CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

C.A.M.P.
FOR SELECTED SPECIES OF
MEDICINAL PLANTS OF SOUTHERN INDIA

Organised by
**FOUNDATION FOR REVITALISATION OF LOCAL HEALTH TRADITIONS
ZOO OUTREACH ORGANISATION/CBSG, INDIA**

R E P O R T

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MEDICINAL PLANTS
CAMP REPORT

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Executive Summary

Indian culture is known for its diverse fields of expertise such as agriculture, metallurgy, astrology, mathematics, linguistics, medicine, surgery, yoga and other specialisations. Some of these fields have grown and have been passed onto generations in time. Nature care is one of them. Older generations have always relied on certain medicinal plants as cure for illnesses and for preventive and promotive health. Now, more and more people - both locals and drug manufacturers have started exploiting medicinal plant species from the wild to cater to the growing commercial market. This situation has led to the decrease in some sensitive plants which have not been able to recover in their natural habitat. Cultivation for sustainable utilisation has not yet been practised partly due to the short-sightedness of the herbal industry which has found it cheaper to collect and harvest medicinal plants from the wild and partly due to lack of knowledge on the breeding biology and propagation techniques for some of these forest dwelling species. In an effort to know what remains of these plants in the wild, intensive surveys need to be conducted. Since it takes time to gather all resources, personnel and finance, a rapid assessment in the form of the Conservation Assessment Management Plan process was conducted in Bangalore to priotitise species. This process involves calling together specialists in the respective fields, in this case, botanists, ecologists, population biologists who have worked on the species to assess the situation with regard to selected southern Indian medicinal plants. The process makes possible rational recommendations for management scenarios to help species recovery.

The Conservation Assessment and Management Plan workshop for selected southern Indian medicinal plants held in Bangalore was the first major effort on plants. This was the first time the revised threat criteria (IUCN Red List criteria) was used to assess plants. Foundation for Revitalisation of Local Health Traditions' list of threatened species (gathered from the Indian Red Data Book, and based on information available on exploitation, endemism and some strong belief of authorities in the field) provided a base to work on. Thirty six identified species were chosen for this workshop for an assessment.

Botanists of different specialities such as taxonomy, genetics, population biology, reproductive biology, from the three southern Indian states formed three working groups to work on twelve species respectively. The groups exchanged their list of plants with each other for revision.

The process helped in bringing together all scattered information with respect to a taxon, whether it be anecdotal, old reference, recent surveys or personal fieldwork. Most of the plants belonged to the Class Angiosperm and only one was a Gymnosperm. Sufficient data in most cases was available to work with.

Seven herbs, three shrubs, seven climbers, two stragglers, one twiner and fifteen trees constituted the 36 species. The range in square kilometres was calculated according to their distribution. Data for ten species was not available and they was marked unknown. Two of the species were considered extinct in the wild but widely cultivated. The number of species falling under different distributional ranges are as follows: 5 with less than 5,000 sq.km., 6 with less than 10,000 sq.km., 7 with less than 50,000 sq.km., 1 with more than 1,00,000 sq.km. and 5 others with no estimates.

The area occupied by each of these species on an average is about 10% of the range area. Estimating the area of occupancy is more difficult than the range areas and it was difficult in more than 50% of the species considered. The populations for most of the 36 species have been known to decline except for a few weedy species. Comparing old records and new information, percentage decline, causes of decline and the rate of decline of species populations were assessed. In some cases it was unknown due to a lack of monitoring. In cases where more data was available, the extent of fragmentation or the locations were noted. Threats that contributed to the decline included loss of habitat due to fragmentation, human interference, loss of habitat, over exploitation and interspecific competition from exotics.

The revised IUCN Red List categories (Mace-Stuart) were used to classify the plants and the results are as follows. Two species are believed to be extinct in the wild; six, critical globally and two, critical regionally; six, endangered globally and one, endangered regionally; four, vulnerable globally, one, vulnerable nationally and one, vulnerable regionally; nine, low risk and four, data deficient. A strong recommendation in this workshop was that the species be categorised according to three levels depending on their distribution and their status locally. The three levels meant – (1) globally, if the species was endemic to India; (2) nationally, if the species was native to India and had populations in the neighbouring countries; (3) regionally, if the species had a wide distribution in a biogeographic area spanning many countries.

