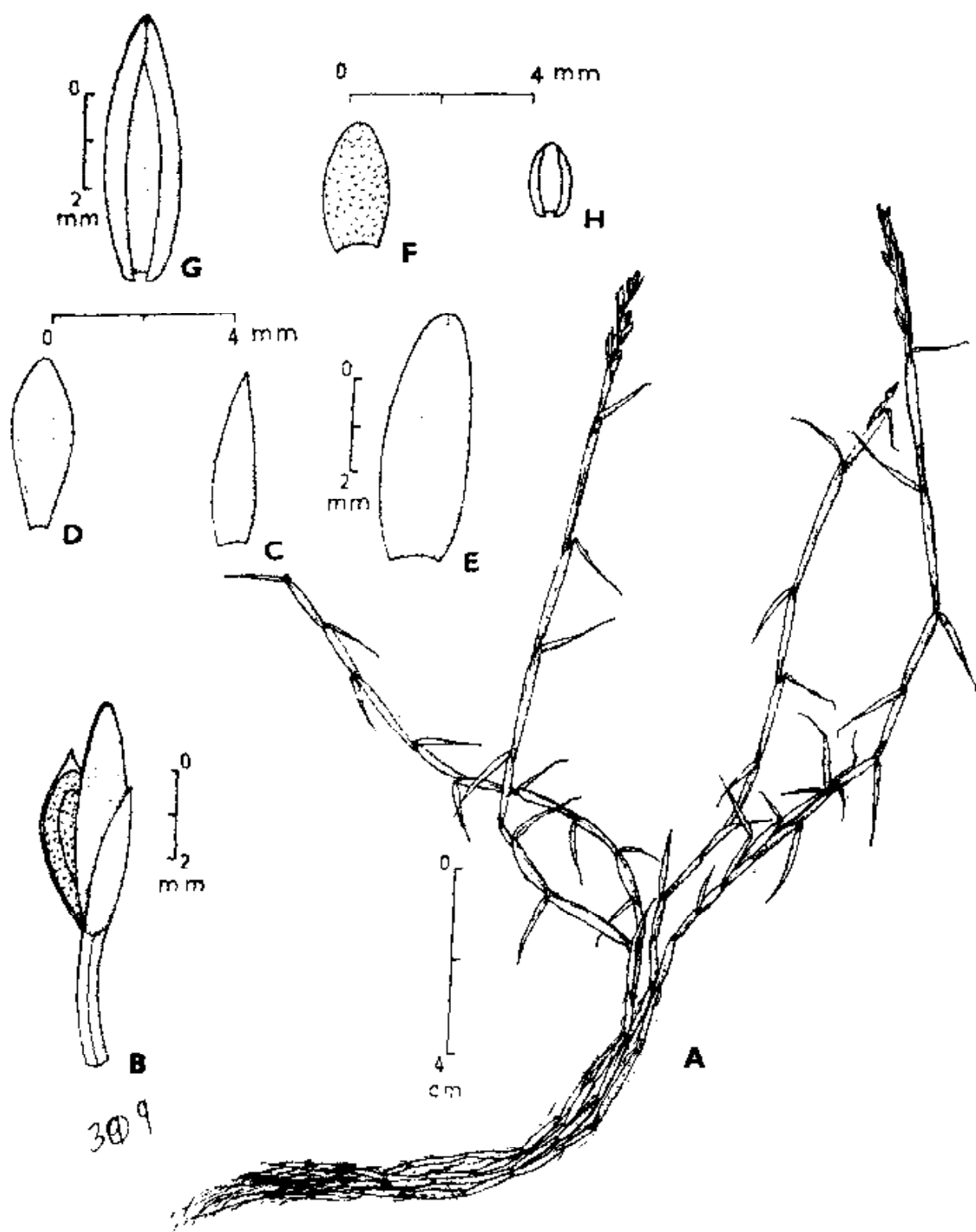
DESCRIPTION: Aquatic annuals. Culms delicate, 10-50 cm, creeping; nodes glabrous. Leaves acicular or lanceolate, 0.5-3×0.05-0.2 cm, acuminate, rounded or narrow at base, glaucous; ligule a row of hairs. Spikes 2-3 cm, hardly exerted from the sheath. Spikelets paired, one sessile, the other pedicelled, ovate-oblong or oblong-lanceolate, 4-6 mm long; pedicels upto 3 mm, flat. Lower glume oblong-lanceolate, 3-4×1-1.5 mm, chartaceous, 3-nerved; upper glume obovate or spatulate, 3-4×1-1.5 mm, chartaceous, 3-5 nerved. Lower lemma oblong or ovate-oblong, 4-6×1.5-2 mm, chartaceous, 7-nerved; upper lemma ovate or ovate-oblong, 2-3×1-1.5 mm, chartaceous or subcoriaceous, softly hairy. Lower palea oblong, 4-6×1.5-2 mm, 2-keeled, 2-nerved; upper palea ovate-oblong, ca 1.5×1 mm, coriaceous, softly hairy (4).

REFERENCES:

1. Bor, N. L. (1961). *The Grasses of Burma, Ceylon, India and Pakistan*, pp. 583-584.
2. Henry, A. N., Vivekananthan, K. & Nair, N. C. (1978). Rare and threatened flowering plants of South India. *J. Bombay Nat. Hist. Soc.* 75: 684-697.

3. Karthikeyan, S. (1983). Endemic grasses of India with emphasis on Rare, Indeterminate and Extinct species. *In: Jain, S. K. & Rao, R. R. (ed.) An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. pp. 240-250.
4. Nair, V. J., Ansari, R. & Sreekumar, P. V. (in ed.). On the collection of *Limmopoa meeboldii* (Fischer) C. E. Hubb. (Gramineae): an extremely rare, endemic and endangered species of Kerala. *J. Econ. Tax. Bot.*
5. Ved Prakash & Jain, S. K. (1983). Tribe *Isachne* (family Poaceae)—its endemism and rarity in India. *In: Jain, S. K. & Rao, R. R. (ed.) An Assessment of Threatened Plants of India.* Botanical Survey of India, Howrah. pp. 256-264.
6. Ved Prakash & Jain, S. K. (1984). Poaceae: Tribe Isachneae. *Fasc. Fl. India* 14: 38. Botanical Survey of India, Howrah.

The material for this sheet was supplied by V. J. Nair and R. Ansari, Botanical Survey of India, Coimbatore.



Linnopoa meeboldii (Fisch.) Hubb. A. Habit. B. Spikelet. C. Lower glume. D. Upper glume. E. Lower lemma. F. Upper lemma. G. Lower palea. H. Upper palea.

STATUS: Rare, surviving only in Namdapha area. Destruction of its habitats is the main threat factor for its decline.

DISTRIBUTION: Arunachal Pradesh, Manipur and Meghalaya. It is recorded from Namdapha Wildlife Sanctuary as rare.

HABITAT AND ECOLOGY: It grows in dense, undisturbed forests near 40 th mile in the proposed Namdapha Biosphere Reserve, in damp moist places on the roots of *Cissus elongata* and other species of Vitaceae, as a complete root parasite.

CONSERVATION MEASURES TAKEN: Its distribution area in Namdapha is a proposed Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: This species has to be conserved *in situ* in the Namdapha forest area which is under protection, as other means of conservation are difficult because of its parasitic habit.

BIOLOGY AND POTENTIAL VALUE: A very interesting species of the family Rafflesiaceae with large flowers of ca 12-16 cm across, and of considerable botanical interest. Earlier it was reported from different parts of N. E. region, but is now confined only to the Namdapha forest area. The whole plant is represented by its flower; other parts much reduced or absent having its roots attached to the host plants. Flowers in December.

CULTIVATION: It is possibly very difficult to grow because of its host specificity in parasitism.

DESCRIPTION: A dioecious, fleshy root parasite with globose buds; bracts white or pink, surrounding the base of flowers. Flowers foetid, ca 3.5-16 cm across; perianth tube hemispheric and solid below, cupular above and marked with 20 radiating ridges. Anthers ca 20, sessile, in a ring under the disk, extrorse. Ovary with anatropous ovules and papillose stigmas. Fruit globose, crowned with the perianth.

REFERENCES:

1. Deb, D. B. (1961): Dicotyledonous plants of Manipur territory. *Bull. Bot. Surv. India* 3(3 & 4): 318.
2. Griffith, W. (1844): *Proc. Linn. Soc.* 1: 216.
3. Hooker, J. D. (1886): *Fl. Brit. India* 5: 71.
4. Jain, S. K. & Sastry, A. R. K. (1980): *Threatened Plants of India. A state-of-the-Art Report.* Botanical Survey of India & MAB., New Delhi, p. 37.
5. Joseph, J. & Chauhan, A. S. (1983). In: Jain, S. K. & Sastry, A. R. K. (ed.) *Botany of some Tiger Habitats in India.* POSSCEF, Botanical Survey of India, Howrah, pp. 26-29.
6. Kanjilal, U.N., et al (1940). *Fl. Assam* 4: 27.

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

STATUS: Vulnerable, due to excessive collection of roots for medicinal uses.

DISTRIBUTION: Jammu & Kashmir, Himachal Pradesh; Nepal; Bhutan. Endemic to the Himalayas.

HABITAT AND ECOLOGY: Alpine Himalaya, in alpine meadows at alt. of 3000-4500 m.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Collection of the species for commercial use from the wild should be banned and attempts to cultivate this species on large scale should be made.

BIOLOGY AND POTENTIAL VALUE: Fls. and frts.: June-October. It is the principal constituent of 'A. ferox' and is the chief Indian Aconite now exported.

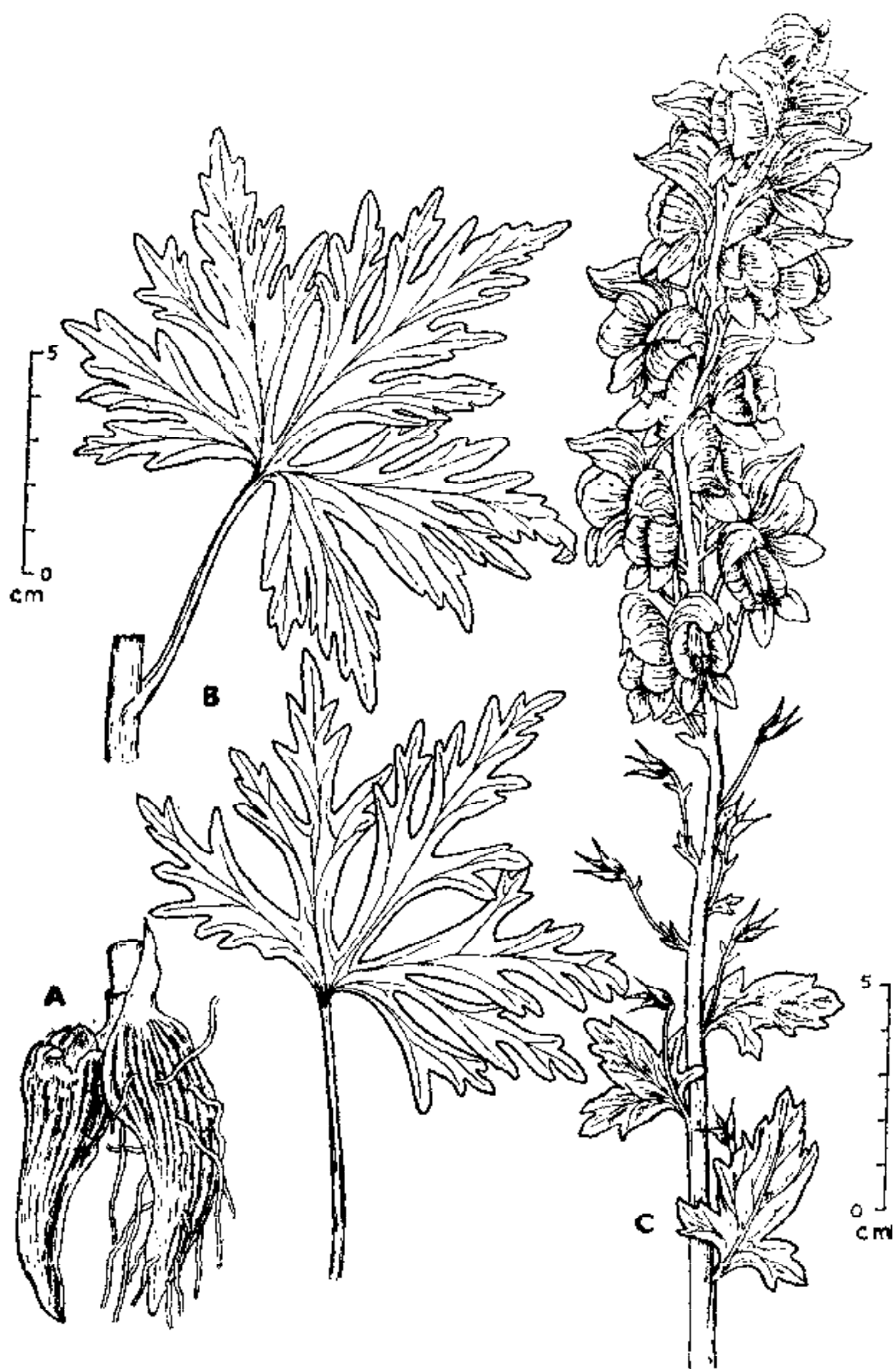
CULTIVATION: Not known in cultivation.

DESCRIPTION: Tall, erect herb with paired tuberous roots. Stem few feet high, straight, simple, terete, finely pubescent in the upper part. Leaves 10-12, scattered, upper leaves sparingly hairy; petiole slender, 5-7 cm long, dilated at the base; blade reniform or ovate-reniform with a very wide sinus or truncate base, 5-partite almost to the base, lobes deeply lacinate. Inflorescence racemose, simple or often with additional branches, 30-40 cm long, lax, greyish-crispo-pubescent, lowest bract leaf-like, rest are much reduced, coarsely dentate. Sepals blue, crispo-puberulous, uppermost helmet-shaped, depressed, 17-22 x 7 mm, produced into a short beak; laterals 14-18 mm long; lower 10 mm long, oblong, obtuse, deflexed. Nectaries hispidulous all over. Carpels 3, oblong, adpressedly greyish-pubescent, style long. Seeds obconic, 3 mm long, terete with numerous transverse lamellae.

REFERENCES:

1. Basu, B. D. (1918). *Indian medicinal plants*, Part 1, i. 15.
2. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened plants of India. A State-of-the-Art Report*. Botanical Survey of India & M.A.B., New Delhi. p. 12.
3. Stapf, O. (1904). *Aconites of India—A monograph*, p. 158, t. 103.

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



Aconitum deinorrhizum Stapf A. Rootstock. B. Cauline leaf. C. Inflorescence (after Stapf)

STATUS: Vulnerable; due to excessive collection for medicinal uses.

DISTRIBUTION: Himachal Pradesh to Sikkim. Endemic.

HABITAT AND ECOLOGY: Temperate to alpine regions of Himalaya in the alt. of 3300-5000 m.

CONSERVATION MEASURES TAKEN: None specifically for this species although some of its habitats fall within some National Parks in the region.

CONSERVATION MEASURES PROPOSED: Collection of this species from wild in bulk quantities should be banned. The species may be tried for cultivation in order to obtain plant material in sufficient quantities for commercial exploitation.

BIOLOGY AND POTENTIAL VALUE: Fls. and Frts.: July-November. It is a rare, poisonous species, used for curing many diseases and also used as arrow poison. The so called 'A. ferox' of Indian commerce or 'Indian Aconite', now available is a mixture of *A. deinorrhizum* and *A. balfourii*.

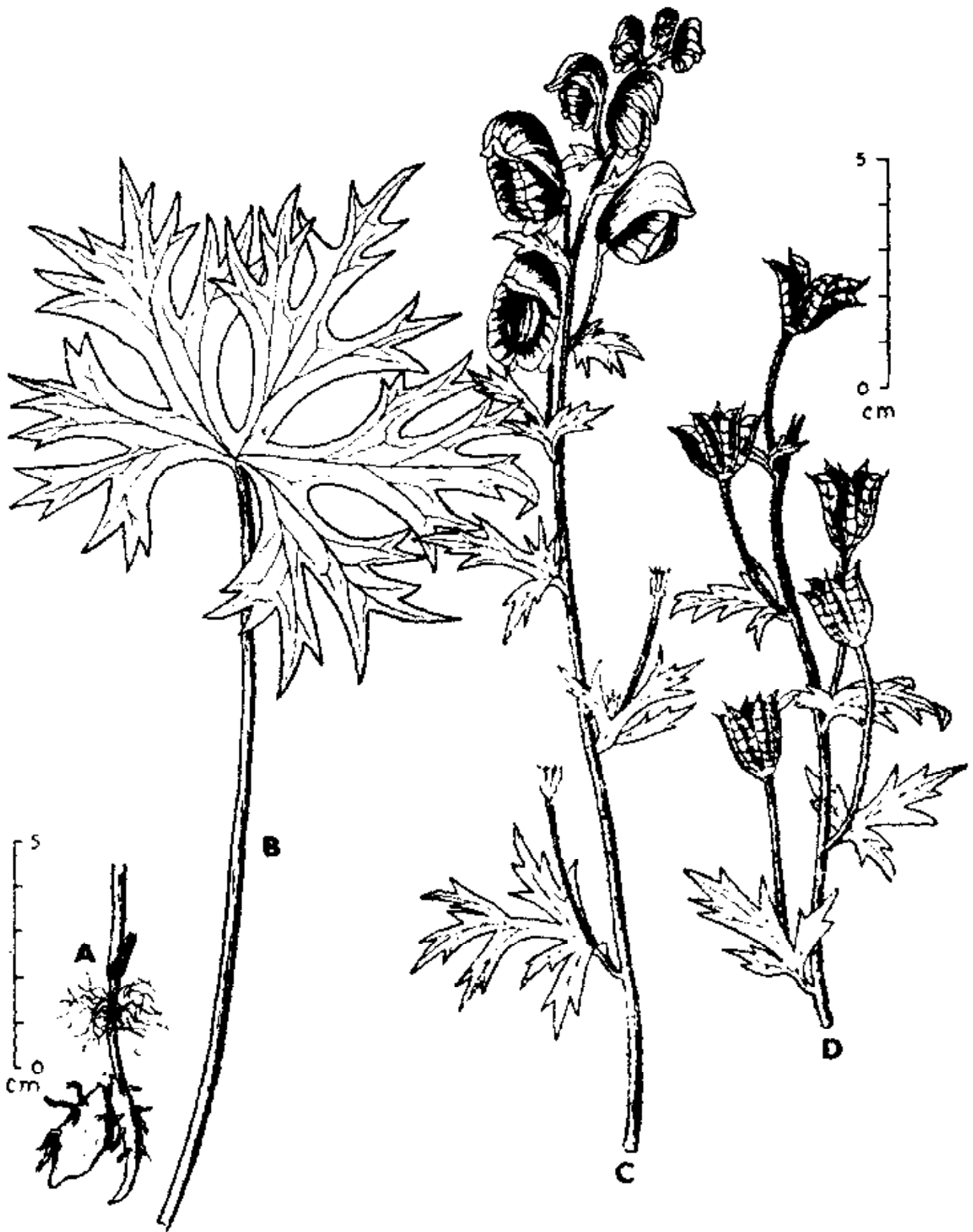
CULTIVATION: Not known in cultivation.

DESCRIPTION: Erect, puberulous herbs with paired, tuberous roots. Leaves scattered, distant, glabrous or the uppermost very sparingly hairy, 7-15 cm, lobes cuneate-ovate, incised; petiole slender, upto 25 cm long, dilated at the base. Racemes 15-30 cm long, simple or sparingly branched below, tomentose; bracts pinnatifid; bractioles linear. Flowers large, pale blue. Helmet about twice as long as high. Carpels five, tomentose, gradually passing into style. Follicles oblong, 15-20 × 4-5 mm, loosely subtomentose, conspicuously reticulate. Seeds obovoid to obpyramidal, 2.5-3 mm long, winged along the raphe, transversely lamellate on the faces, lamellae undulate.

REFERENCES:

1. Hooker, J. D. & Thomson, T. (1872). *Fl. Brit. India* 1: 28.
2. Stapf, O. (1904). *Aconites of India—A monograph*, p. 169, t. 109, figs. 1-16.

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



Aconitum ferox Wall. ex Ser. A. Tuber. B. Basal leaf. C. Inflorescence. D. Infructescence (after Stapf).

STATUS: Endangered. Causes for its decline are the clearance of forests for the development of factories and agricultural purposes. It has not been collected since 1932, but it is likely that plants may still be surviving.