Most of the species traded either locally or commercially are of wild origin. Very few species are culti-vated and of the over 500 species used widely by traditional herbal pharmaceuticals, less than 50 have standardised agro-technology developed.

The scenarios led to recommendations in the areas of Population and Habitat Viability Assessments, Research, Cultivation and Genetic Management. It was decided that PHVA was required for 20 of the 36 species. Recommendations to survey, monitor, habitat management, taxonomic and life history studies were the other research management recommendations. Genetic management was sought for species under cultivation and for those categorised as endangered or critical. Cultivation programme was recom-mended to species that were over exploited in the wild and those that have a good potential to be commer-cially utilised in future.

The workshop participants formed six different working groups for certain identified areas in medicinal plant conservation and utilisation.

Cultivation for utilisation – export of plant material:
Recommendations in this group were that research on propagation, agronomic and nursery practices, seed viability and storage should be carried out on priority basis. Marketing tie-ups with manufacturers to ensure guaranteed returns to the cultivators. Enforcement of law to ban wild collections.

Assigning threatened IUCN Red List categories – criteria for 'area of occupancy':
It was felt that the categories would be difficult to apply since the plants vary in occupancy areas depend-ing on the vegetation type. It was suggested to investigate this aspect.

The need for threat status assessment at regional/national level:
The group felt that applying the threat categories at the global level was not totally appropriate since the management prescriptions for conservation was more at regional or national level. It was therefore recom-mended that the assessments be made at the regional and national level along with those at global level.

Herbaria work independently, not networked:
The group also identified this as a major hurdle in plant conservation in India because of the potential problems in working independently and not having consistent and systematic studies. It was recom-mended that the Botanical Survey of India should take up the responsibility to network and guide research activities.

Survey and monitoring of threatened medicinal plants:
The working group suggested certain guidelines for survey and monitoring of threatened medicinal plants such as methodology, field studies and quantification studies such as transect/quadrat methods.

Genetics:
The group suggested action plans for conservation of genetic diversity of threatened plant species of southern India with emphasis on seed storage, herbal gardens, metapopulation management, reproductive biology, etc.

Reintroduction – management of critically endangered species:
The group recommended identification of *in situ* areas of conservation for each of the endangered spe-cies, demographic studies, study of phenological processes, limiting factors, standardising propagation techniques, regulations over exploitation, supplementation of nursery raised plants into the wild, create awareness, etc.

The workshop which started off on guidelines to the process finally came out with very good recommenda-tions for adapting the process for plants. It suggested some additions to the Taxon Data Sheets as well as the Summary Data Table. The columns in the Taxon section of the spreadsheet were slightly modified to suit plants.

The process helped in classifying the 36 taxa according to the IUCN Red List categories (Mace-Stuart, 1994)

Extinct
Madhuca insignis

Extinct in the wild
Plectranthus vettiveroides

Critical
Adhatoda beddomei
Cycas circinalis (regional level)
Coscinium fenestratum
Kaempferia galanga (regional level)
Piper barberi
Syzygium travancoricum
Trichopus zeylanicus travancoricus
Utleria salicifolia

Endangered
Cyclea fissicalyx
Kingiodendron pinnatum
Madhuca diplostemon
Myristica malabarica
Pterocarpus santalinus
Rauvolfia serpentina
Saraca asoca (regional level)

Vulnerable
Ampelocissus araneosa
Aristolochia tagala (national level)
Commiphora wightii (regional level)
Cycas circinalis (national level)
Holostemma ada-kodien
Hydnocarpus macrocarpa
Ochreinauclea missionis
Saraca asoca

Low risk
Aristolochia bracteolata
Elaeagnus conferta
Embelia ribes
Gardenia gummifera
Glycosmis macrocarpa
Operculina turpethum
Piper longum
Vateria indica
Woodfordia fruticosa

Data deficient
Aerva wightii
Asparagus rottleri
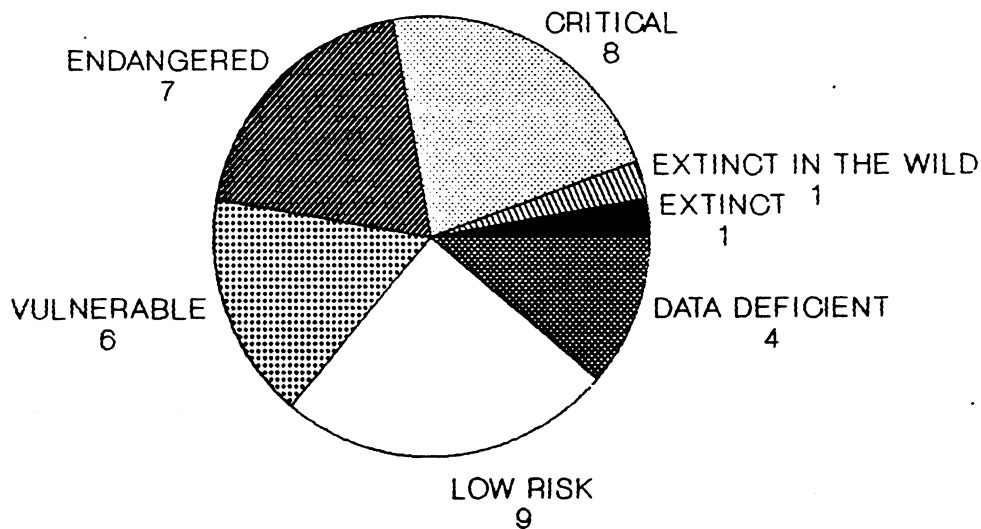*Buchnania lanzan*
Cleome burmanni

IUCN Red List Categories for 36 Selected Species of Southern Indian Medicinal Plants

FOUNDATION FOR REVITALISATION OF LOCAL HEALTH TRADITIONS

and

ZOO OUTREACH ORGANISATION/CBSG, INDIA

THANK

REPORT

CAMP Workshop for Selected S. Indian Medicinal Plants

CBSG, India

CBSG

ZOO

Section II.

Reports

Saraca asoca
(Roxb.) Willd

Introduction

Fragmentation and habitat degradation have led to the extinction or near extinction of many indigenous plant species. Medicinal plants particularly are vulnerable because they are not only uprooted for development, but also commercially exploited. This reduces individuals to such low numbers that species may not recover and survive in the wild over the long term. With the ever growing need for more land for human habitation and the commercial prospects of extracting and trading, medicinal plants in particular face a high degree of threat of extinction. Intensive management of the species in the wild and also cultivating them for conservation and for sustainable utilization *in situ* is necessary.

This universal scenario is better understood at a more regional level. Southern Indian plant species like anywhere else in India, are in danger due to various factors of human influence. Two hundred and fifty six species have been identified as being rare or endangered in the Indian Botanical Red Data Book. This list covers only medicinal plants in usage by locals or by pharmaceutical industries. Very little is known of the extent of damage caused to these native species, their distribution or area of occurence.

There are extensive tracts of forests protected as reserves where many of the species are found. Because of human habitation, grazing, timber collection, local medicine and illegal collection for local or international markets, medicinal plants are under severe pressure. In spite of protection in the parks, species are lost.

Conservation Assessment and Management Plan

Within the Species Survival Commission (SSC) of IUCN (The World Conservation Union), the primary goal of the Conservation Breeding Specialist Group (CBSG) is to contribute to the development of holistic and viable conservation strategies and management action plans. Toward this goal, CBSG is collaborating with organisations, agencies and other Specialist Groups worldwide in the development of Conservation Assessment and Management Plans (CAMPs), both on a global and a regional basis, with the goal of facilitating an integrated approach to species managment for conservation.

CAMPs provide strategic guidance for the application of intensive management techniques that are increasingly required for survival and recovery of threatened taxa. CAMPs are also one means of testing the applicability of the new IUCN Red List criteria for threat as well as the scope of its applicability. Additionally, CAMPs are an attempt to produce ongoing summaries of current data for groups of taxa, providing a mechanism for recording and tracking of species status.