DISTRIBUTION: Endemic to Khasi Hills in Meghalaya, in the North-eastern region of the country. It was first collected by Griffith in 1837 from Nongkhlow; Hooker and Thomson collected it in 1850 from Cherrapunji and later in 1932 P. C. Kanjilal located this species in the Mamloo forest, Khasi Hills. It could not be collected after 1932.

HABITAT AND ECOLOGY: It grows in the sub-tropical forest areas and around water sources and on humus rich soils. During the growing period of June to October, the high rainfall coupled with optimum temperature facilitate this annual herb to grow profusely.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Mawsmai forest of Cherrapunji has been declared as reserve forest by the state forest department and an attempt should be made to rehabilitate this species in that area. The other area, i.e., Mamloo forest is completely destroyed for development of a cement factory. (b) Efforts are also being made to locate and rehabilitate this species in the Nongkhlow forest, another earlier known locality.

BIOLOGY AND POTENTIAL VALUE: Not known, but an annual climber of botanical interest. However, the species with its foliage and flower clusters should be of horticultural importance. Flowers in July to August.

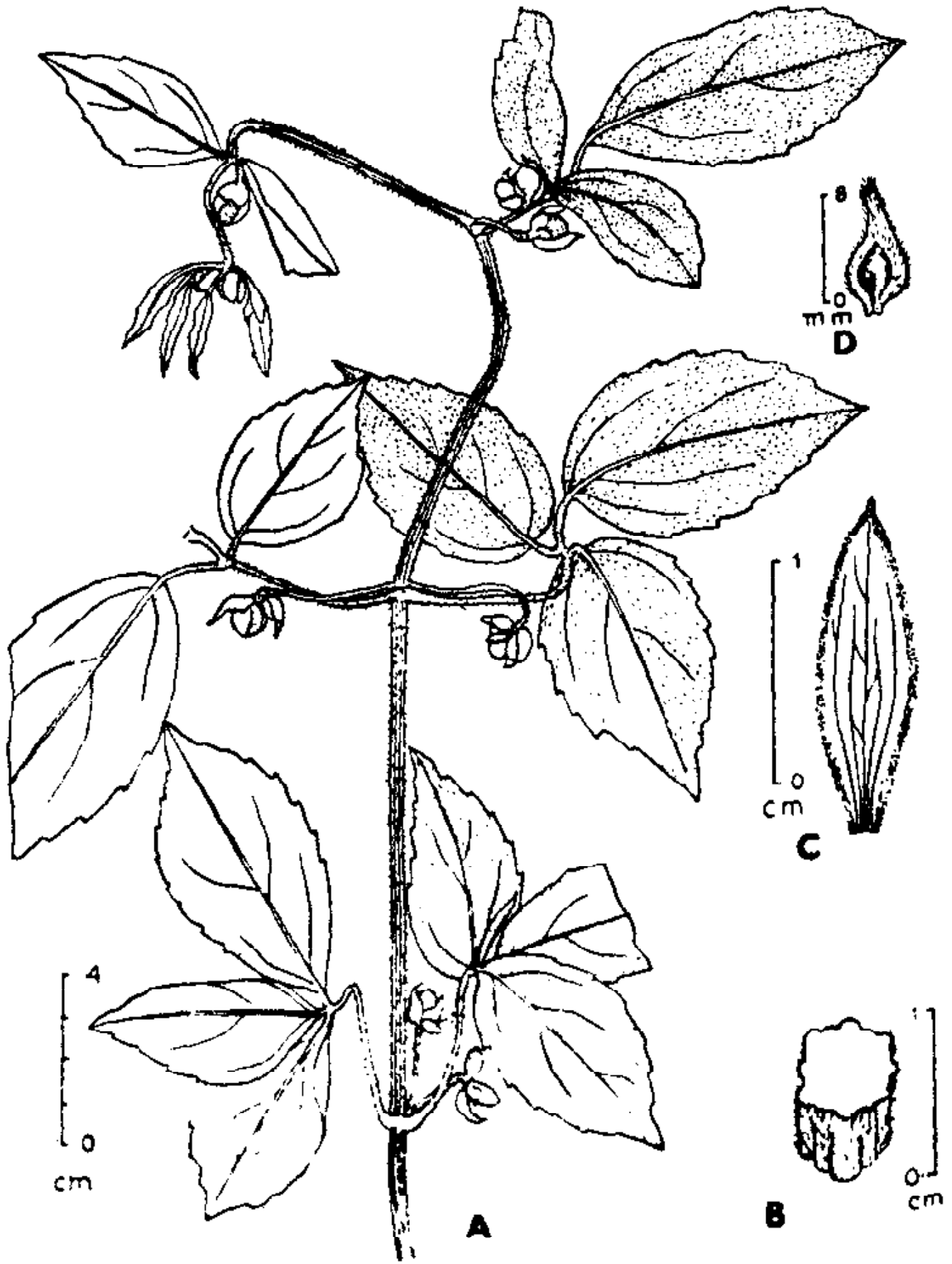
CULTIVATION: This species is not known in cultivation.

DESCRIPTION: A slender woody climber; branches with more than 6 ribs. Leaves opposite, 3-foliolate, sometimes simple, hairy on both surfaces. Leaflets 2.6-7 0.8-4.6 cm, usually toothed at margin, petiole ca 2.6-6.5 cm long. Flowers in axillary fascicles with naked pedicels, tepals ca 4-7 × 1-3 mm, oblong, tomentose outside. Stamens glabrous, connective produced into a minute mucronule beyond the anther. Achene broad-ovate or obovate, hairy.

REFERENCES:

1. Hooker, J. D. (1872). *Fl. Brit. India* 1: 2-6.
2. Kanjilal, U.N., et al (1934): *Fl. Assam* 1 (1): 1-6.
3. Kapoor, S. L. (1962): *Bull. Nat. Bot. Gardn. Lucknow* 78: 1-67.
4. Kapoor, S. L. (1966): *Bull. Nat. Bot. Gardn. Lucknow* 124: 5-6.
5. Mukherjee, S. K. (1959): *Bull. Bot. Surv. India* 1(1): 138.

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



Clematis opiculata Hook. f. et Thoms. A. Habit. B. T.S. of Stem. C. Sepal. D. Achene.

STATUS: Vulnerable. Causes for its decline are forest fires and excessive collecting by horticulturists; only 10 specimens collected between 1878 and 1911, excluding *R. Wight* 925, all are preserved in CAL.

DISTRIBUTION: Endemic to three neighbouring localities in Tamil Nadu, viz., the Nilgiri, the Pulney and Kodaikanal hills; first collected by Lady Norton (vide *Wallich Num. list no.* 661) from Jugo in the Nilgiri Hills and was thence introduced to England in 1824.

HABITAT AND ECOLOGY: This strictly evergreen species is restricted to higher altitudes between 1525 to 4040 m around the type locality.

CONSERVATION MEASURES TAKEN: None for the species or its wild habitat, although its distributional localities in the Nilgiris are now included in the Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: To declare several localities in the hills of Kodaikanal, Pulneys and the Nilgiri, where the species occurs in abundance, as protected reserves; to introduce the species in botanic gardens for *ex-situ* conservation.

BIOLOGY AND POTENTIAL VALUE: This is the tallest-growing and finest of the strictly evergreen Cotoneasters. The shrub produces clusters of small white flowers, succeeded by quantities of rich crimson red drupes—all these virtues rendering the species a favourite with the gardeners and horticulturists.

CULTIVATION: It is well-known in cultivation in the higher altitudes and introduced successfully in England in 1824, and continued to hold interest over the last one hundred and fifty years in U. K. It is also grown in large groupings or massing in the pleasure grounds and for the shrubbery border and also planted as an informal hedge or borderline species between the garden proper and the adjoining woodlands. (4).

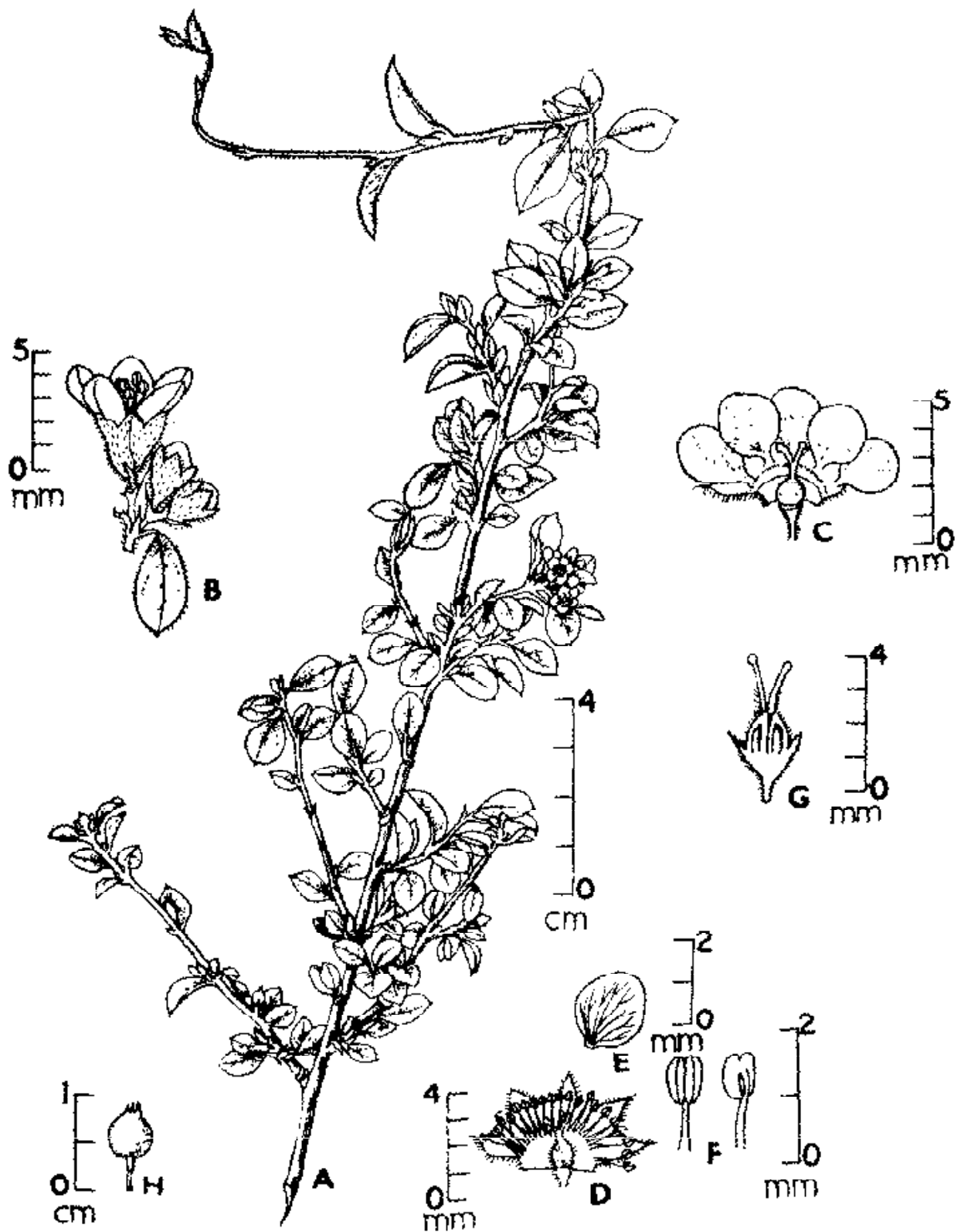
DESCRIPTION: Shrub, 2.5-3.5 m high, strictly evergreen, rigid, erect, profusely branched, branches long and slender, covered when young with ash-grey tomentose hairs, but becoming subglabrous or scattered tomentose at age. Leaves 15 mm x 5 mm, dark green above and tomentose beneath, lamina subcoriaceous, elliptical, obovate or ovate, apex frequently obtuse or acute, rarely short acuminate-mucronate, base obtuse or cuneate, margin recurved; petiole 1-4 mm long, tomentose. Inflorescence erect with clusters of 1-8 flowers per peduncle, peduncle and pedicel short, tomentose; flowers 7-9 mm across; petals white, spreading; hypanthium tomentose with dentate calyx-lobes. Drupe subglobose, 7 x 5 mm, scarlet red when ripe, with 2 nutlets inside.

REFERENCES:

1. Fyson, F. (1920). *Flora of Nilgiri and Pulney Hill tops* 3: 44, t. 328.
2. Klotz, G. (1963). Neue oder Kritische Cotoneaster-Arten II, *Wiss. Z. Univ. Halle, Math.* 12(10): 773.

3. Lindley, J. (1829). *Bot. Reg.*, p. 15 sub. t. 1229.
4. Osborn, A. (1923). The genus *Cotoneaster*. *The Garden* 87: 23.
5. Wallich, N. (1829). Numerical List No. 661.
6. Wight, R. (1838). *Spicilegium Neilgherrense*, p. 53, t. 65.
7. Wight, R. (1845). *Jc. Plant. Ind. Orient.* p. 992.

The material for this sheet was supplied by G. Panigrahi and Arvind Kumar, Botanical Survey of India, Howrah.



Cotoneaster buxifolius Wall. ex Lindl. A. Habit. B. Flower. C. Flower-dissected. D. Calyx, Stamens & Carpel. E. Petal. F. Stamens. G. L. S. of carpel. H. Fruit.

STATUS: Indeterminate: represented by only four collections in the Central National Herbarium (CAL) collected between June 1884 and 1909 from the Lachung Valley (3150 m) in north Sikkim. Since the area is not fully surveyed, there may be pockets of its wild population.

DISTRIBUTION: Endemic in Sikkim Himalaya. The place of origin of the seeds from which the plants were raised for Baker's tab. 55(1) is not "Khasia mountains" (1), but Sikkim Himalaya (3).

HABITAT AND ECOLOGY: Restricted to temperate-subalpine altitudes (1545—3152 m) in Sikkim; it is a deciduous or semi-evergreen shrubby species quite hardy against frost.

CONSERVATION MEASURES TAKEN: None for the wild habitat.

CONSERVATION MEASURES PROPOSED: Lachung valley (3150 m) in Sikkim may be declared a protected area by the Government of Sikkim or the Central Government, not only for the protection of this species, but also for the rich potential germ-plasm endemic to the valley.

BIOLOGY AND POTENTIAL VALUE: A semi-evergreen or deciduous shrub, to 4 m high is popular among the gardeners and horticulturists, not only for its shining leaves, 2-5 flowers per peduncle, but also for its bright scarlet red edible berries. It was introduced in England in 1860s and has been multiplied in cultivation ever since. In mild winters it retains many of its leaves until Christmas. It is an excellent shrub for massing and invariably produces berries freely. The species is named after Mr. Simons, under the mistaken belief that the seeds of the species came from Khasia Hills where Simons was collecting plants at the time.

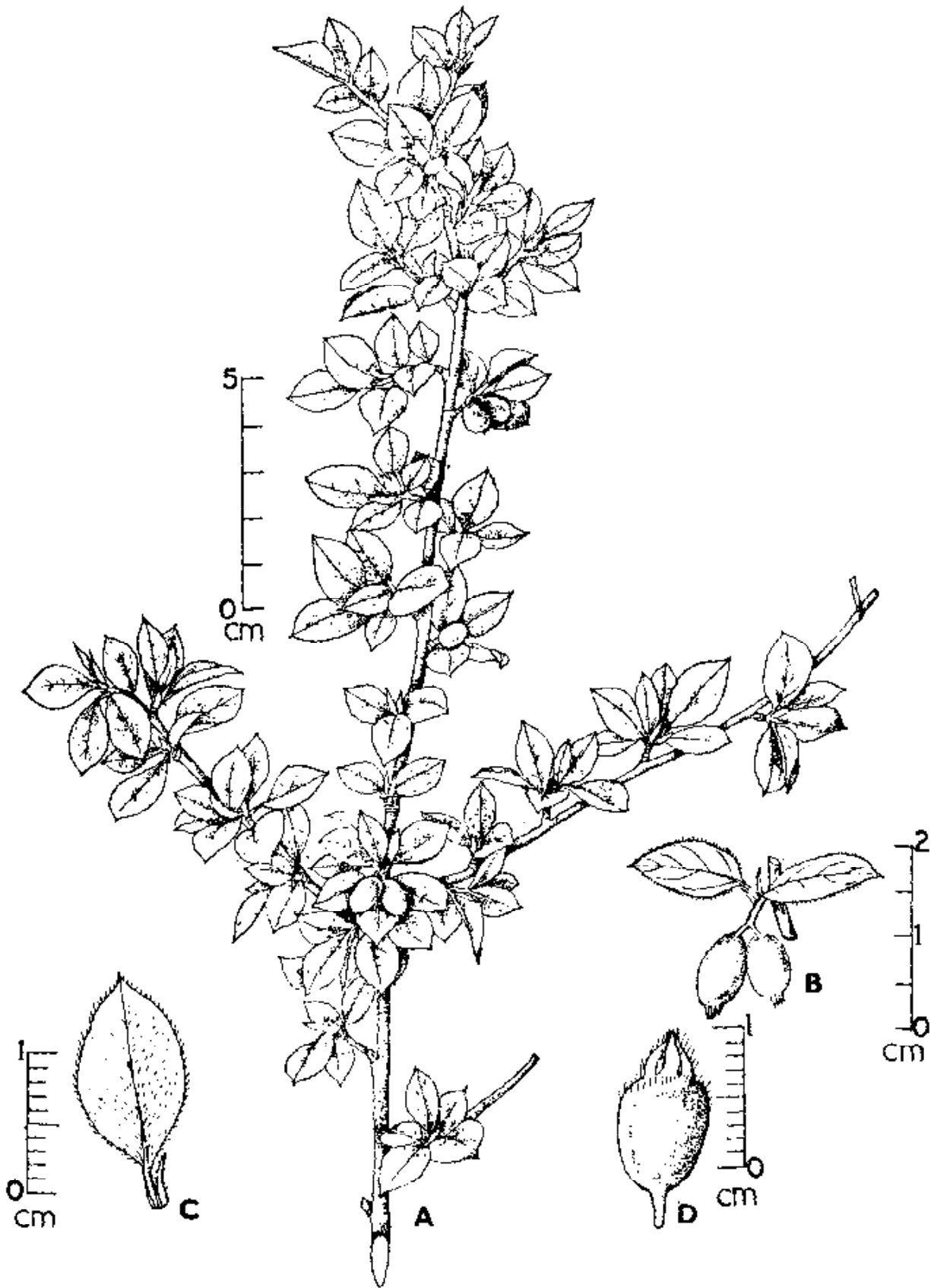
CULTIVATION: The species is easily propagated from its seeds, cuttings, layering, vegetative multiplication ensuring more efficient propagation and retention of quality. The species is an ideal horticultural attraction for the gardeners in temperate latitudes/altitudes. Frequently cultivated and occasionally naturalised in N. W. Europe.

DESCRIPTION: Erect shrub, deciduous or semi-evergreen, 3-6 m high, slender branches strigose pubescent and persisting to 2-3 years. Leaves elliptic-obovate, cuneate at the base, narrowing above the middle to a mucronate apex, dark green above and pubescent beneath when young, pale green beneath and sparsely strigose, chiefly on the veins and margin. lamina 25-15 mm, subcoriaceous; petiole 2-4 mm long, pubescent. Flowers 2-4 in short cymes; calyx tube appressed pubescent at the upper half only; sepals triangular; petals upright, white with red markings. Fruit short, turbinate, ca 8 mm long, shortly ellipsoidal or obovoid, with 3-4 nutlets per fruit. Ripe drupe scarlet red and edible.

REFERENCES:

1. Baker, J. G. (1869). Natural order Rosaceae, tribe Pomeae, genus *Cotoneaster*. *Refig. bot.* 1: t. 55.
2. Hooker, J. D. (1878). *Fl. Brit. India* 2: 386.
3. Klotz, G. (1963). The *Cotoneaster* of the *C. nitidus* Jacques Group. *Bull. Bot. Surv. India* 5 (3 & 4): 208.
4. Osborn, A. (1923). The genus *Cotoneaster*. *The Garden* 87: 42.
5. Rehder, A. (1940). *A Manual of cultivated trees and shrubs*, p. 349. (Second revised ed.)
6. Schneider. (1906). *Illus. Handb. Laubholz.* 1: 746, fig. 419, f.

The material for this sheet was supplied by G. Panigrahi and Arvind Kumar, Botanical Survey of India, Howrah.



Cotoneaster simonsii Hort. ex Baker A. Habit. B. Fruits. C. Leaf. D. Mature fruit.

STATUS: Endangered. Due to developmental activities its natural habitat has suffered changes.

DISTRIBUTION: Tamil Nadu, Tirunelveli. Endemic.