In addition to management in the natural habitat, conservation programs leading to viable populations of threatened species may sometimes need a captive component. Such components can range from the development of active, long-term captive populations or utilization of technologies developed and refined under captive conditions. In general, captive populations and programs can serve several roles in holistic conservation: 1) by providing scientific resources for information and technology that can be used to protect and manage wild populations, 2) as genetic and demographic reservoirs that can be used to reinforce wild populations either by revitalizing populations that are languishing in natural habitats or by reestablishing, via translocation or utilization of captive technologies, populations that have become depleted or extinct; and 3) as living ambassadors that can educate the public as well as generate funds for *in situ* conservation.

It is proposed that, when captive populations or technologies developed in captivity can assist species conservation, captive and wild populations should, and can be, intensively and interactively managed with interchanges of plants or genetic material occurring as needed and as feasible. Captive populations should be a support, not a substitute for wild populations. There may be problems with interchange between captive and wild populations with regard to disease, logistics, and financial limitations. In the face of the immense extinction crisis facing the medicinal plants, these issues must be addressed and resolved within the next several years.

The CAMP Process

The CAMP process assembles expertise on wild and captive management for the taxonomic group under review in an intensive and interactive workshop format. The purpose of the Southern Indian Medicinal Plants Conservation Assessment and Management Plan (CAMP) workshop was to assist in the development of a conservation strategy for plants, and to continue to test the applicability of the new IUCN Red List criteria for threat (Mace and Stuart, 1994).

In October of 1994, a group comprising of 18 individuals met to discuss the Mace-Lande categories of threat assessment. The individuals came from different backgrounds such as botany, ecology and population biology when the Conservation Assessment Management Plan process was introduced. It was discussed in certain depth where certain suggestions were made to make the CAMP format more applicable to plants. The process on the whole was accepted to be tried on selected medicinal plants. Thereafter, a formal CAMP for the species was arranged.

Assessment of Selected Southern Indian Medicinal Plants

The Conservation Assessment Management Plan for selected southern Indian medicinal plant taxa was tested with the new IUCN Red List criteria which was a revised version of the earlier Mace-Lande criteria. This criteria was felt to be better suited for plants in its applicability compared to the earlier version.

The participants worked in three different groups to discuss a set of taxa. The assessments and recommendations of each of the working groups for each taxa were circulated to and discussed by the entire group prior to final consensus by all participants, as represented in this document. Summary recommendations concerning research management, assignment of all taxa to threatened status and cultivation were supported by the workshop participants.

To determine and assess the status of medicinal plants in southern India, a political area covering the three states of Karnataka, Kerala and Tamil Nadu with a forest cover of about 60,000 sq.km. was considered. Specifically, 36 of the 256 species of medicinal plants that were known to be extremely endangered were chosen for assessment. This information was gathered from the Indian Red Data Book on plants.

Medicinal Plants which are Reportedly Rare

	Botanical Name	Family	Habit
1.	Adhatoda beddomei C. B. Clarke	Acanthaceae	Shrub
2.	Aerva wightii Hook. f.	Amaranthaceae	Herb
3.	Ampelocissus araneosa Planchon	Vitaceae	Climber
4.	Aristolochia bracteolata Lam.	Aristolochiaceae	Herb
5.	Aristolochia tagala Cham.	Aristolochiaceae	Climber
6.	Asparagus rottleri Baker	Liliaceae	Herb
7.	Buchnania lanzan Sprengel	Anacardiaceae	Tree
8.	Cleome burmanni Wight & Arn.	Capparidaceae	Herb
9.	Commiphora wightii (Arn.) Bhandari	Burseraceae	Tree
10.	Coscinium fenestratum (Gaertn.) Coleb.	Menispermaceae	Climber
11.	Cycas circinalis L.	Cycadaceae	Tree
12.	Cyclea fissicalyx Dunn.	Menispermaceae	Climber
13.	Elaeagnus conferta Roxb.	Elaeagnaceae	Stragler
14.	Embelia ribes Burm. f.	Myrsinaceae	Climber
15.	Gardenia gummifera L.	Rubiaceae	Tree
16.	Glycosmis macrocarpa Wight	Rutaceae	Shrub
17.	Holostemma ada-kodien Shultes	Asclepiadaceae	Twiner
18.	Hydnocarpus macrocarpa (Bedd.) Warb.	Flacourtiaceae	Tree
19.	Kaempferia galanga L.	Zingiberaceae	Herb
20.	Kingiodendron pinnatum (Roxb. ex Dc) Harms	Caesalpiniaceae	Tree
21.	Madhuca diplostemon (Clarke) Royen	Sapotaceae	Tree
22.	Madhuca insignis (Radik) H.J. Lam.	Sapotaceae	Tree