HABITAT AND ECOLOGY: In humid, dense, evergreen forests.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Should be cultivated in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Its beautiful flowers deserve attention for cultivation as an ornamental plant.

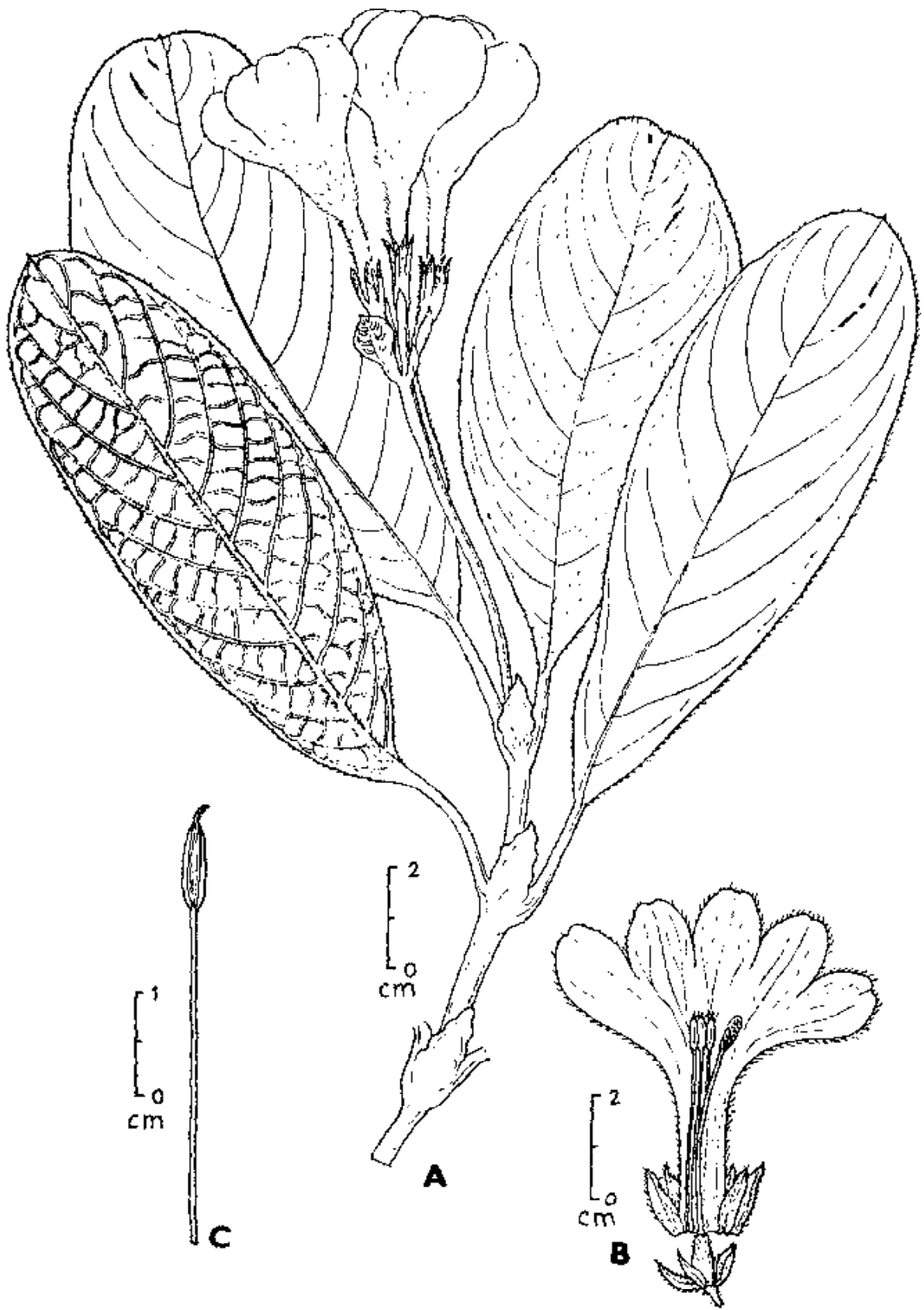
CULTIVATION: Not known to have been cultivated anywhere.

DESCRIPTION: A low silky villous undershrub. Leaves opposite, simple, 10-18 × 3.5-7.5 cm, elliptic or oblong-obovate, entire, rounded at apex, glabrous or with short hairs above, pubescent on the nerves beneath; stipules interpetiolar, triangular. Inflorescence subterminal, long peduncled, silky bracteate cymes. Calyx tube oblong; lobes 5, linear, about 1 cm long. Corolla pale blue, villous; tube about 4 cm long, narrowly funnel shaped; lobes 5, oblong, rounded. Stamens 5, included within the tube; filaments filiform; anthers included, cohering in a tube, pointed and spurred at their tips. Ovary 1-celled; style filiform; stigma clavate, furrowed; ovules numerous in 2-parietal, 2-lamellate placentas. Fruit a berry, 2-celled, many seeded.

REFERENCES:

1. Beddome, R. H. (1874). *Icon. Pl. Ind. Orient.* t. 25.
2. Hooker, J. D. (1880). *Fl. Brit. India* 3: 93.

The material for this sheet was supplied by D. B. Deb, Botanical Survey of India, Howrah.



Acranthera grandiflora Bedd. A. Habit B. Floral parts. C. Stamen.

STATUS: Endangered, due to natural habitats being depleted for developmental activities.

DISTRIBUTION: Tamil Nadu, Trunelveli District. Endemic.

HABITAT AND ECOLOGY: On forest floor at about 200 m in alt.

CONSERVATION MEASURES TAKEN: None on record.

CONSERVATION MEASURES PROPOSED: To protect the habitat where it is now growing; cultivation of the plant in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest. Sufficient study of the plant has not been made.

CULTIVATION: Not known in cultivation.

DESCRIPTION: A herb, woody at base; stem glabrous, obtusely angular to terete, pinkish in colour, with stipular scars below and crowded leaves above. Leaves opposite, petiolate, 9-11 x 2-2.5 cm, lanceolate, acuminate, narrowed to the petiole at base, submembranous, pale green in colour, glabrous; nerves 6 pairs, rigid below; petiole 1-1.5 cm long; stipules interpetiolar, free, 2-3.5 x 7-10 mm long, ovate, pectinate with long glabrous teeth, black glandular at the tip. Inflorescence axillary cyme with 5-7 mm long peduncle. Flowers 5-6 mm long, epigynous, heterostylous; pedicel 0.7-1 cm long, slender, glabrous. Calyx lobes 4, about double the calyx tube, lanceolate, 1.5-2 mm long, erect, glabrous. Corolla white, tubular, 1.8-2 mm long, densely pubescent at throat inside; lobes 1.8-2 mm long, ovate, acute, recurved, minutely pubescent inside. Stamens 4, at the sinus of the corolla lobes; filaments short in long styled flowers and long in short styled ones, 0.5-2 mm long; anthers 1-1.5 mm long, linear-oblong. Ovary inferior; style 2-7 mm long, exserted or not; stigma 0.5-0.7 mm long, bilobed, papillose. Capsule globose, 2-3 mm across, glabrous. Seeds few to many, angular; testa reticulate, brownish.

REFERENCES:

1. Beddome, R. H. (1874). *Icon. Pl. Ind. Orient.*, t. 3.
2. Rama Rao, T. (1914). *Flowering plants of Travancore*, p. 204.
3. Sebastine K. M. & Vivekananthan, K. (1967). *Bull. Bot. Surv. India* 9: 173.

The material for this sheet was supplied by D. B. Deb and (Mrs.) Ratna Dutta, Botanical Survey of India, Howrah.

STATUS: Endangered. Known only from the original collection made about 100 years ago. Though the region has been well-explored, it could not be rediscovered.

DISTRIBUTION: Palghat hills, Kerala. Endemic.

HABITAT AND ECOLOGY: In open grasslands at about 2000 m in altitude.

CONSERVATION MEASURES TAKEN: None. Silent Valley is now protected.

CONSERVATION MEASURES PROPOSED: Efforts should be made to collect the plants from the original habitat in Palghat district, particularly in Silent Valley area, Kerala state and if available to introduce the species in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: A plant of academic and distribution interest. Flowers and fruits during March-May.

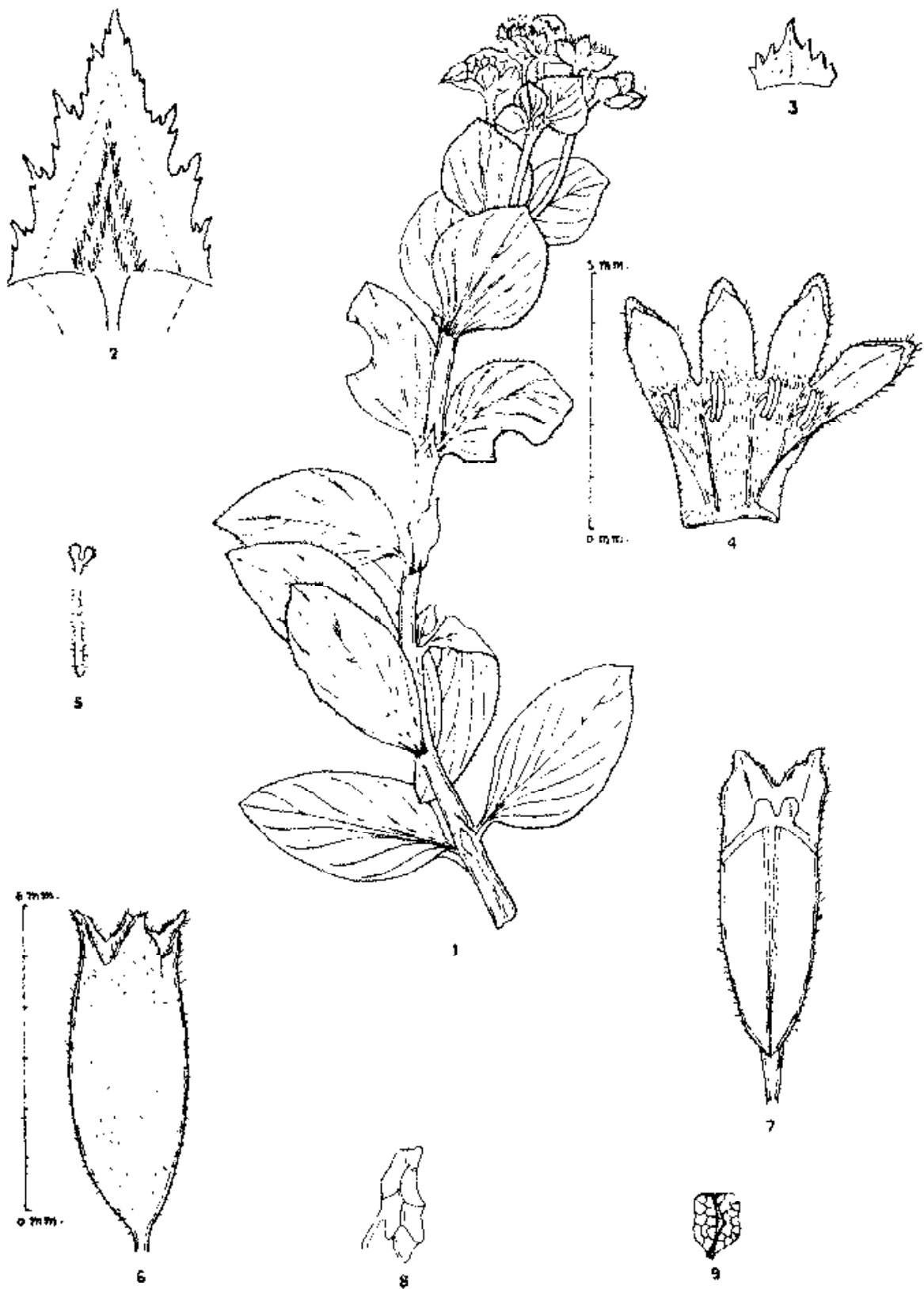
CULTIVATION: Not taken up anywhere.

DESCRIPTION: A dichotomously branching shrub, 15-20 cm high; stem white barked, nodose, terete below, angular, glabrous or strigose above. Leaves sessile or subsessile, 0.7-4 × 0.6-2 cm, elliptic-ovate or oblong, acute at apex, sometimes contracted into a short flattened petiole at base, recurved at margin, scabrid, coriaceous; lateral nerves 6-9 pairs, channelled above; stipules 2, connate, 2-3 × 4-5 mm, triangular, toothed, villous in the centre. Inflorescence terminal from upper leaf-axils, sessile, capitate cymes, with 2-6 involucral bracts below; peduncles 2-3 cm long, strigose. Flowers sessile, 7-8 mm long, epigynous, bracteate; bracts 1.5 × 1 mm, foliaceous. Calyx campanulate, hispid; tube produced above ovary; lobes 4, ovate, 1-1.2 mm long, acute. Corolla 4-5 mm long; throat densely woolly inside; lobes 4, beaked, setulose at apex outside. Stamens 4, arising below the sinus of the corolla lobes; filaments 0.5-1 mm long; anthers linear-oblong, 1-2 mm long. Ovary inferior; style 1-2 mm long with spreading hairs; stigma bilobed, pilose hairy. Capsule oblong or subglobose, 2-3 × 1-2 mm, hispid, dehiscing septicidally. Seeds 8-10 in each locule, planoconvex or angular, 0.7-1 × 0.5-1 mm, narrowly winged, testa reticulate, brownish in colour.

REFERENCES:

1. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 621.
2. Hooker, J. D. (1880). *Fl. Brit. India* 3: 52.

The material for this sheet was supplied by D. B. Deb and (Mrs.) Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis beddomei Hook. f. 1. Habit 2. Stipule. 3. Bract. 4. Corolla with stamens. 5. Style and stigma. 6. Capsule. 7. Capsule-dehiscence. 8. Placenta. 9. Seed.

STATUS: Possibly Extinct. It could not be collected during the last one hundred and fifty years, though the region has been explored fairly well during the last forty years.

DISTRIBUTION: Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: Hilly region in the Nilgiris.

CONSERVATION MEASURES TAKEN: None specific for the species. The Nilgiri area is now protected as a Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: Efforts should be made to collect the plant if it exists. If available it should be cultivated in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest not studied thoroughly. Flowering and fruiting time: May-April.

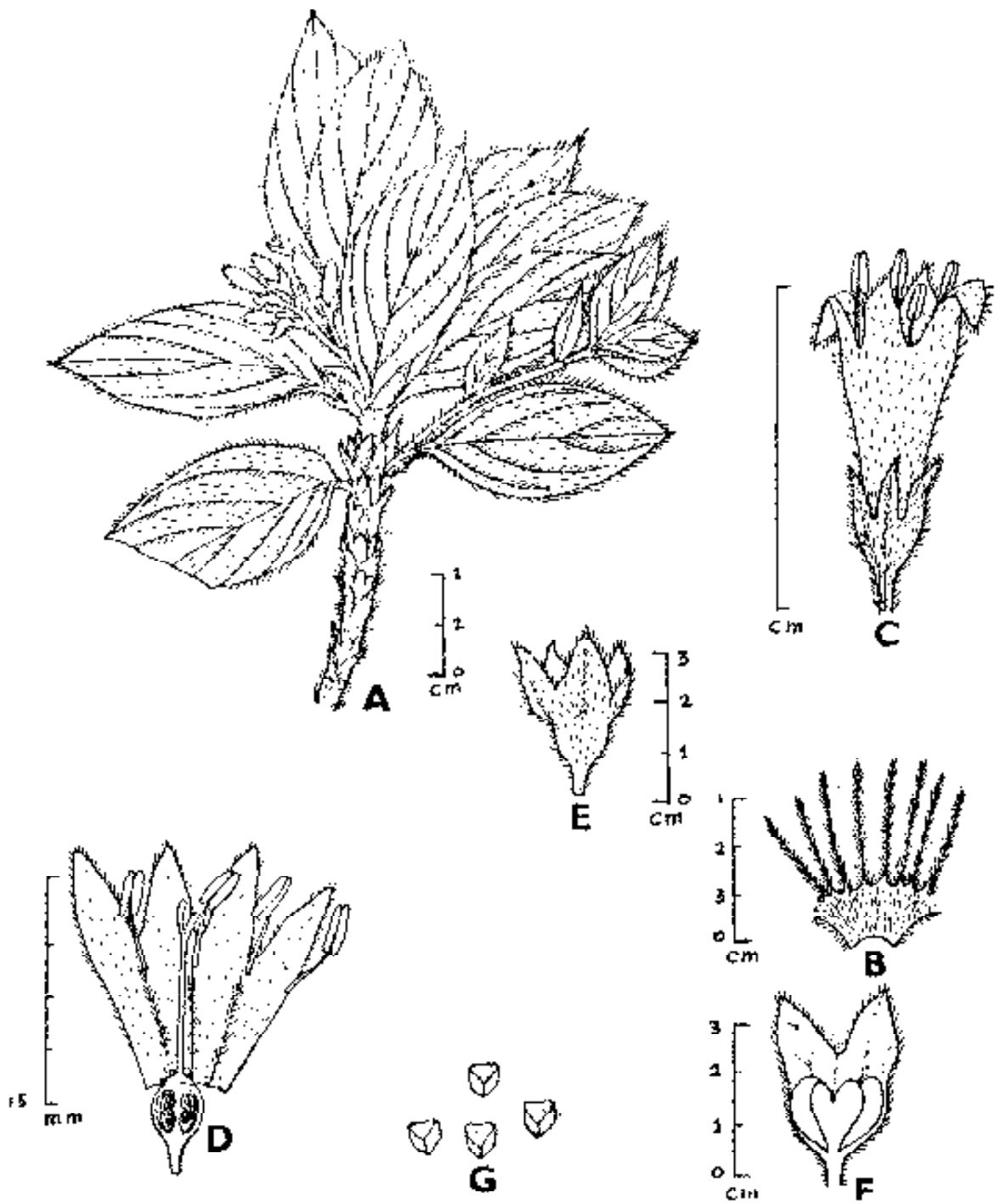
CULTIVATION: Not cultivated anywhere.

DESCRIPTION: Undershrub, 5-15 cm long, branches articulate with stipular scars, leafy above. Leaves opposite, sessile or shortly petioled, 1.5 × 0.8-2.5 cm, ovate or elliptic-lanceolate, mucronate at apex, attenuated at base, coriaceous, densely yellowish hirsute hairy; nerves 3-4 pairs, hirsute; petiole 1-2 mm long, hirsute; stipules interpetiolar, sheathing at base, deeply pectinate, hirsute. Inflorescence axillary, short pedunculate corymbose cymes, few flowered, densely hirsute. Flowers pedicelled, 18-20 mm long, bracteate, hirsute; bracts foliaceous; pedicel 1-2 mm long. Calyx tube much produced above ovary; lobes 4, lanceolate, 2.5- 3.5 mm long, acuminate. Corolla bell-shaped, tube 4-6 mm long, densely pubescent inside; lobes 4, ovate, acute, pubescent inside. Stamens 4, exserted; filaments 2-3.5 mm long, adnate at throat; anthers 1-2 mm long, oblong-linear. Ovary ovoid, 2-celled, with many ovules in medianly attached axile placenta; style 8-9 mm long, slender; stigma bilobed, fleshy, papillose. Capsule globose, 2.3 × 2-2.3 mm, hirsute, crown much below the calyx lobes. Seeds few, angular, narrowly winged, testa reticulate, brownish in colour.

REFERENCES:

1. Beddome, R. H. (1864). *Madras J. Lit. Ser.* 3, 1: 149.
2. Beddome, R. H. (1874). *Icon. Pl. Ind. Orient.* t. 2.
3. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 591.
4. Hooker, J. D. (1880). *Fl. Brit. India* 3: 55.
5. Kuntze, O. (1891). *Rev. Gen. Pl.* 1: 293.

The material for this sheet was supplied by D. B. Deb and (Mrs.) Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis hirsutissima Bodd. A. Habit. B. Stipule. C. Flower. D. Flower split open. E. Capsule. F. Dehiscent capsule. G. Seeds.

STATUS: Vulnerable. Natural habitats have undergone changes due to developmental activities. It has not been collected in recent years although the area has been well-explored.

DISTRIBUTION: Tamil Nadu and Kerala. Endemic.

HABITAT AND ECOLOGY: Grows in evergreen forest floors.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: To cultivate the plant in botanic gardens whenever available.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest, not studied thoroughly. Flowers and fruits: March-April.

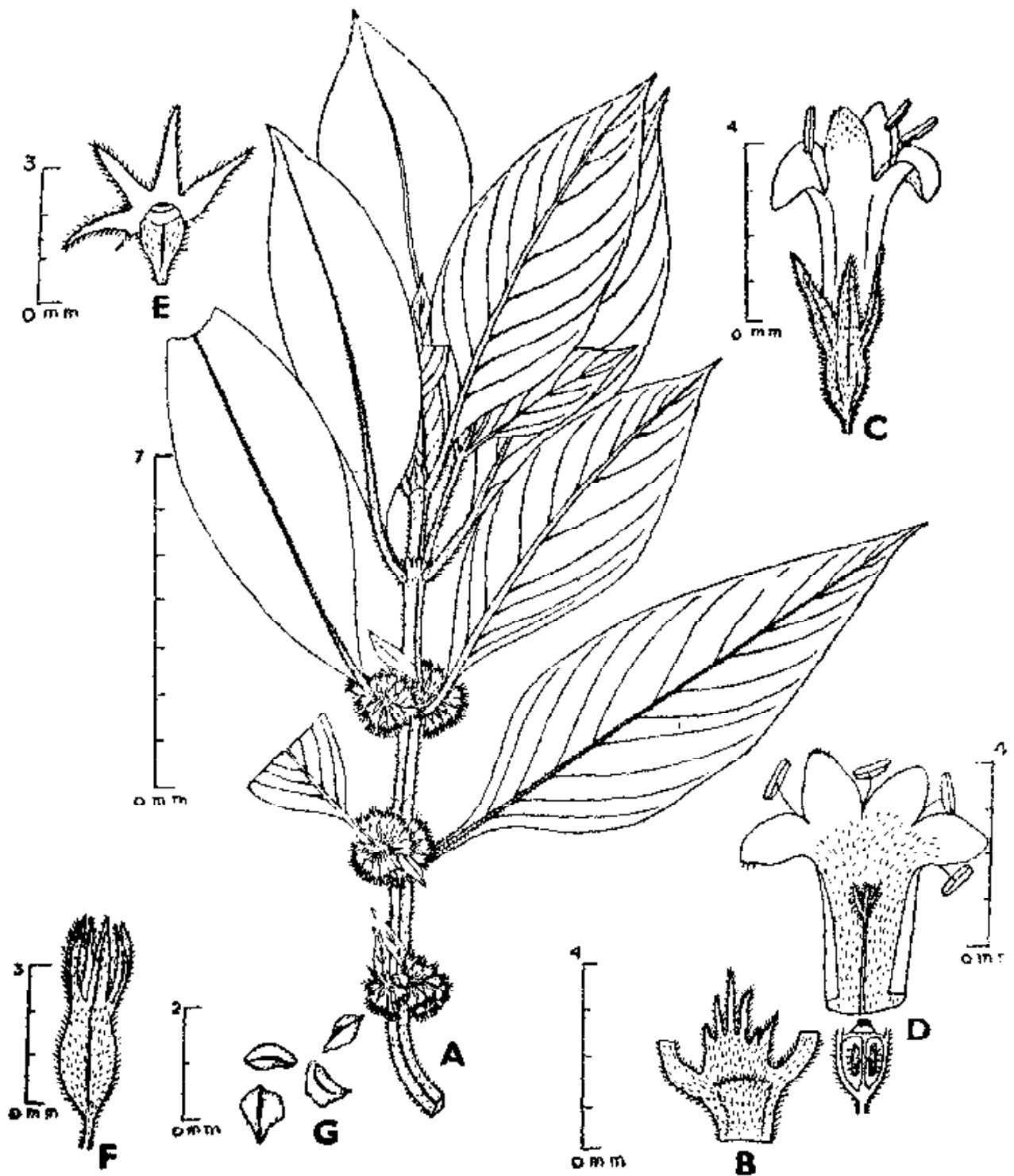
CULTIVATION: Not taken up anywhere.

DESCRIPTION: An undershrub with whitish obtusely angular, puberulous stem. Leaves opposite, petiolate, 8-12 × 3-4 cm, lanceolate or elliptic-lanceolate, acuminate at apex, narrowed to the petiole at base, membranous, puberulous, scabrid at margin; lateral nerves 8-10 paired; petiole 1-2 cm long, puberulous; stipules interpetiolar, 2-3 × 3.5 mm, triangular, whitish, with 4-6 bristles, puberulous. Inflorescence axillary, subpedunculate cymes, densely puberulous. Flowers pedicelled, epigynous, 6-7 mm long, puberulous; bracts linear, 1-2 mm long. Calyx tube slightly extended over the ovary; lobes 4, linear-lanceolate, 1.5-2 mm long. Corolla white, tubular, 4-5.5 mm long; tube 3-3.5 mm long, pubescent inside; lobes ovate-lanceolate, hispid outside. Stamens 4, exserted, filaments about 1.5 mm long, anthers linear. Ovary subglobose, 2 celled, 10-12-ovuled in medianly placed axile placenta; style 2-2.5 mm long, slender, glabrous; stigma swollen, bifid, papillose, included. Capsule ovoid or ellipsoid, 8-10 ribbed, 2-2.8 mm long, glabrescent, with persistent calyx lobes; crown angular. Seeds 20-24, angular, narrowly winged, reticulate, brownish or blackish.

REFERENCES:

1. Gamble, J. S. (1919). *Kew Bull.* 1919: 405.
2. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 599.
3. Rolla Rao & Hemadri, K. (1973). *Ind. For.* 90: 378.

The material for this sheet was supplied by D. B. Deb and (Mrs.) Ratna Dutta, Botanical Survey of India, Howrah.



Hedyotis ramarowii (Gamble) Rolla Rao et Hemadri A. Habit. B. Stipule. C. Flower. D. Flower split open. E. Hypanthium with calyx F. Capsule. G. Seeds.

STATUS: Possibly Extinct. It has not been seen in natural habitats after the original discovery in 1937, though the region has been well-explored during the last thirty years. Its habitats may have undergone changes due to developmental activities.

DISTRIBUTION: Kerala (Travancore). Endemic.

HABITAT AND ECOLOGY: On forest floor of high mountains.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Efforts should be made to collect the plant from its type locality and cultivate in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest. Flowers and fruits in September.

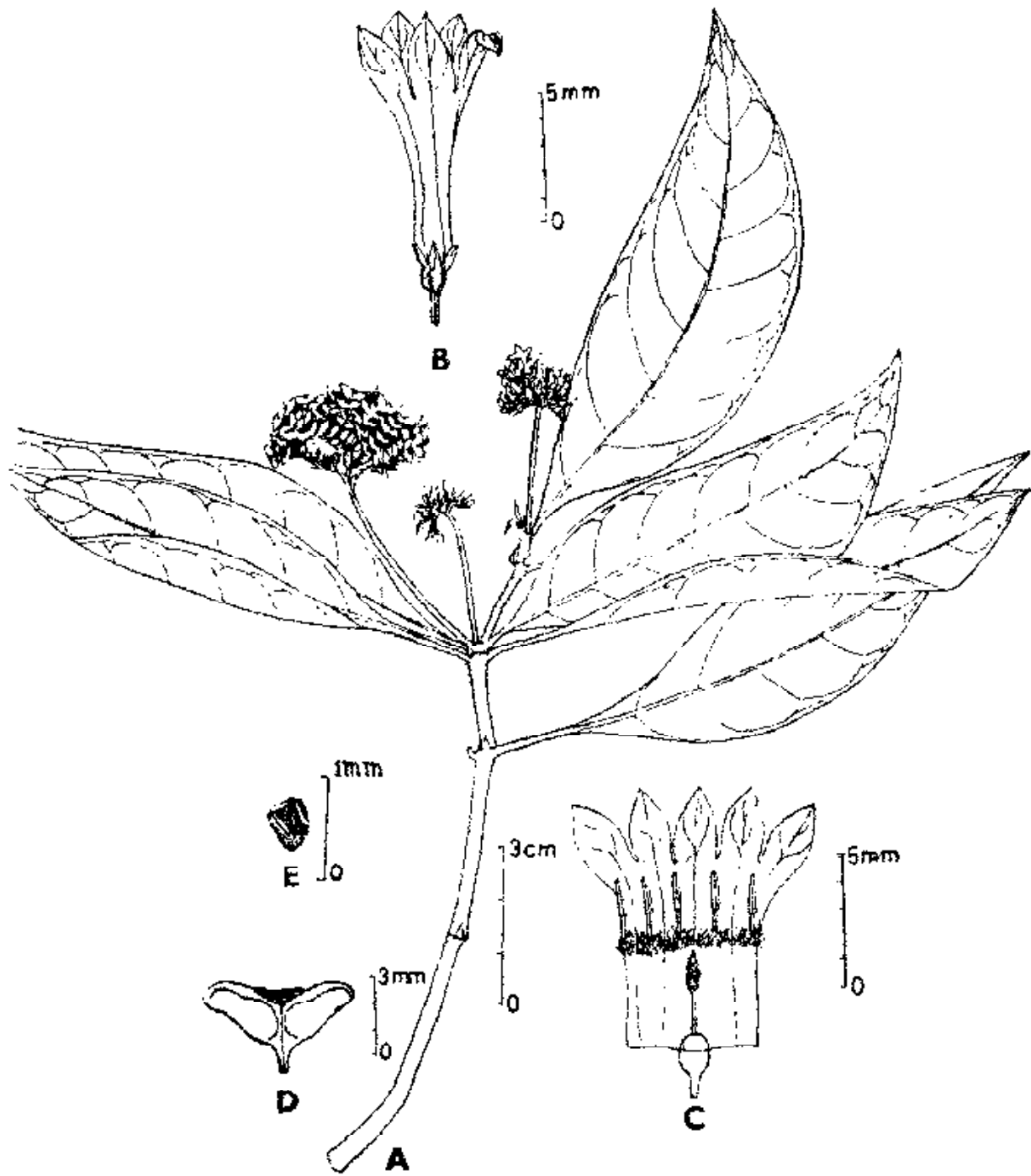
CULTIVATION: Not taken up anywhere.

DESCRIPTION: Herbs, woody at base, puberulous above. Leaves opposite, 5-13 × 1.4-5 cm, ovate-lanceolate to lanceolate, caudate-acuminate at apex, tapering to the petiole at base, slightly unequilateral, glabrous, dark green above, pale below; lateral nerves 6-9 pairs; petiole 1-3 cm long, glabrous; stipules interpetiolar, subulate, glabrous. Inflorescence axillary, trichotomously corymbose, 1-1.75 cm across; peduncle slender, glabrous, 2.5-3 cm long, elongating upto 6 cm on fruiting. Flowers bracteate, bracteolate, pedicellate, epigynous, 9-11 mm long; pedicels 1-1.25 mm long, glabrous, bracts and bracteoles similar, persistent, linear, glabrous. Calyx tube obovoid, glabrous; calyx lobes 5, 0.75-1 × 0.4-0.6 mm, ovate-lanceolate, acute, glabrous. Corolla 8.25-10 mm long, infundibuliform, glabrous outside, with a villous ring inside slightly below the middle and just above the insertion of filaments; lobes 5, ovate, acute, glabrous, 2.75-3.25 × 1.5-1.8 mm. Stamens 5, adnate to the middle of corolla tube or slightly below, inserted; filaments 2.5-2.75 mm long, glabrous; anthers 1.25-1.5 mm long, linear-oblong. Ovary inferior, obovoid; disc 0.5-0.6 mm high; style 1.5-2.5 mm long, glabrous; stigma 2-lobed, warty. Capsule 1.5-3 × 4.5-8 mm, glabrous, 2-locular; locules ovate-oblong with straight tip. Seeds 0.4-0.5 × 0.4 mm, 5-8 angular, glabrous, brown; testa areolate, tubercled on the thick wall.

REFERENCES:

1. Fischer, C. E. C. (1939). *Kew Bull.* 1939: 248.
2. Sebastine, K. M. (1962). *Bull. Bot. Surv. India* 4: 223.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza barnesii Fisch. A. Habit. B. Flower. C. Flower split open. D. Capsule. E. Seed.

STATUS: Presumed Extinct. There are only a few gatherings in the herbaria. It has not been collected after 1952, though the region has been well-explored.

DISTRIBUTION: Tamil Nadu, Kerala and Karnataka. Endemic to hills of South India.

HABITAT AND ECOLOGY: Grows on damp, shady places or in rocky slopes at 930-2150 m in altitude.

CONSERVATION MEASURES TAKEN: Nonespecifically for the species.

CONSERVATION MEASURES PROPOSED: To cultivate the plants in botanic gardens if found in natural habitats and to protect its distribution areas.

BIOLOGY AND POTENTIAL VALUE: A plant of botanical interest. Flowers and fruits: February-August.

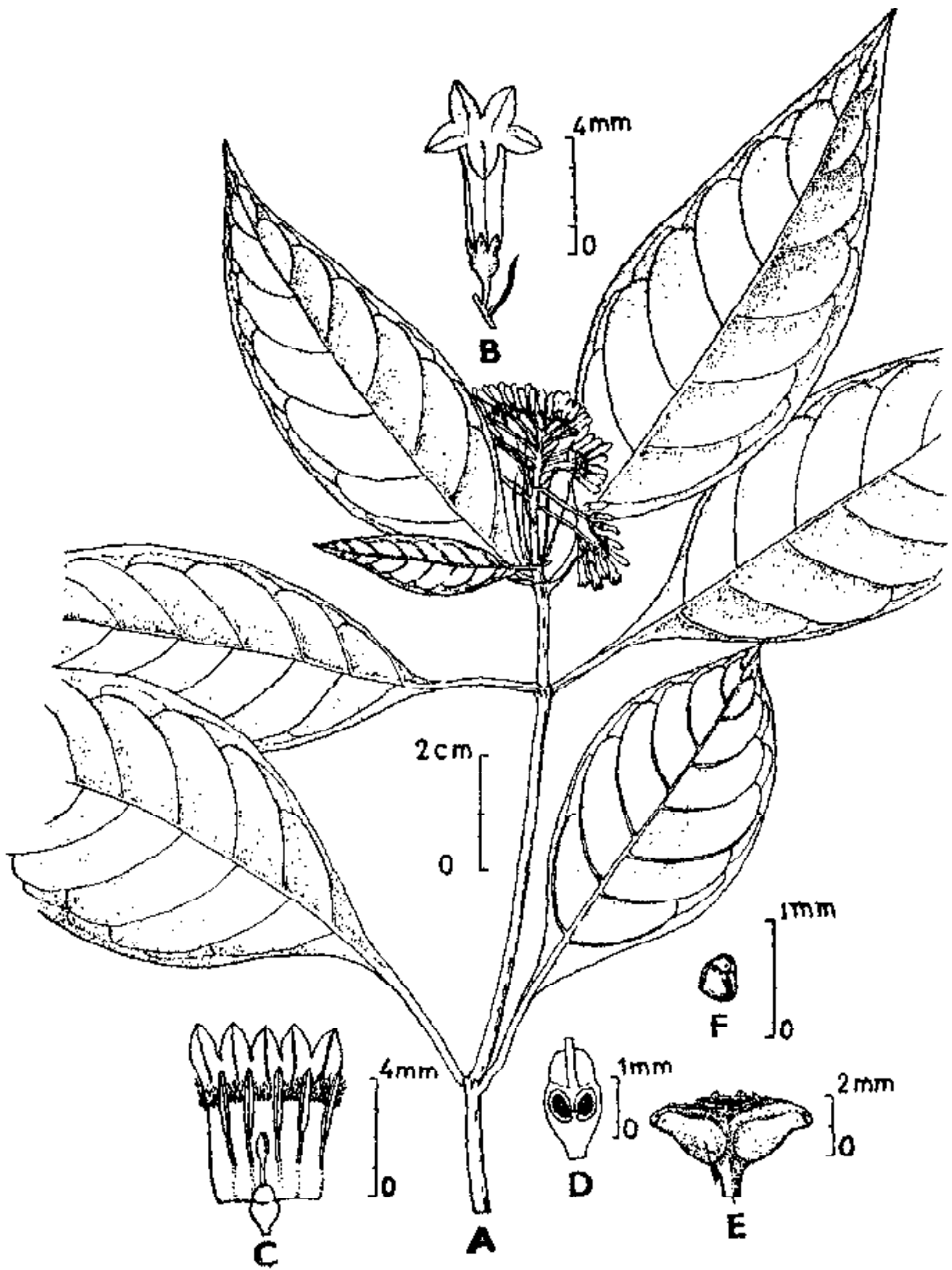
CULTIVATION: Not taken up anywhere.

DESCRIPTION: Herbs or undershrubs, upto 50 cm tall, with erect branching stem, glabrous. Leaves opposite, 3-15 x 1-5-6.5 cm, ovate or elliptic-ovate, acuminate at apex, attenuate at base, glabrous; lateral nerves 6-10 pairs; petioles 0.8-3.5 cm long, glabrous; stipules opposite, interpetiolar, 4-12 mm long, bifid or entire, subulate, glabrous. Inflorescence terminal or axillary subcorymbose cymes, 1-4 cm across, puberulous; peduncle 0.5-1.8 cm long. Flowers bracteate, bracteolate, pedicellate, epigynous, gemopetalous, 6.5-12 mm long, white or lilac; bracts and bracteoles persistent, linear, puberulous; pedicel minute, 0.75-1.25 mm long. Calyx obovoid, puberulous; lobes 5, subulate. Corolla 5-5-1.5 mm long, funnel shaped, glabrous outside, villous at the throat within; lobes 5, 1.5-2 x 1-1.5 mm, ovate, acute. Stamens 5, adnate to the base of corolla or slightly above, inserted or slightly exerted; filaments 1.75-2 mm long, glabrous; anthers 2.5-3.25 mm long, linear-oblong. Ovary inferior, 0.75-1.25 x 0.6-1.25 mm, obovoid; disc 0.5-0.75 mm high; style 1/3rd of the corolla tube, glabrous; stigma 2-lobed. Capsule 3 x 4-7 mm, bilocular, glabrous; locules ovate-oblong. Seeds minute, irregularly angular, 0.4-0.5 x 0.5-0.4 mm; testa areolate.

REFERENCES:

1. Fyson, P. F. (1915). *Fl. Nilgiris & Pulney Hill tops* 1: 191.
2. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 608.
3. Hooker, J. D. (1880). *Fl. Brit. India* 3: 80.
4. Rama Rao, T. (1914). *Flowering plants of Travancore*, p. 206.
5. Wight, R. & Arnott, G. A. W. (1834). *Prodr. Fl. Penin. Ind. Orient.*, p. 405.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza brunonis Wt. & Arn. var. *brunonis*. A. Habit. B. Flower. C. Flower split open. D. L. S. of Ovary. E. Capsule. F. Seed.

STATUS: Presumed Extinct. This is known only from its type collected in 1937, and has not been collected even though the region has been botanically explored during the last thirty years.

DISTRIBUTION: Kerala.

HABITAT AND ECOLOGY: Slopes of High mountains.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Efforts should be made to relocate the species and cultivate in botanic gardens. If it is rediscovered from any locality, its natural habitats should be protected.

BIOLOGY AND POTENTIAL VALUE: A little known plant of academic interest. Flowers and fruits in May-June.