23.	*Myristica malabarica* Lam.	Myristicaceae	Tree
24.	*Ochreinauclea missionis* (Wallich ex G. Don) Ridsdale	Rubiaceae	Tree
25.	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae	Climber
26.	*Piper barberi* Gamble	Piperaceae	Climber
27.	*Piper longum* L.	Piperaceae	Stragler
28.	*Plectranthus vettiveroides* (Jacob) Singh & Sharma	Lamiaceae	Herb
29.	*Pterocarpus santalinus* L.f.	Fabaceae	Tree
30.	*Rauvolfia serpentina* (L.) Benth Ex Kurz	Apocynaceae	Shrub
31.	*Saraca asoca* (Roxb.) Willd.	Caesalpiniaceae	Tree
32.	*Syzygium travancoricum* Gamble	Myrtaceae	Tree
33.	*Trichopus zeylanicus* Gaertn. Sub sp. *travancoricus* Burkill ex Narayanan	Dioscoriaceae	Herb
34.	*Utleria salicifolia* Beddome.	Asclepiadaceae	Shrub
35.	*Vateria indica* L.	Dipterocarpaceae	Tree
36.	*Woodfordia fruticosa* (L.) Kurz	Lythraceae	Tree

The 36 taxa from 30 families belong to Class Angiospermae but for one species Cycas which belongs to Class Gymnospermae. A mojority of the taxa in question are trees while the rest are shrubs, herbs and lianas.

Habits of the 36 species

Habit	Total
Climber	7
Twiner	1
Straggler	2
Herb	7
Shrub	3
Tree	15

The workshop participants came up with a status report of all of the taxa and the recommendations for management.

The IUCN Red List category for assessing threats was used for the first time. The categories were better applicable to plants than the Mace-Lande categories. In assessing categories, numerical information for the effective area occupied by the taxon, total area of its spread, fragmentation, degree of decline over a particular period of time and threats were taken into consideration. A conservative assessment based on these and individual studies classified all the taxa under the new IUCN Red List categories, viz. Extinct, Extinct in the wild, Critical, Endangered, Vulnerable, Low risk, Data deficient. The same categories were applied to the taxa regionally, nationally and globally depending on its spread. Since the assessment was being made for just three Indian states, it was felt necessary at the workshop that the taxa be accorded the category locally. Since most of the species were either endemic or more concentrated in these states, their assessment was global. Taxa occuring in areas other than the three states but within India were assessed both globally (if known) and regionally. Similarly, taxa occuring in India and the neigh-bouring countries were assessed nationally and regionally. In the present excercise, 5 taxa have been categorised either nationally, regionally, or both. The workshop participants felt very strongly that assessing the taxa locally was better in terms of recommending action plans (refer to working group reports).

The Indian Botanical Red Data Book taxa were individually assessed at the workshop and accordingly 1 taxa was extinct, 1 extinct in the wild, 8 critical, 7 endangered and 6 vulnerable and 9 low risk. Taxa classified as 'low risk' have either a good spread all through India or are safe in large tracts of protected area in the hills or are thriving as weeds. Four taxa were listed as data deficient either due to lack of recent work or previous information. The Summary Data Table lists information such as Number of Mature Individuals which for plants is not easy to gather. Hence this column for most of the species is listed as unknown.