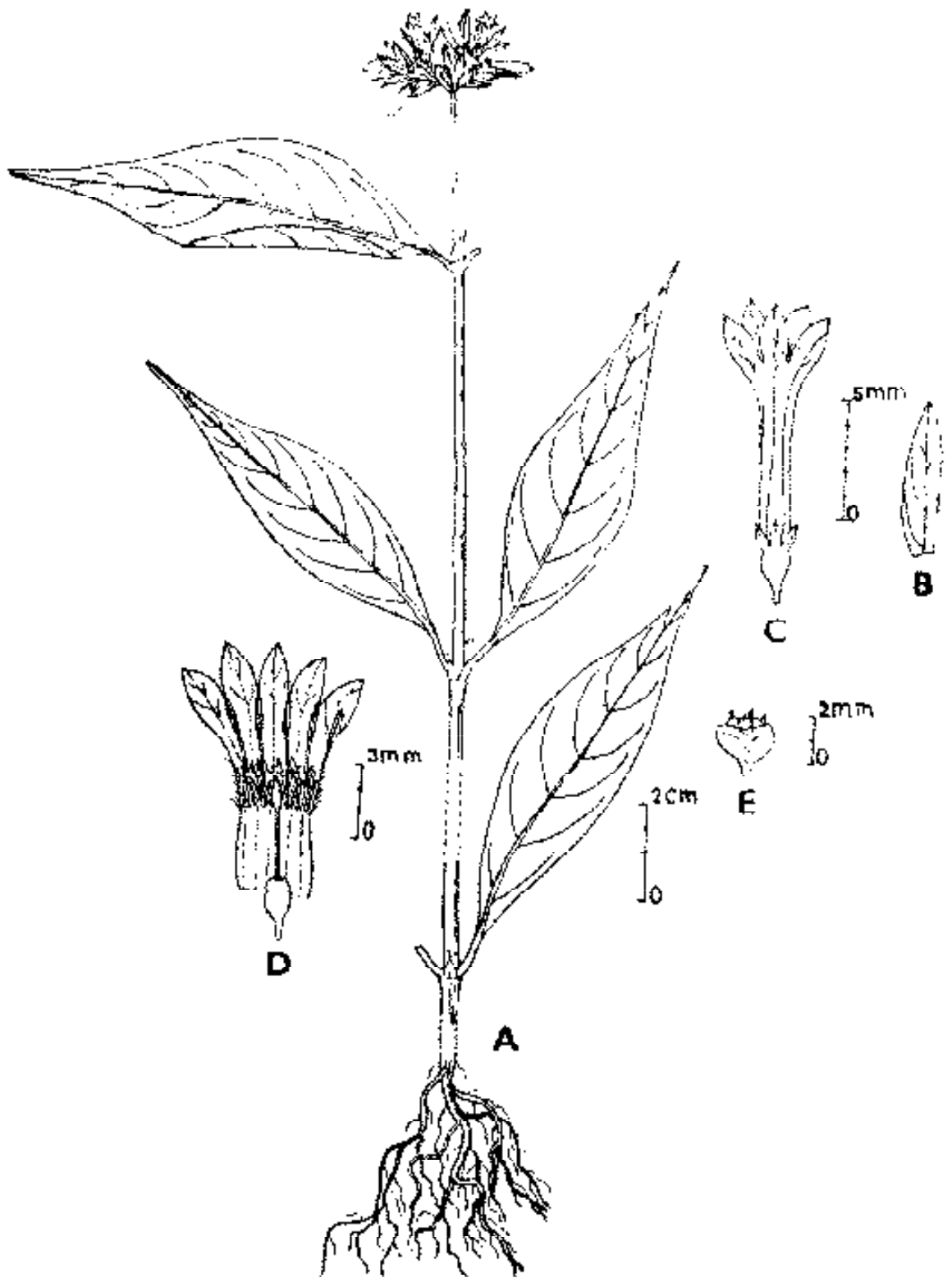
CULTIVATION: Not cultivated anywhere.

DESCRIPTION: A glabrous herb, woody at base. Leaves opposite, 5-12 × 1.5-3.5 cm, elliptic-lanceolate, caudate-acuminate at apex, cuneate at base, glabrous, sometimes puberulous along the margins, dark olivaceous green above, pale brownish-green below; lateral nerves 7-9 pairs, petioles 0.5-1.5 cm long, glabrous; stipules interpetiolar, 3-6 mm long, ovate-lanceolate, caudate-acuminate, glabrous. Inflorescence terminal, capitate cymes, 1-2 cm across, contracted, glabrous; peduncle 3-4.5 cm long, glabrous. Flowers bracteate, bracteolate, pedicellate, epigynous, 9-13.3 long, white; bracts and bracteoles persistent, similar, 5.5-9.5 × 2-5 mm, lanceolate to ovate-lanceolate with distinct midribs, acute, glabrous; pedicels 1-1.5 mm long, glabrous. Calyx cupshaped; lobes 5, 1-1.6 × 0.4-0.5 mm, ovate-lanceolate, acute, slightly keeled at back, glabrous. Corolla 8-12 mm long, funnel shaped, glabrous outside, with a villous ring of hairs at the middle of the corolla tube within just below the insertion of filaments; lobes 5, 1.5-2.5 × 0.8-1.5 mm, ovate, acute, minutely papillose within. Stamens 5, adnate slightly below the middle of corolla tube, inserted; filaments 3.5-4 mm long, slender; anthers 1.5-1.8 mm long, linear-oblong. Ovary inferior, obovoid; disc 0.4-0.5 mm high; style slender, 2.5-3.25 mm long, glabrous; stigma 2-lobed. Capsule small, glabrous.

REFERENCES:

1. Fischer, C. E. C. (1938). *Kew Bull.* 1938 (3): 125.
2. Sebastine, K. M. (1962). *Bull. Bot. Surv. India* 4: 223.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza caudata Fisch. A. Hab. B. Bract. C. Flower. D. Flower split open.
E. Capsule.

STATUS: Endangered. It has been collected only once after the original discovery about 50 years ago.

DISTRIBUTION: Kerala. Endemic.

HABITAT AND ECOLOGY: Grows on swampy soil at about 900 m in alt.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: Steps to search for the plants in natural habitats, to cultivate them in botanic gardens and to protect the localities should be considered.

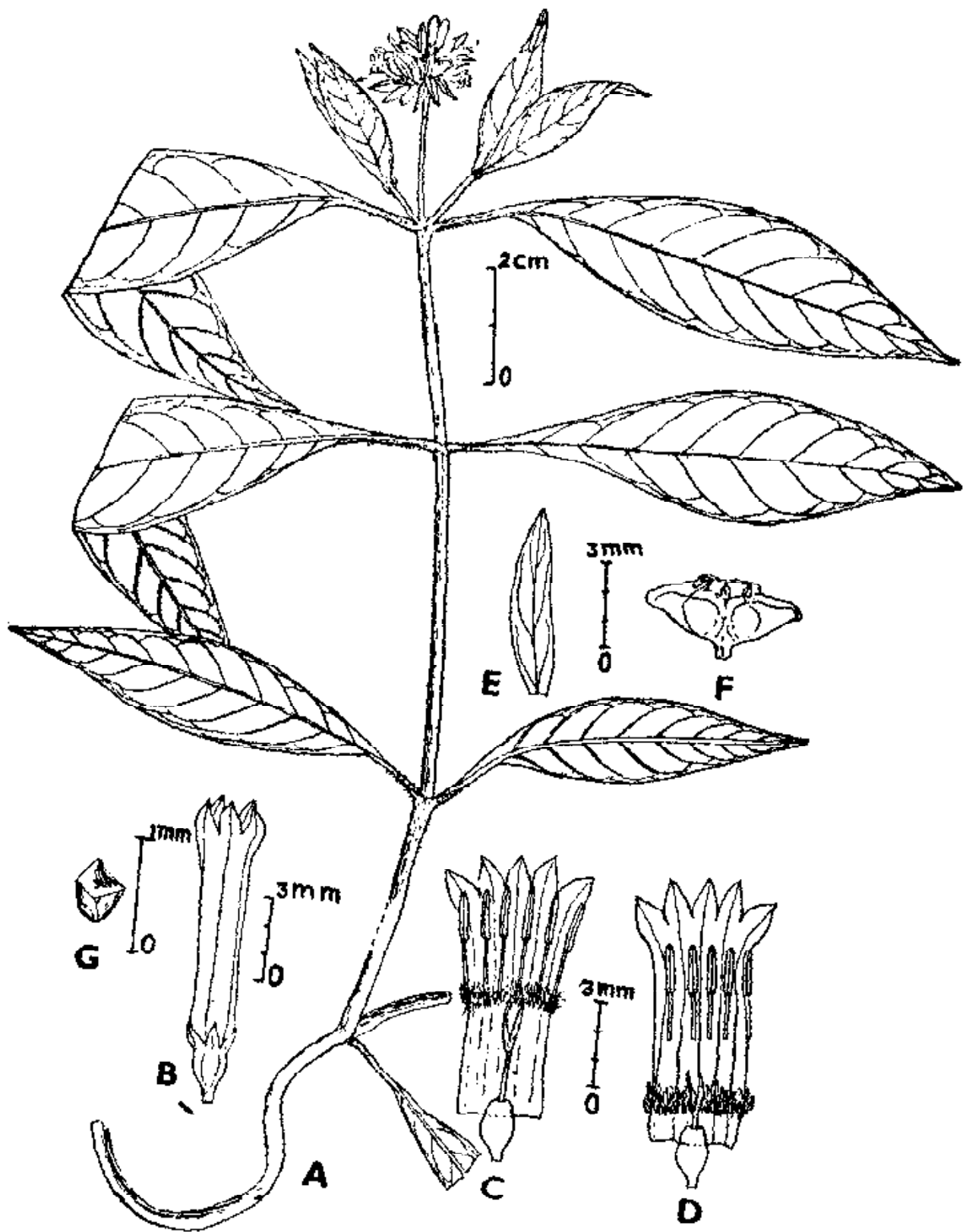
BIOLOGY AND POTENTIAL VALUE: A plant of academic interest. Flowers and fruits in June.

DESCRIPTION: Pubescent herbs, erect or prostrate, rooting at base. Leaves opposite, 5-9 × 1-2.5 cm, narrowly elliptic, acuminate at both ends, slightly unequalateral at base, glabrous, dark green above, pale and scabrid on the nerves beneath; lateral nerves 7-10 pairs, arching forward to unite with a distinct loop; petioles 0.5-1.5 cm long, brown puberulous; stipules interpetiolar, deciduous, 0.3-0.8 cm long, subulate, entire, scabrid, sometimes hairy beneath. Inflorescence terminal, capitulate cymes, 1.5 cm across, glabrous; peduncles 2-3 cm long, glabrous. Flowers bracteate, bracteolate, pedicellate, epigynous, heterostylous, 8-10 mm long, crimson or pinkish-white; bracts and bracteoles similar, persistent, 5-7 mm long, lanceolate or ovate-lanceolate, glabrous; pedicels 0.5-1 mm long, glabrous. Calyx tube obovoid, glabrous; lobes 5, 0.8-1 × 0.4-0.5 mm, ovate-lanceolate, acute, glabrous. Corolla 7-8.75 mm long, funnel shaped, glabrous outside, with a villous ring at the insertion of filaments within; lobes 5, 1.3-6.5 × 0.75-1.25 mm, ovate, spreading, acute. Stamens 5, 1.3-6.5 × 0.75-1.25 mm, ovate, spreading, acute, adnate at the middle or above the base of corolla, slightly exerted or inserted; filaments 2.2-2.4 mm long; anthers 1.75-2 mm long, linear-oblong. Ovary 0.8-1 × 0.6-1 mm, obovoid; disc 0.5-0.6 mm high; style 2-2.25 mm or 0.75-1 mm long, glabrous; stigma 2-lobed. Capsule 2-2.5 × 4.5-6.25 mm, glabrous, 2-locular; locules ovate-oblong with slightly inclined tip. Seeds 0.5-0.6 × 0.5 mm, angular, glabrous, brown; testa areolate, tubercled.

REFERENCES:

1. Fischer, C. E. C. (1938). *Kew Bull.* 1938: 124.
2. Sebastine, K. M. (1962). *Bull. Bot. Surv. India* 4: 223.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza incarnata Fisch. A. Habit. B. Flower. C. & D. Flower split open. E. Bract. F. Capsule.

STATUS: Possibly Extinct. After its original discovery it has been collected only once in 1935. It could not be located after that, even though the region has been well-explored in recent years. Due to developmental activities the habitat may have undergone change.

DISTRIBUTION: Nilgiri hills. Endemic.

HABITAT AND ECOLOGY: Along slopes of forested mountains at 2000-2500 m alt.

CONSERVATION MEASURES TAKEN: None specifically. The area is recently declared as a Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: Intensive search in the Nilgiris and adjoining hill ranges and if it is located, introduction in botanical gardens.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest; flowers and fruits during May-June.

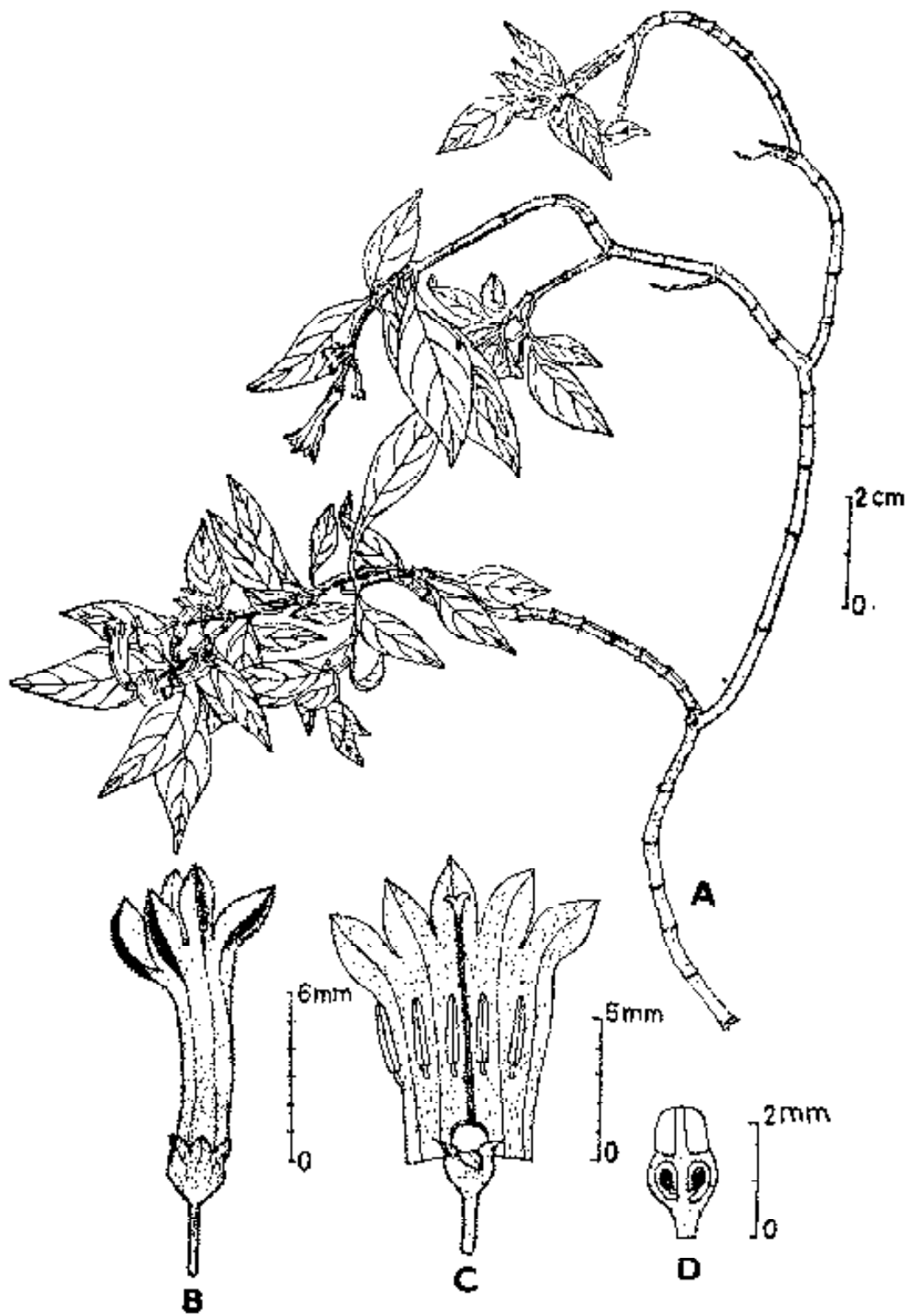
CULTIVATION: Not taken up.

DESCRIPTION: Herbs or undershrubs, 25-40 cm tall, somewhat woody at base, branching, pubescent. Leaves opposite, 1.5-4.5 × 0.75-1.5 cm, ovate-lanceolate, acute at apex, cuneately decurrent at base, glabrous above, pale and pubescent on the nerves beneath; lateral nerves in 6-10 pairs; petiole 0.5-2 cm long, slender, pubescent; stipules falling off soon, 1.5-2.5 mm long, triquetrous, acuminate, entire. Inflorescence a small terminal cyme of few flowers, peduncle 1-1.5 cm long, puberulous. Flowers bracteate, bracteolate, pedicellate, epigynous gamopetalous, 10-15 mm long, pale blue; bracts and bracteoles caducous, minute, puberulous; pedicel 0.5-0.25 mm long, puberulous. Calyx obovoid, puberulous; lobes 5, 0.75-1 × 0.75 mm, acute, puberulous. Corolla funnel shaped, 8.5-12.25 mm long, puberulous outside, villous within; lobes 5, ovate, slightly curved inward, acute, strongly keeled at back. Stamens 5, adnate below the middle of corolla, inserted; filaments 0.75-1 mm; anthers 2.5-2.75 mm. Ovary inferior, obovoid. Disc 1 mm high; style as long as corolla tube or slightly longer, pubescent; stigma 2-lobed. Capsule 2-lobed.

REFERENCES:

1. Blasco (1970). *J. Bomb. Nat. Hist. Soc.* 67(3): 524.
2. Fyson, P. F. (1921). *J. Ind. Bot.* 2: 210.
3. Gamble, J. S. (1919). *Kew Bull.* 1919: 407.
4. Gamble, J. S. (1921). *Fl. Pres. Madras*, p. 607.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiarrhiza pykarensis Gamble A. Habit. B. Flower. C. Flower split open. D. L.S. of ovary.

STATUS: Endangered. Its habitats in many localities have undergone changes due to developmental activities and extensive jhumming.

DISTRIBUTION: Meghalaya, Nagaland and Manipur.

HABITAT AND ECOLOGY: On moist shady places at 600-1200 m in alt.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: Efforts should be made to collect the plants and grow in botanic gardens. Some areas in the region rich in endemics and threatened plants should be protected.

BIOLOGY AND POTENTIAL VALUE: A plant of academic interest, not thoroughly studied. Flowers and fruits during April-December.

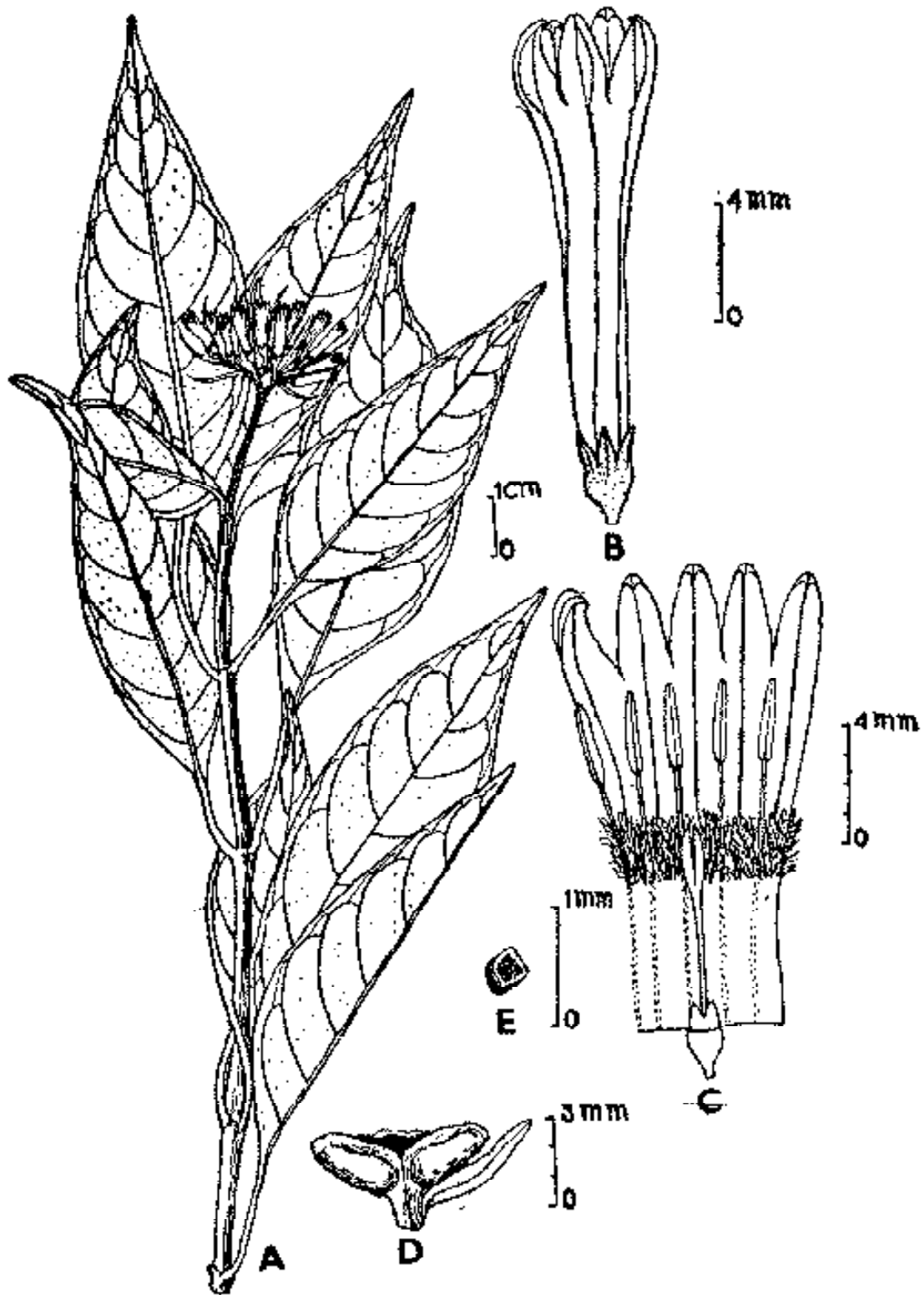
CULTIVATION: Not cultivated anywhere.

DESCRIPTION: Suffruticose erect glabrous herb. Leaves opposite, 6-16.5 × 2.4-4.5 cm, elliptic or elliptic-lanceolate, acuminate at apex, tapering to the base, darkgreen above, pale below, scattered hairy on both the surfaces; midrib impressed above; lateral nerves 9-12 pairs, arched, joining above along the margin; petioles 1-3.5 cm long, slender; stipules early deciduous, minute, linear. Inflorescence a terminal corymbose cyme, 2-4 cm across, puberulous; peduncle 1.2-2.5 cm long, elongating upto 6 cm on fruting, puberulous. Flowers 13-15 mm long, white; bracts and bracteoles similar, persistent, 4-14 mm long, linear, puberulous. Calyx lobes 5, 1.25-2 × 0.2-0.25 mm, ensiform or linear, acute, puberulous. Corolla 11.7-13.4 mm long, narrowly funnel shaped, glabrous outside, villous below the middle within; lobes 5, broadly ovate-oblong, acute, shortly recurved, keeled at back, glabrous. Stamens 5, adnate to the middle of corolla tube, inserted; filaments 3-4 mm long; anthers 2.75-3.5 mm long, linear-oblong. Ovary inferior, obovoid, disc 1-2 mm high; style 3-4 mm long, glabrous; stigma bifid glabrous. Capsule 2-2.5 × 5.7 mm, 2-lobed, puberulous, locules ovate-oblong with straight tips. Seeds minute, irregularly angular, glabrous, brown, testa ateolate with tubercled thick wall.

REFERENCE:

1. Fischer, C. E. C. (1940). *Kew Bull.* 1940: 34.

The material for this sheet was supplied by D. B. Deb and D. C. Mondal, Botanical Survey of India, Howrah.



Ophiorrhiza wattii Fiech. A. Habit. B. Flower. C. Flower split open. D. Capsule. E. Seed.

STATUS: Endangered. It has not been seen anywhere after the original discovery made about 7 decades ago, though the region has been explored in recent years, suggesting the possible loss of the species due to habitat changes for developmental activities and extensive forest clearings for jhum cultivation in recent years.

DISTRIBUTION: Restricted to Abor Hills in Arunachal Pradesh.

HABITAT AND ECOLOGY: In deep shaded gorges and stream sides at 300-1220 m in alt.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Serious efforts should be made to locate the plant and cultivate in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: As the original gathering was without flowers, the plant is not fully known. It is of academic interest.

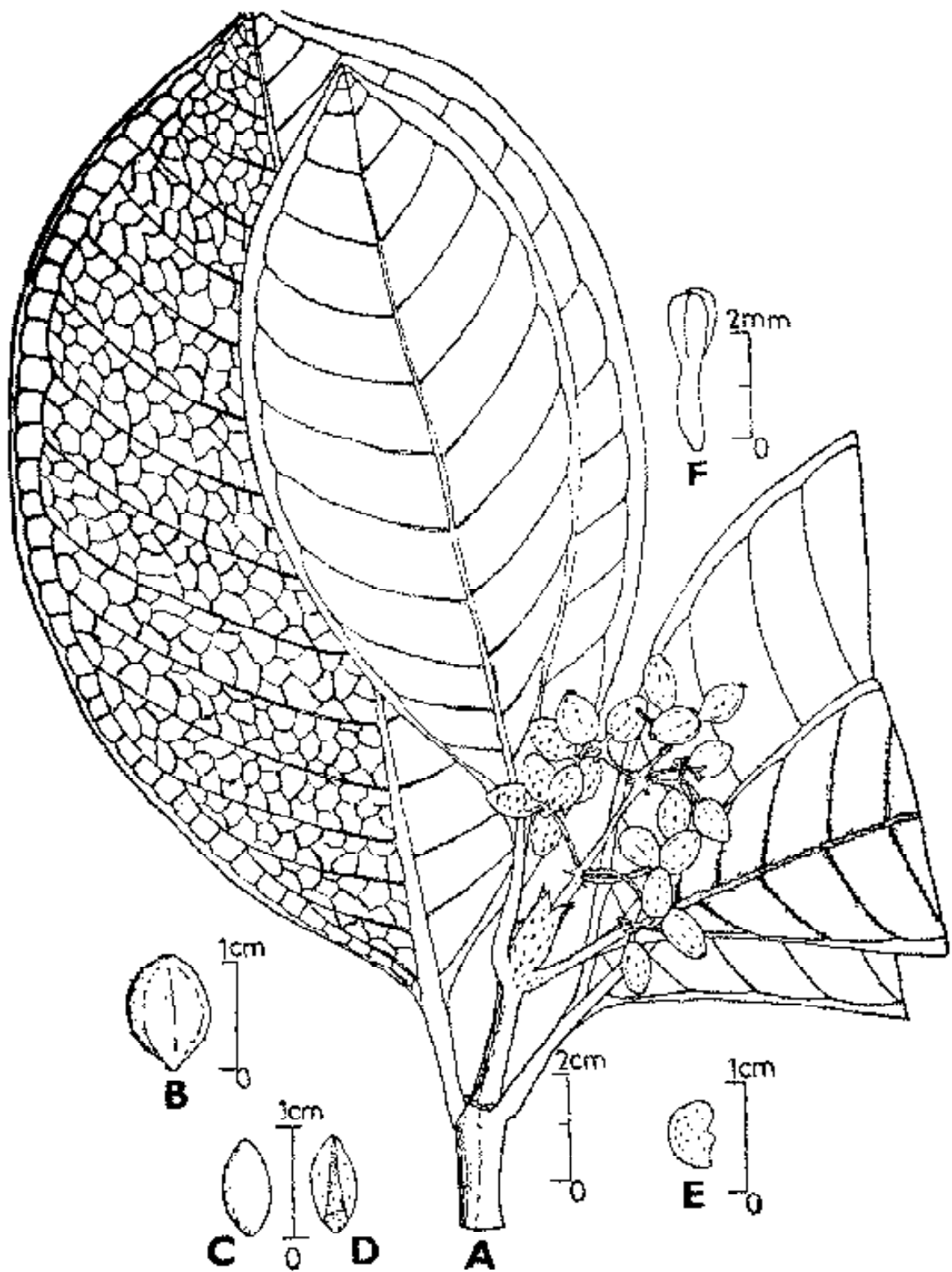
CULTIVATION: Not cultivated anywhere.

DESCRIPTION: Small shrubs, 1.8-2 m high, glabrous. Leaves opposite, petiolate, 17-24 × 6-17 cm, broadly ovate or elliptic, shortly acuminate at apex, slightly incurved at margin, cuneate at base, thinly coriaceous, pale green, glabrous above, brownish-green tomentose beneath; midrib channelled above; lateral nerves 10-14 pairs, subopposite, subparallel, faint above, without domatia, intramarginal nerves conspicuous; petiole 2-5 cm long, stout, tomentose beneath; stipules interpetiolar, 15-20 × 10-12 mm, spatulate to obovate, 2-lobed, acuminate or caudate, pubescent above and at base beneath. Inflorescence terminal, peduncled or sessile panicle of cymes, 5-7 × 5-6 cm when fruiting; branches 4-5 at a whorl, short, pubescent or puberulous; peduncle 0.5-1.5 cm long, puberulous; bracteoles persistent, 4-6 × 2-4 mm, ovate to lanceolate, acuminate, entire or 2-3-lobed, acute or acuminate, pubescent. Flowers not seen. Calyx 2-2.5 × 2-2.5 mm; hypanthium obovoid, pubescent; calyx lobes 5, 1-2 mm long, linear, pubescent above. Fruits sessile, 8-10 × 2-8 mm, ovoid or ellipsoid-ovoid, crowned with persistent calyx lobes at apex, 2-4 striped, loosely puberulous; pyrenes 2, ellipsoid, acute at both ends, planoconvex, smooth, thin walled; raphides present. Seeds 7-9 × 4-5 mm, ellipsoid, acute at both ends, planoconvex, dorsally slightly ridged, ventrally T-shaped grooved.

REFERENCES:

1. Burkill, I. H. (1925). *Rec. Bot. Surv. India* 10: 361.
2. Dunn, S. T. (1920). *Kew Bull.* 1920: 133.

The material for this sheet was supplied by D. B. Deb and M. Gangopadhyay, Botanical Survey of India, Howrah.



Psychotria aborensis Dunn. A. Habit. B. Fruit. C, D, E. Seed (different views).

STATUS: Possibly Extinct. It could not be collected during the last eighty years, though the region has been fairly well-explored in recent years.

DISTRIBUTION: Nicobar island.

HABITAT AND ECOLOGY: In seashore forests.

CONSERVATION MEASURES TAKEN: Nil.

CONSERVATION MEASURES PROPOSED: Efforts should be made to collect the plant and cultivate in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Not known; it is of academic interest.

CULTIVATION: Not taken up anywhere.

DESCRIPTION: A glabrous shrub, about 2 m high. Leaves opposite, petiolate, 9-18 × 3-7 cm, elliptic, elliptic-obovate or elliptic-lanceolate, acuminate at apex, cuneate or subacute at base, membranous, glabrous, glossy above; midrib channelled above; lateral nerves 1-16 pairs, faint above, conspicuous beneath, arcuate, with domatia; nervules inconspicuous; petiole 0.5-1.8 cm long, glabrous; stipules interpetiolar, 10-15 × 5-7 mm, ovate-oblong, acute or obtuse at apex, entire, glabrous above, sparsely villous at base beneath. Inflorescence terminal, peduncled, panicle of cymes, 4-6 × 1.5-2.5 cm, elongating to 7 × 3.5 cm when fruiting, opposite or sub-opposite, short, slender, glabrous; bracts and bracteoles absent; peduncle 1.5-3 cm long, glabrous. Flowers 6-6.5 mm long, tubular; pedicels 1-1.5 mm long, glabrous. Hypanthium ca 1 mm long, obovoid, glabrous. Calyx ca 1 × 2 mm, cupular, truncate or shortly toothed; teeth triangular, acute. Corolla tube 2-5.3 mm long, glabrous above, densely villous at the throat within; lobes 5, 1.5-1.7 mm long, ovate-lanceolate, shortly inflexed, warty above. Stamens 5, inserted; filaments ca 0.5 mm long, adnate at throat; anthers 0.5-0.7 mm long, oblong, dorsally convex. Ovary ca 0.5 mm long; style 2.5-3 mm long, broad, glabrous; stigma × 0.7 mm long, lobes ovate-oblong, obtuse, ciliate at margin; disc ca 0.6 × 1.2 mm, subglobose, smooth. Fruits shortly stalked, 9-10 × 4-6 mm, obovoid, crowned with persistent calyx lobes, faintly 6-10 striped, glabrous; stalks 2-4 mm long; pyrenes 2, ovoid-oblong, obtuse at apex, acute at base, planoconvex, thick walled, raphides present. Seeds ca 5 × 2 mm, ovoid-oblong, obtuse at apex, acute at base, planoconvex, dorsally smooth; albumen ruminant, embryo minute.

REFERENCES:

1. Brandis, D. (1906). *Indian Trees*, p. 394.
2. Hooker, J. D. (1880). *Fl. Brit. India* 3: 164.
3. Kurz, S. (1875). *J. Bot.* 4: 328.
4. Kurz, S. (1876). *J. Asiat. Soc. Beng.* 45: 107.
5. Thothathri, K. (1962). *Bull. Bot. Surv. India* 4: 293.

The material for this sheet was supplied by D. B. Deb and M. Gangopadhyay, Botanical Survey of India, Howrah.

STATUS: Endangered; it has not been collected after 1916. Since the area is not fully explored there may be areas where this species may be located.

DISTRIBUTION: Andaman islands, Port Blair. Possibly endemic.

HABITAT AND ECOLOGY: Coastal forests at about 250 m in alt.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive efforts should be made to locate the plants and thereafter to introduce in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Could be of horticultural interest and timber value.

CULTIVATION: Not known to be cultivated any where.

DESCRIPTION: Small tree, 5-9 m high; stem slender, terete, striated, minutely hairy or glabrous. Leaves 11-18 × 4-7 cm, elliptic or elliptic-ovate or broadly ovate, acute or acuminate at apex, attenuate at base; lateral nerves 10-11 pairs, obscurely hairy, glabrous on maturity, recurved at margin; petiole 1-2 cm long; stipules orbicular, about 8 mm across, coriaceous, reflexed, glabrous. Inflorescence terminal, divergent, ferruginous pubescent; bracts: lower lanceolate, petiolate, about 2 cm long, upper linear. Flowers 1-2.5 fascicled; bracteoles spatulate. Hypanthium ovoid, pubescent. Calyx lobes triangular, subglabrous, acute. Corolla tubes cylindric, 4 mm long, white hairy above; lobes reflexed, shorter than tube. Anthers ovoid. Stigma exserted, bifid, lobes narrowly obovate. Capsule globose. Seeds minute, obscurely winged.

REFERENCE:

1. Cowan, J. M. (1932). The genus *Wendlandia*. *Notes Roy. Bot. Gard. Edin.* 80: 295.

The material for this sheet was supplied by D. B. Deb and G. G. Maiti, Botanical Survey of India, Howrah.



Wendlandia andamanica Cowan A. Habit B. & C. Flower. D. Stamen. E. Capsule.

STATUS: Presumed Extinct. It has not been collected for the last 150 years in spite of recent extensive explorations in the area.

DISTRIBUTION: South India: Courtallum and Tirunelveli, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: In river beds at low altitudes.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive efforts should be made to relocate the plants and thereafter to introduce in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Timber is used for miscellaneous purposes.

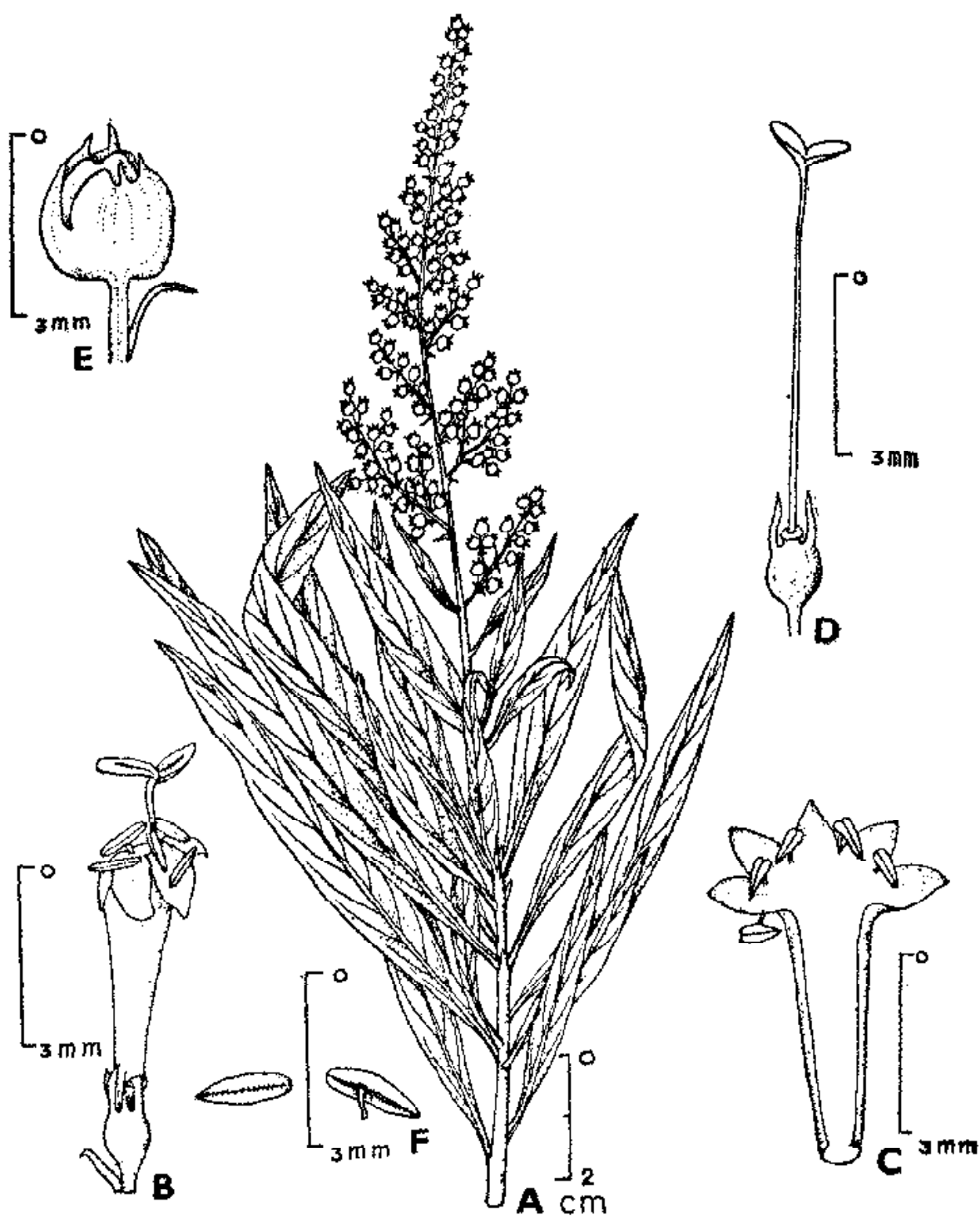
CULTIVATION: Not known to be cultivated anywhere.

DESCRIPTION: Glabrous tree with rather slender branches. Leaves ternately whorled, 4-11 × .5-1.75 cm, narrowly linear-lanceolate, acute, narrowed into a short petiole, coriaceous, not shining, midrib strong; lateral nerves 6-8 pairs, very slender; petiole about 1 cm long; stipules persistent, about 5 mm long, triangular-ovate, subulate or cuspidate. Inflorescence terminal, a slender pyramidal panicle, leafy below. Flowers rather crowded, often pedicelled; bracts ligulate, acuminate, hastate at base. Calyx tube turbinate, glabrous, about 1.5 mm long; lobes cuspidate, about 1 mm long, subulate. Corolla tube slender, about 5 mm long; lobes almost orbicular, small. Stamens exserted, filaments short; anthers dorsifixed, linear, about 1 mm long. Style about 6 mm long, exserted; stigma bifid. Fruit globose, about 2 mm across, rugose.

REFERENCES:

1. Cowan, J. M. (1932). *Notes Roy. Bot. Gard. Edin.* 80: 279.
2. Hooker, J. D. (1882). *Fl. Brit. India* 3: 40.

The material for this sheet was supplied by D. B. Deb and G. G. Maiti, Botanical Survey of India, Howrah.



Wendlandia angustifolia Wt. ex Hook. f. A. Habit. B. Flower. C. Corolla with stamens. D. Gynoecium. E. Fruit.

STATUS: Vulnerable and becoming scarce due to over-exploitation for its medicinal properties.

DISTRIBUTION: Himalayas: Jammu and Kashmir to Sikkim.

HABITAT AND ECOLOGY: Fleshy rooted perennial on rocky alpine slopes at 3300-5000 m altitude.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Collection of this species from the wild should be banned. Attempts should be made to cultivate this important medicinal plant for its exploitation.

BIOLOGY AND POTENTIAL VALUE: Fls. and Frts: June-September. Perennial herb with elongate, stout creeping rootstock, propagated by seeds and rhizomes. Widely used as a medicine in a large number of diseases and ailments.

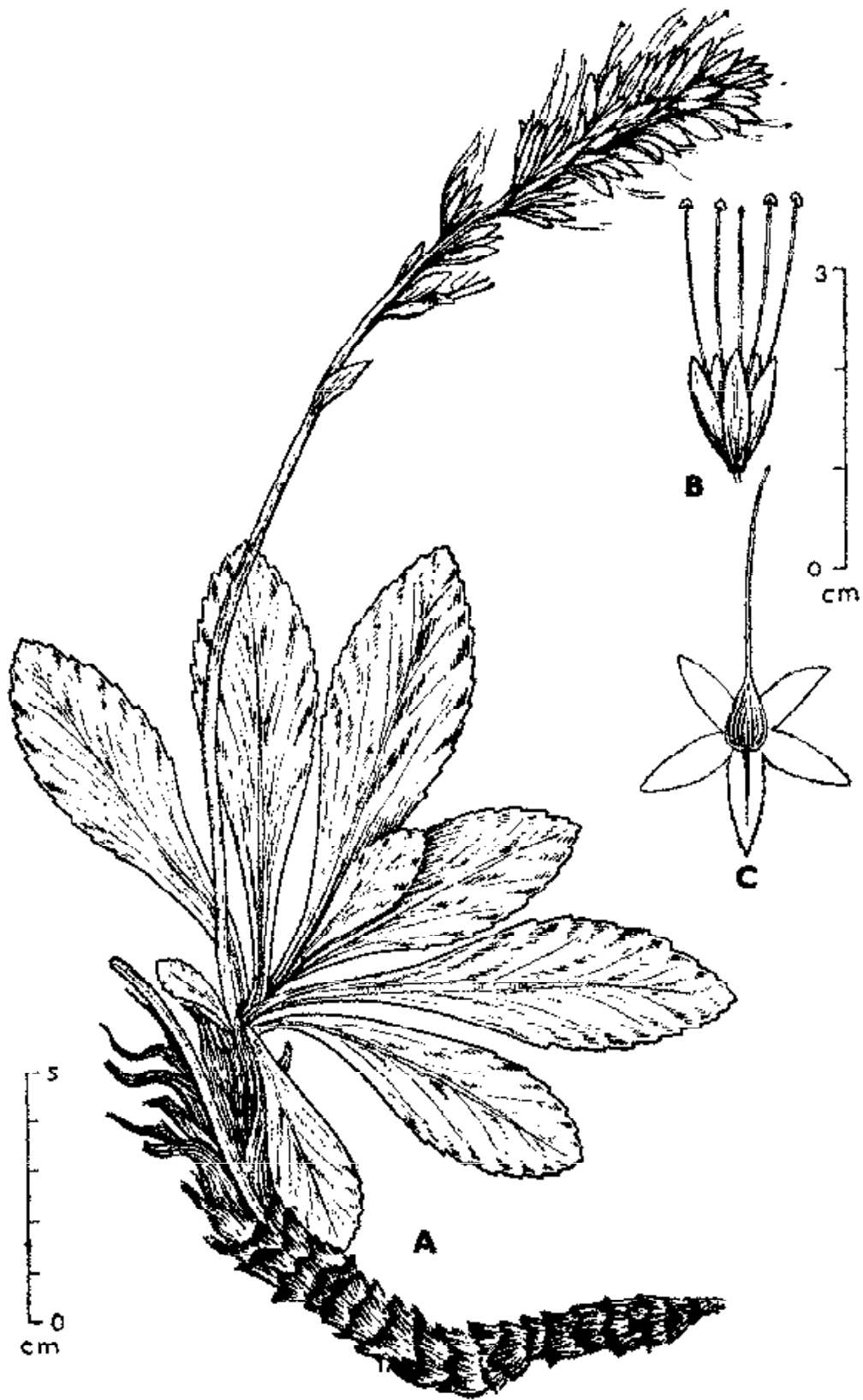
CULTIVATION: Not known in cultivation.

DESCRIPTION: Rootstock as thick as little finger, covered with withered leaf-bases. Leaves 5-10 cm, coriaceous, tip rounded, base narrowed into a winged sheathing petiole. Scape stout, ascending, longer than the leaves, with or without bracts below the inflorescence. Spike 5-10 cm long, obtuse, many flowered, sub-hirsute; bracts oblong or lanceolate, as long as calyx. Sepals 5, lanceolate, 4-7 mm long, ciliate. Corolla 5-8 mm long; lobes ovate, acuminate, ciliate. Capsule 1-1.5 cm long, ovoid, turgid, acute.

REFERENCES:

1. Anon. (1969). *The Wealth of India: Raw materials* 8: 49.
2. Basu, B. D. (1918). *Indian Medicinal Plants—Plates*. Part 111. t. 699.
3. Royle, J. F., (1839). *Illust. Bot. Himal.* 291. t. 71.

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



Picrorhiza kurroa Benth. A. Habit B. Flower. C. Pistil. (after Royle).

STATUS: Rare; this species is known only from Nilgiris.

DISTRIBUTION: Nilgiris, Tamil Nadu. Endemic.

HABITAT AND ECOLOGY: In moist deciduous forests.

CONSERVATION MEASURES TAKEN: The Nilgiri hills are now declared as a Biosphere Reserve.

CONSERVATION MEASURES PROPOSED: The plants should be collected and cultivated in the experimental gardens of Botanical Survey of India.

CULTIVATION: None.

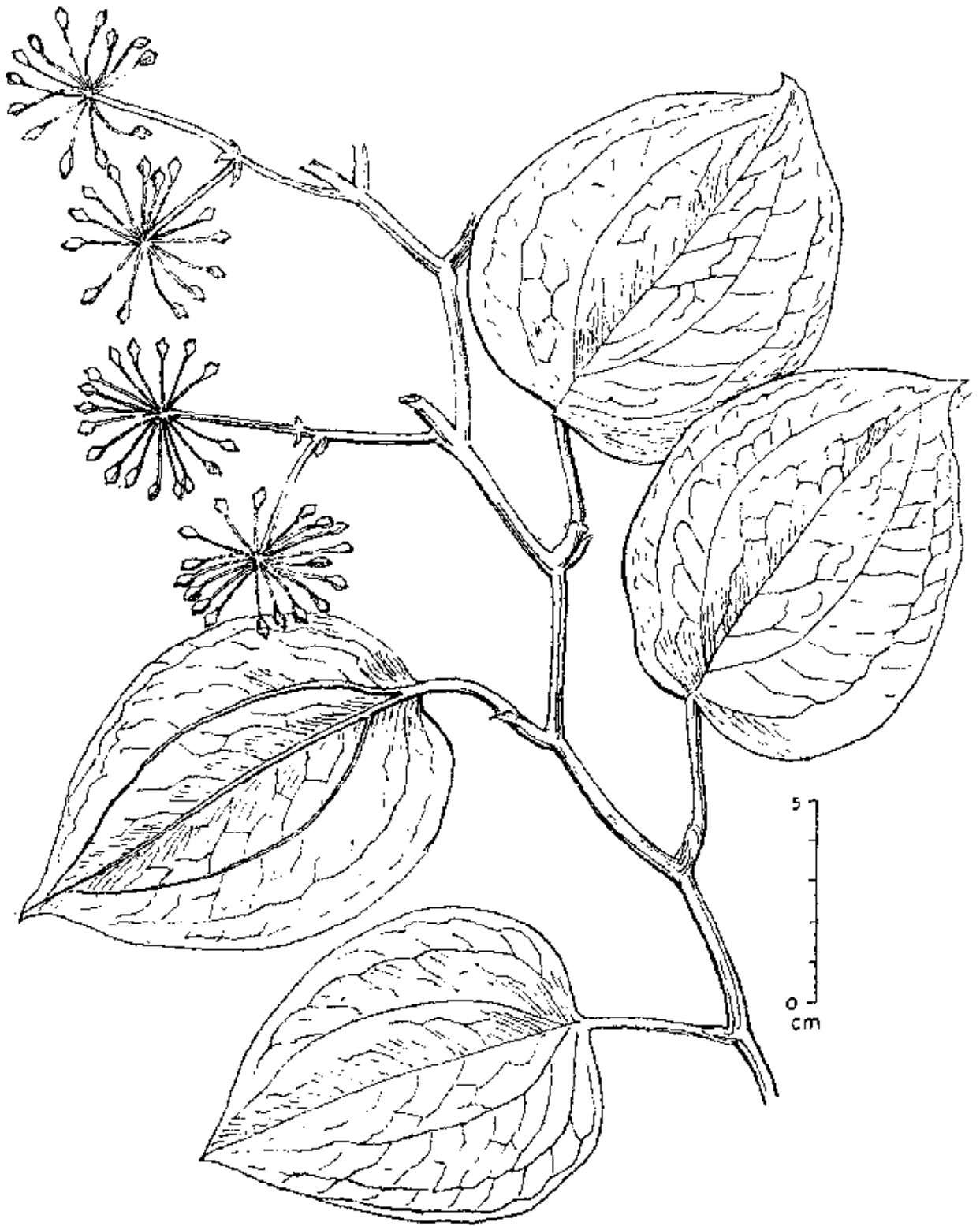
BIOLOGY AND POTENTIAL VALUE: Not known.

DESCRIPTION: Large climbing shrubs, flowering branches stout, slightly zig-zag, smooth or slightly prickly; leaves 7-12 × 5-10 cm, broadly ovate, orbicular or orbicular-ovate, apex abruptly contracted, acute, base cordate or rounded; petioles curved upwards or twisted above the middle, winged at base. Inflorescence an umbel, many flowered. Flowers: staminate perianth linear-oblong, reflexed at anthesis; pistillate perianth broadly elliptic. Berries globose, reddish when mature.

REFERENCES:

1. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 1061. (repr. ed.)
2. Koyama, T. (1966). *Advan. Front. Pl. Sci.* 4: 49-50.

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



Smilax wightii A. DC.

STATUS: Presumed Extinct. It could not be collected since 1877. Causes for its decline and possible extinction are the destruction of its natural habitats. The type specimens (No. 21884 A—D) are deposited in CAL. It is represented only by a line drawing in ASSAM herbarium.

DISTRIBUTION: Endemic to the Khasi hills in Meghalaya. Griffith (*s.n.*) collected it from the Khasi hills. Later, Rutton (1873) and Clarke (1877) could also collect this species from the Khasi hills. It has not been collected after that.

HABITAT AND ECOLOGY: This species was collected from the sub-tropical forests of the Khasi hills, in between 1000-1500 m alt.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Efforts should be made to relocate them in the type locality to raise plants from seeds in botanic gardens.

BIOLOGY AND POTENTIAL VALUE: Uses and potential value of this species are not known. Flowers during May-June.

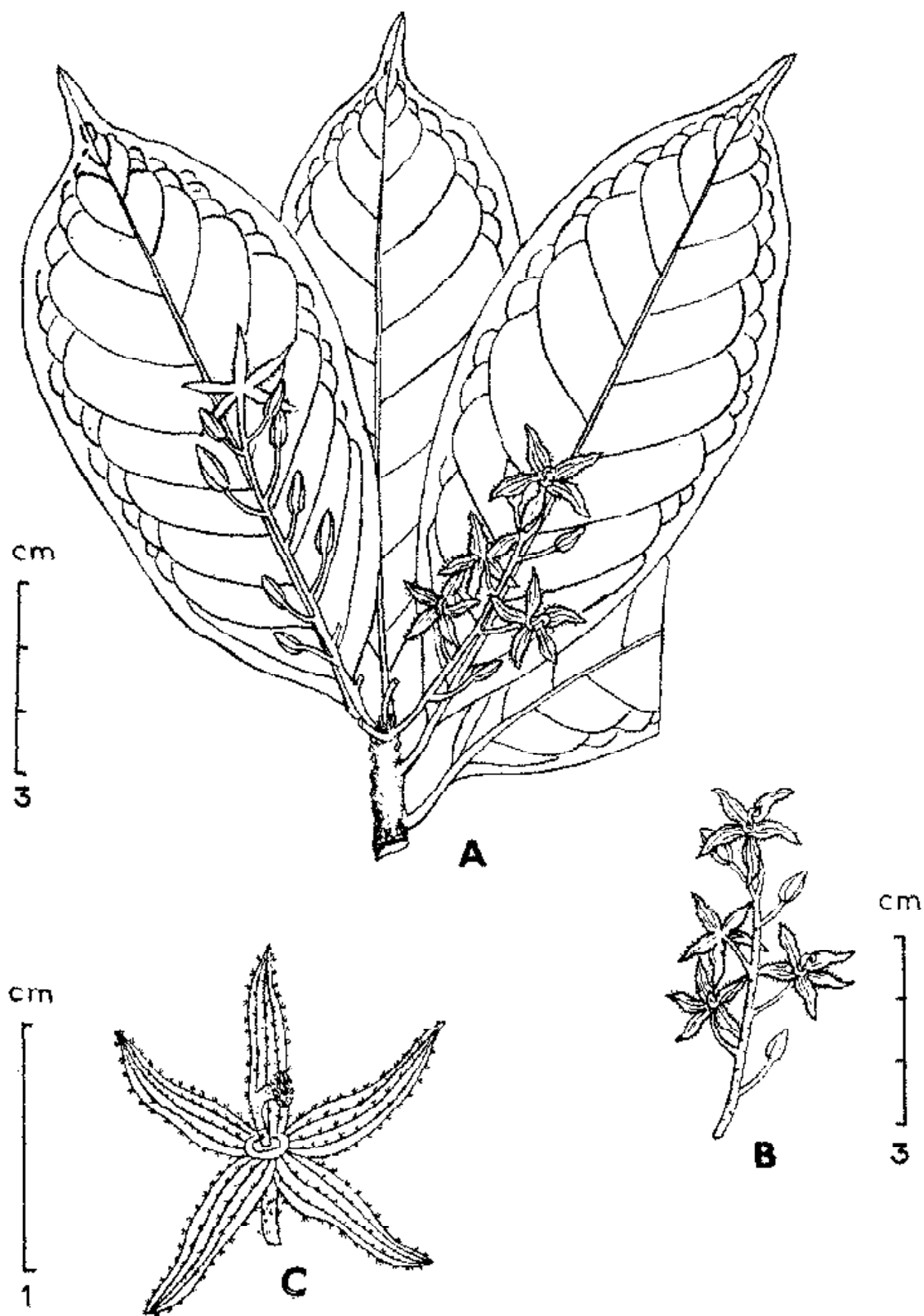
CULTIVATION: Not known in cultivation.

DESCRIPTION: A medium sized tree, young shoots and inflorescence ferruginous tomentose. Leaves elliptic or obovate, lanceolate, entire, ca 8-17.5 × 4-5.6 cm long, narrowed towards the base and shortly petiolate. Racemes axillary or terminal. Flowers bracteate, pedicillate, apetalous. Pedicels 6-12 mm long. Calyx lobes 5, puberulous inside, linear-lanceolate, 3-nerved. Staminal column ca 3-4 mm long, thick and reflexed.

REFERENCES:

1. Debbarman (1934): *Fl. Assam*. 1(1): 154.
2. Debbarman & Biswas (1934): *Assam For. Rec. Bot.* 1 : 5.

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



Sterculia khasiana Debbar. A. Flowering twig. B. Inflorescence. C. Flower.

STATUS: Endangered. The development of Mamloo cement factory near Cherrapunji threatens its natural habitat and is resulting in habitat loss.

DISTRIBUTION: Endemic to Meghalaya. It was reported by Dyer in 1874 based on Griffith's collection from the Khasi hills. It has not been collected since 1938.

HABITAT AND ECOLOGY: It grows in the thick, moist virgin forests near Cherrapunji and Shongpung forests of Meghalaya.

CONSERVATION MEASURES TAKEN: Recently the Mawsmal forest area in Meghalaya has been declared as reserve forest by the State Government, which may help its protection in wild, if introduced there.

CONSERVATION MEASURES PROPOSED: Efforts are being made to relocate and rehabilitate this tree species.

BIOLOGY AND POTENTIAL VALUE: An interesting species of the genus *Adinandra*, admired in horticulture due to the white fragrant flowers which bloom during April to June. Its timber is useful for furniture.

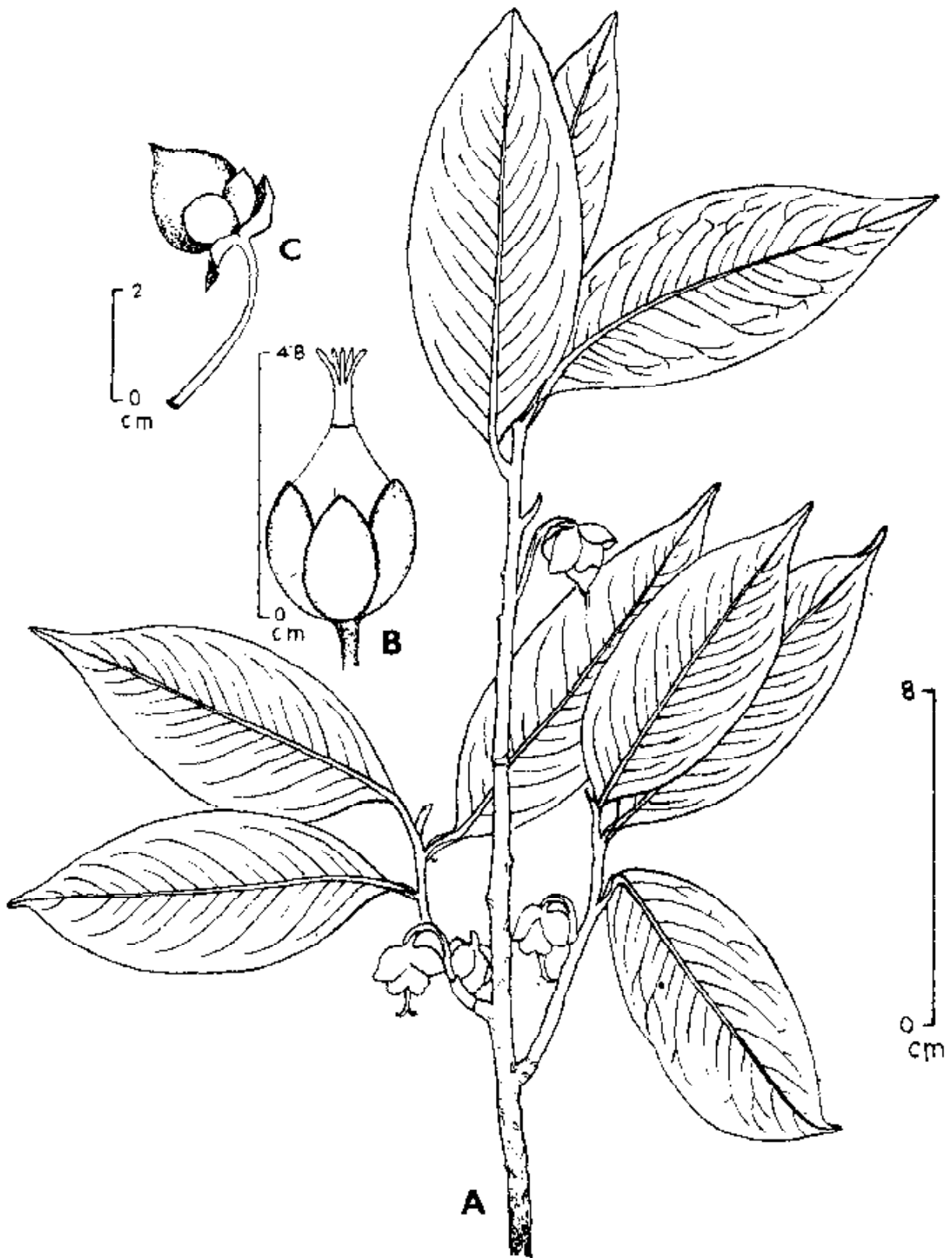
CULTIVATION: Not known in cultivation.

DESCRIPTION: A small tree, bark warty. Leaves elliptic-lanceolate to oblong-lanceolate, cuneate at base, bluntly acute to acuminate at apex, entire with recurved margins; lateral nerves ca 20, obscure. Flowers axillary, solitary or paired on ca 2.2-3 cm long pedicels, white, fragrant. Sepals 5, persistent, ca 1.3 cm long, suborbicular to orbicular. Stamens many, adnate with petals. Ovary 5-celled, glabrous, style 5-fid, jointed. Fruit a berry, ovoid, many seeded.

REFERENCES:

1. Balakrishnan, N. P. (1981): *Fl. Jowai* 1 : 94. Botanical Survey of India, Howrah.
2. Dyer, W. T. T. (1874). *In: Hooker, J. D., Fl. Brit. India* 1 : 282.
3. Jain, S. K. & Sastry, A. R. K. (1980). *Threatened Plants of India. A State-of-the-Art-Report*. B.S.I. & MAB. New Delhi, p. 12.
4. Kanjilal, U.N., *et al* (1934): *Fl. Assam* 1 : 177.

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



Adinandra griffithii Dyer A. Fruiting branch. B. Ovary with sepals. C. Fruit.

STATUS: Vulnerable; a narrow mountain endemic confined to Courtallum and Agastyamalai Hills, is at risk because of the clearing of its habitat for the cultivation of plantation crops. This species was hitherto represented only by the type collection, *Wight 427* from Courtallum (1, 3). However, there are some collections in the Madras Herbarium from Agastyamalai and surrounding areas made in recent years but wrongly identified as *Cissus trilobata* Lam., which resembles *Cayratia roxburghii* in having 3-foliate, glabrous leaves. (Type in MH!).

DISTRIBUTION: Kerala (Trivandrum and Quilon dists.), Tamil Nadu (Tirunelveli dist.)

HABITAT AND ECOLOGY: Occurs in tropical evergreen forests between 750-1000 m.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: 'Agastyamalai and environs', a potential area for the establishment of a biosphere reserve (2) is rich in several endemic species (ca 150 species), including this species.

BIOLOGY AND POTENTIAL VALUE: It is an endemic species confined to a very small area.

CULTIVATION: So far none.

DESCRIPTION: Scandent shrubs; branches cylindrical, striate, glabrous, glaucous. Tendrils leaf-opposed, simple, wiry. Leaves 3-foliate, pedate, glabrous; petioles 3.5-5.0 cm long; terminal leaflets 12-16 × 4.0-6.5 cm, elliptic-lanceolate, rounded or acute at the base, undulate-dentate, acuminate at the apex, petiolules ca 2 cm long; lateral leaflets 10-15 × 3.5-6.5 cm, oblique at the base, margins and apex as in the terminal leaflets, petiolules ca 1 cm long. Inflorescences ca 5 cm long of axillary, dichotomous cymes; peduncles ca 2.5 cm long. Flowers bisexual, 4-merous, glabrous; calyx cupular, entire. Petals ca 2 × 1 mm, hooded at the apex. Disc fleshy, covering the ovary. Berries ca 1 cm across, 2-4-seeded. Seeds ca 7 mm across, adaxial surface with a circular pit, abaxial surface convex, smooth with a spatulate chalaza.

REFERENCES:

1. Gamble, J. S. (1957). *Fl. Pres. Madras* 1: 169. (repr. ed.).
2. Henry, A. N., Chandrabose, M., Swaminathan, M. S., & Nair, N. C. (1984). *J. Bombay Nat. Hist. Soc.* 81: 282.
3. Vajravelu, E. (1983). *Plant Conservation Bull.* 4: 25. Botanical Survey of India, Howrah.

The material for this sheet was supplied by B. V. Shetty and C. P. Malathi, Botanical Survey of India, Coimbatore.

STATUS: Vulnerable in the wild. Causes for its decline are habitat destruction, forest clearing and excessive collection/exploitation due to its professed medicinal properties.

DISTRIBUTION: Endemic to the Cuddapah-Tirupati range of the Southern Eastern Ghats in Andhra Pradesh. The species was first described and reported from "Cuddapah hills" by Thistleton Dyer in 1881. However, this species seems to have disappeared from the Cuddapah region and now it is probably confined to the Tirupati hills only.

HABITAT AND ECOLOGY: The plant grows in dry deciduous forest occurring on the exposed rocky slopes and in the denuded valleys of the Tirupati hills between 300-900 m altitudes. It is found along the rock-strewn holy streams (known as 'teerthas' in the local vernacular) of Tirumala hills. The soil in which it grows is mostly of lateritic, gneissic and quartzitic origin. This cycad is associated with other drought resistant species of plants like *Phoenix pusilla* Gart., *Decaschistia cuddapahensis* Paul et Nayar, *Gardenia gummiifera* Linn. f. and *Pterocarpus santalinus* Linn. f.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Legislating a ban on the collection/exploitation/sale (in any form whatsoever) of the plant, (b) establishment of a biosphere reserve encompassing the natural habitat of this species along with other endemics and plant genetic resources of Tirumala hills, (c) to study the biology of the species to find means of artificial propagation.

BIOLOGY AND POTENTIAL VALUE: This is a horticulturally graceful palm-like plant whose stem is exposed only 10-15 cm above the ground and has dark brown exfoliating scales. The plant is gregarious in habit with 2-8 trunks in a clump. It sprouts new foliage in early summer and bears male and female cones on separate individuals. The male cone is pruned away by local tribals for its professed medicinal properties, being used as a major ingredient in rejuvenating tonics. As in *C. circinalis* the pollen might possibly have narcotic properties; pharmacognostic studies could ascertain the true drug potential of the plant.

CULTIVATION: The plants are often uprooted by avid plant collectors for ornamental use in private gardens. A few specimens are in cultivation in the Botanical Survey of India Gardens at Yercaud, Indian Botanic, Howrah and in the University Botanic Garden and T. T. Devasathanam garden at Tirupati and Tirumala respectively.

DESCRIPTION: Shrub. Stem 10-15 cm long. Leaves ca 1 m long; petioles ca 15 cm long, the upper one-third with few minute spines, base covered with tufted tomentum; leaflets 10-18 × 0.5 cm, linear, apex-acuminate, margins strongly revolute. Male cone ca 20 × 8 cm, rusty brown, apical portion of microsporophyll of the upper half of the cone strongly deflexed, blade of megasporophyll usually narrow-lanceolate, long-acuminate; margins dentate-lobate, ovules 2 on either side. Seeds globose, ca 4 cm across.

REFERENCE:

1. Dyer, W. T. T. (1881). On a New Species of *Cycas* from Southern India. *Trans. Linn. Soc. Ser. II*, ii, 5: 85, t. 17.

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

STATUS: Presumed Extinct in its type locality, due to habitat loss.

DISTRIBUTION: Endemic to Manipur, Eastern India. Beddome (1) described this species on Dr. Watt's collection from Kayan, east Manipur. Despite several collection tours in Manipur conducted by Botanical Survey of India, this species has not been found and collected since the original collection.

HABITAT AND ECOLOGY: Grows at about 1800 m altitude. No other information is available due to non-collection of this species.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive search in its type locality and other likely areas and *ex situ* conservation in conservatories if rediscovered, should be tried.

BIOLOGY AND POTENTIAL VALUE: No information.

DESCRIPTION: "Rhizome?; stipes stramineous, 10-12 cm long, clothed with a few light coloured deciduous scales. Frond 30-35 cm long, 5-6 cm wide, tripinnate, broadest in the centre, gradually narrowed towards apex and base, rachis naked, texture subcoriaceous, surface glossy, ultimate segments obovate to lanceolate, sharply acuminate or rarely with a rounded apex, more or less 2-lobed; veins once forked in ultimate segments. Sori apical on short lower veinlets, often furnished with a few deciduous hair-like scales." (2).

REFERENCES:

1. Beddome, R. H. (1888). New Manipur Ferns collected by Dr. Watt. *J. Bot.* 234.
2. Beddome, R. H. (1892). *A Handbook to the ferns of British India, Ceylon and the Malay Peninsula with supplement*, p. 49.
3. Tagawa, M. (1949). Fern. Miscellany (1). *J. Jap. Bot.* 22: 163.

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

STATUS: Endangered, due to clearing of forests for shifting cultivation and forest fires.

DISTRIBUTION: Endemic to Manipur, Eastern India. Beddome (1) described this species on Watt's collection n. 6159. Despite several recent collection trips in Manipur conducted by Botanical Survey of India, the species has not been collected.

HABITAT AND ECOLOGY: No information available due to further non collection of this species. No precise data on the ecology has been indicated by the original collector.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Attempts should be made to locate this species in Manipur and adjoining regions and if rediscovered, it is to be introduced into Botanic Gardens and Conservatories.

BIOLOGY AND POTENTIAL VALUE: No information; however an endangered species with restricted distribution.

DESCRIPTION: "Rhizome erect, furnished with numerous long stiff, wiry roots, covered with narrow, linear, pale coloured scales. Stipes tufted, 2.5-8 cm long. Fronds 15-30 cm long, 5-10 cm wide, lanceolate, attenuate at both ends, bipinnate, turning quite black on drying, pinnae oblong-acuminate, lower pinnules largest, pinnules dimidiate, being always more or less cut away at the base, more developed on the upper side, cut down $\frac{1}{3}$ - $\frac{1}{2}$ towards the midrib into several lobes which have 2-4 sharp, unequal serratures at the rounded apex; veins forked or pinnate in the lobes. Sori very small, about the centre of the veins; indusia athyrioid, fugaceous" (1).

REFERENCE:

1. Beddome, R. H. (1892). *A Handbook to the ferns of British India, Ceylon and the Malay Peninsula with supplement*, p. 33.

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

STATUS: Endangered. Cause for its decline is habitat destruction.

DISTRIBUTION: Mountains of Southern India in between 1350 to 1800 m alt.

HABITAT AND ECOLOGY: Along stream banks in shady humid forests.

CONSERVATION MEASURES TAKEN: Some of its distributional localities are being protected in the newly established Nilgiri-Wynad biosphere reserve.

CONSERVATION MEASURES PROPOSED: Efforts should be made for its introduction in botanic gardens, and further collection from the wild should be prevented.

BIOLOGY AND POTENTIAL VALUE: One of the handsome large species of tree ferns. It is of academic and distributional interest.

CULTIVATION: The species is not under cultivation at present. Efforts should be made for its introduction in botanical gardens.

DESCRIPTION: Trunk ca 5 m high; stipe 40 cm or more long, dark brown, provided with spines upto 1.5 mm long, scales on stipes 15×1.5 mm, dark brown, margins fragile, narrow, shining, rachis, more or less purple tinged, sparsely verrucose, glabrescent. Pinnae 60 cm long, small verrucose, glabrescent, lower surface bearing pale bullate scales possessing long acuminate crisped apics. Larger pinnae 10-12×1.8-2.1 cm, sessile, lobed almost upto costae, lower segments not free, costules 3-4 mm apart; veins 10-12 pairs, furcate, sometimes in the middle again furcate; lamina segments small, margins crenate-serrate. Sori indusiate near costules, indusium pale, small, paraphyses small, not longer than sporangia, bullate scales abundant on costae and costules, a few crisped hairs present on costae.

REFERENCES:

1. Dixit, R. D. (1984). *A census of the Indian Pteridophytes*. Botanical Survey of India, Howrah.
2. Holttum, R. E. (1965). Tree ferns of the genus *Cyathea* Sm. in Asia (excluding Malaysia). *Kew Bull.* 19: 463-487.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

STATUS: Endangered; due to clearing of forests and its habitats.

DISTRIBUTION: South India. Restricted to Nilgiri hill ranges in Tamilnadu state. Described by Beddome (1) as *Elaphoglossum squamosum* from that area. After a lapse of about hundred years, Vohra *et al* (4) rediscovered the species from Silent valley, adjacent to Nilgiri hills. Endemic.

HABITAT AND ECOLOGY: Epiphytes on tree trunks at lower level or on moist rocks. Grows between 1500-1800 m in alt.

CONSERVATION MEASURES TAKEN: The Nilgiris are recently declared as a Biosphere Reserve and the Silent Valley in Kerala as a National Sanctuary.

CONSERVATION MEASURES PROPOSED: Trials to grow in other hilly areas in South India; introduction in green-houses and botanical gardens are suggested.

BIOLOGY AND POTENTIAL VALUE: No information, but it is of botanical interest and distributional significance.

DESCRIPTION: Rhizome short, obliquely ascending or even upright, densely covered with narrowly lanceolate or linear brown scales, scales acute at apex. margin with thin black teeth. Phyllopodia indistinct. Fronds crowded together and inserted all round the rhizome, stipes 2-6 cm long, covered with woolly lanceolate scales, scale margin with long concolorous setiferous teeth. Lamina simple, 8-25 cm long, oblong-elliptic, base cuneate or attenuate, apex abruptly narrowed, subobtuse to obtuse; texture thin, upper surface green to brown, sparsely scaly, lower surface green, hidden under the dense coating of pale-brown woolly scales; scales on both surfaces vary in shape, narrow to broadly lanceolate, sometimes orbicular with long setiferous teeth. Sori cristicoid.

REFERENCES:

1. Beddome, R. H. (1863). *The Ferns of South India*, p. 67, t. 197
2. Biswas, A. & Ghosh, S. R. (1984). The fern family *Elaphoglossaceae* in India, Nepal, Bhutan. *Proc. Ind. Acad. Sci. (Pl. Sc.)* 93(6): 602
3. Sledge, W. A. (1967). The genus *Elaphoglossum* in Indian Peninsula and Ceylon. *Bull. Brit. Mus. Nat. Hist.* 4(2): 94
4. Vohra, J. N., *et al* (1982). Observations on the Cryptogamic flora of Silent valley. In: Jain, S. K. (ed.) *Botanical Studies on Silent Valley* 1. Botanical Survey of India, Howrah. p. 7, 38.

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

STATUS: Endangered and endemic species in South India, restricted to hilly terrain in moist shady places. Beddome (1) reported this species from the Western Ghats but this species is not represented in MH. Recently it has been collected from Silent Valley Reserve Forest, Palghat Dt., Kerala after a lapse of 120 years (5).

DISTRIBUTION: South India, endemic to Western Ghats. The report of it from Burma by Christensen (2) and Dickson (3), according to Kramer (4) is probably an error and the specimen (*Ghatak* 440 Madras) available at Kew Herbarium seems to be from some hilly areas of erst-while Madras State (Tamil Nadu) but not probably from Madras City.

HABITAT AND ECOLOGY: Terrestrial in moist humus soil in shady places along the banks of streams in association with species of *Trichomanes*. The young leaves are greenish, sometimes with pink tinge.

CONSERVATION MEASURES TAKEN: Silent Valley area has been recently declared as a National Sanctuary. The small populations observed will therefore be safe provided these are left undisturbed.

CONSERVATION MEASURES PROPOSED: To conserve the plants in their natural habitat and also to introduce them in experimental gardens, for *ex situ* conservation.

BIOLOGY AND POTENTIAL VALUE: A very fragile species of the genus *Lindsaea*, with restricted distribution; can be of potential interest in horticulture and indoor decoration.

CULTIVATION: It is seen only in the wild. It can be multiplied by vegetative method and also by spore germination.

DESCRIPTION: Rhizome slender, short, creeping, brownish. Stipes stramineous, pale brown, quadrangular except at extreme base, 10-20 cm. Lamina simply pinnate or bipinnate with one or two pairs of lateral pinnae. Pinnules 20-30 to a side, the upper ones closer, ascending, lower ones spreading, basal pinnules little reduced, upper ones gradually and strongly reduced, a few denticuliform ones connected with the terminal segments. Veins immersed, once or twice forked. Sori interrupted; indusium pale-green, rigid, entire or crenate.

REFERENCES:

1. Beddome, R. H. (1892). *A Handbook to the ferns of British India, Ceylon and the Malay Peninsula with supplement.*
2. Christensen, C. (1931). Asiatic Pteridophyta collected by Joseph F. Rock: 1920-1924. *Contr. U.S. Nat. Herb.* 26: 265-337. pl. 13-29.
3. Dickson, G. F. (1946). The Ferns of Burma. *Ohio J. Sc.* 46: 109-141.
4. Kramer, K. U. (1972). The Lindsaeoid ferns of the Old World. VI. Continental Asia, Japan and Taiwan. *Gard. Bull. Singapore* 26: 1-18.
5. Nair, N. C. & Bhargavan, P. (1985). Recent finds of five rare or little known pteridophytes from Silent Valley and neighbourhood. *J. Econ. Tax. Bot.* 6(2): 267-270.

The material for this sheet was supplied by N. C. Nair and P. Bhargavan, Botanical Survey of India, Coimbatore.

STATUS: Endangered. Causes of threat are clearing of forests and destruction of its habitats.

DISTRIBUTION: Endemic to Khasia Hills, Meghalaya, Eastern India (4). Fee (5) described this species from Khasia Hills. Last collection was made by C. B. Clarke in 1871 according to herbarium materials available in CAL.

HABITAT AND ECOLOGY: Grows in sandy river beds in between 600-1300 m alt. (3)

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: Intensive search to recollect the species and to grow in Botanical Gardens.

BIOLOGY AND POTENTIAL VALUE: No information.

DESCRIPTION: Small plants, rhizome very slender; scales lanceolate; stipes slender, distant. Fronds dimorphous. Sterile fronds upto 5 cm long, membranaceous, stipe 1-4 cm long, lamina oblong or broadly lanceolate, 2-5.5 cm long, 6-10 mm broad at middle, base tapering, apex obtuse, margin entire, costa distinct, costules indistinct, veins reticulate forming areola which contain free included veinlets, areola small towards margin. Fertile frond 9-12 cm long, stipe slender, wiry; lamina linear, 3.5 cm long, 3-4 mm broad at middle.

REFERENCES:

1. Beddome, R. H. (1865). *The ferns of British India*, t. 116.
2. Beddome, R. H. (1883). *A Handbook to the ferns of British India, Ceylon and Malay Peninsula*, p. 430. t. 259.
3. Clarke, C. B. (1880) A review of ferns of N. India. *Trans. Linn. Soc. ser.2. Bot.* 1: 579.
4. Copeland, E. B. (1947). *Genera Filicum*, p. 199.
5. Fee, A. L. A. (1865) *Mem. Fam. Faug.* 8, t. 31, f. 2.
6. Hooker, W. J. (1864). *Species Filicum* 5: 277.
7. Hooker, W. J. (1861). *Second century of ferns*, t. 78.
8. Hooker, W. J. & Baker, J. G. (1867). *Synopsis Filicum*, p. 420.

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

STATUS: Endangered. Cause for its decline is endemism to North-West Himalayas and habitat destruction in the region.

DISTRIBUTION: Endemic to North-West Himalayas.

HABITAT AND ECOLOGY: On moss-covered rock boulders along streams and rivulets.

CONSERVATION MEASURES TAKEN: None.

CONSERVATION MEASURES PROPOSED: (a) Collection of plant material should be stopped, (b) efforts should be made to introduce the species in conservatories.

BIOLOGY AND POTENTIAL VALUE: It is one of the beautiful species of the genus. It is of much academic interest due to presence of two lateral veins in the lateral and median leaves.

CULTIVATION: Trials may be made to introduce the species in conservatories.

DESCRIPTION: Stems 15-25 cm, decumbent, terete, densely matted, bright red to stramineous red, simple in the basal region, copiously branched above, branches decompound, flagellate. Rhizophores long, confined to the basal half. Leaves obscurely heteromorphic, continuous, usually adpressed to the stem, rigid; lateral leaves oblong, subfalcate, cuspidate, ciliate at the base on proximal side, rest dentate to denticulate, distal side smooth with a strong median nerve and two lateral branches, median leaves small, elliptic, cuspidate, dentate. Strobili quadrangular, 3-5 × 1-2 mm; sporophylls uniform, deltoid, cuspidate, dentate.

REFERENCES:

1. Alston, A. H. G. (1945). An enumeration of the Indian species of *Selaginella*. *Proc. Nat. Inst. Sci. India* 11: 211-235.
2. Dixit, R. D. (1979). *Taxonomic studies on the families Lycopodiaceae and Selaginellaceae in India*. Ph.D. Thesis, Calcutta University, Calcutta.
3. Dixit, R. D. (1983). Rare and interesting Pteridophytes of India-II. In: Jain, S. K. & Rao, R. R. (ed.) *An Assessment Threatened Plants of India*. Botanical Survey of India, Howrah.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

STATUS: Endangered. Cause for its decline is mainly habitat destruction. It is known by few collections only and the last collection was made in the year 1968.

DISTRIBUTION: Endemic to South India.

HABITAT AND ECOLOGY: On rock boulders with mossy cover near permanent source of trickling water and along streams.

CONSERVATION MEASURES TAKEN: None

CONSERVATION MEASURES PROPOSED: To relocate the species; efforts may be made to introduce in the botanic gardens and green-houses.

BIOLOGY AND POTENTIAL VALUE: It is one of the smallest species of the genus *Selaginella*. The smaller species are fast disappearing due to habitat destruction. It is of academic interest.

CULTIVATION: Nil.

DESCRIPTION: Stems 1.5-5.0 cm, wiry, procumbent, stramineous, branched from the base, branches irregularly bipinnate. Rhizophores small, wiry, confined to the basal region. Leaves heteromorphic, minutely denticulate, rotundate at the base, subobtusate at the apex; lateral leaves distant on the mainstem, subcontiguous on the branches, ovate, oblique; axillary leaves ovate-oblong. Strobili small, 2-3 × 1-1.5 mm, terminal on the branches; sporophylls a few only, larger sporophylls ovate, oblique, subobtusate; smaller sporophylls ovate, cordate, subacute. Megaspores 200-300 µm, dull-yellow, smooth to irregularly papillate; microspores 20-22 µm, deep-yellow, papillate.

REFERENCES:

1. Alston, A. H. G. (1945). An enumeration of the Indian species of *Selaginella*. *Proc. Nat. Inst. Sci. India* 11: 211-235.
2. Dixit, R. D. (1983). Rare and interesting Pteridophytes of India-II. In: Jain S. K. & Rao, R. R. (ed.) *An Assessment of Threatened Plants of India*. Botanical Survey of India, Howrah.

The material for this sheet was supplied by R. D. Dixit, Botanical Survey of India, Allahabad.

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