Medicinal Plants Conservation and Assessment Management Plan Spreadsheet Categories

SCIENTIFIC NAME: Scientific names of extant taxa: genus, species, subspecies.

WILD POPULATION
LOCATION / RANGE: Geographical area where a species and its subspecies occur.

HABIT: The morphological stucture of the plant.

FAMILY: Family to which the taxon belongs.

The next section of the spreadsheet covers the wild population of the taxa in question. Columns in the WILD POPULATION section of the spreadsheet are:

AREA or extent of occurence: List the actual size of the area in which the species occurs, if possible. Also list the areas contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred, or projected sites of present occurence of a taxon, excluding cases of vagrancy (Fig). This measure does not take account of discontinuities or disjunctions in the spatial distributions of taxa. Extent of occurence can often be meeasured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180° and which contains all the sites of occurence).

AAA: > 5,000 sq km
AA: < 5,000 sq km
AA-1: < 1,000 sq km
AA-2: < 100 sq km
AA-3: < 10 sq km
B: 5,000 - 9,999 sq km
C: 10,000 - 49,999 sq km
D: 50,000 - 99,999 sq km
E: > 100,000 sq km
F: 500,000 - 999,999 sq km
G: > 1,000,000 sq km

OCCUP or area of occupancy: List the area actually occupied by the taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur through out the area of its extent of occurence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of the taxon (eg. colonial nesting sites, feeding sites for the migratory taxa). The size of the area of occupancy will be the function of the scale at which it is measured, and should be at a scale appropriate to relent biological aspects of the taxon. The criteria include values in km², and thus to avoid errors in classification the area of occupancy should be measured on grid squares which are sufficiently small.
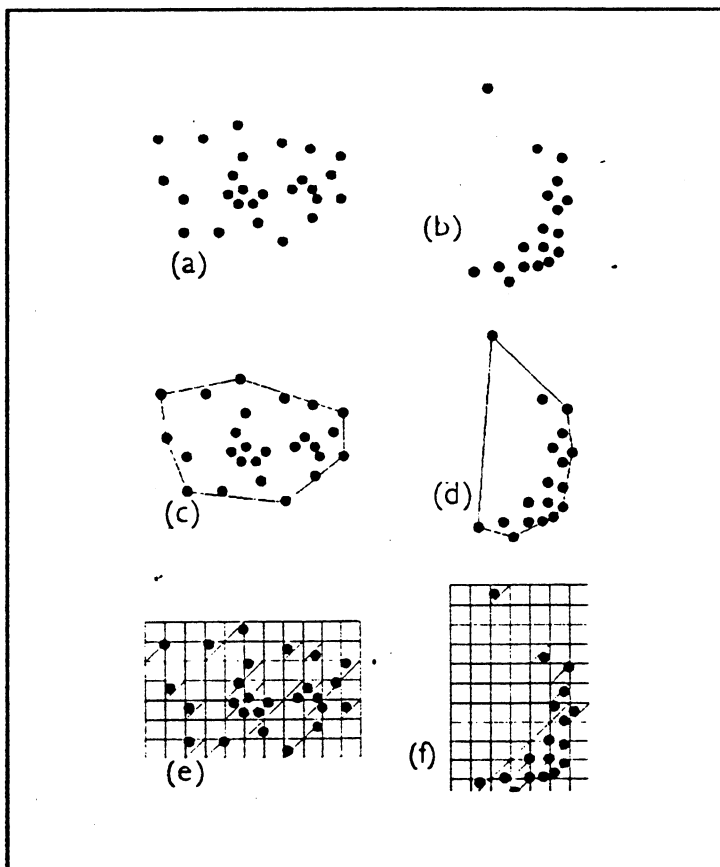
Two examples of the distinction between the extent of occurence and area of occupancy. (a) and (b) are the spatial distribution of the known, inferred, or projected sites of occurence. (c) and (d) show one possible boundary to the, extent of occurence, which is the measured area within this boundary. (e) and (f) show one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

FRAG/LOCS: Number of populations within the taxonomic unit. The number of populations is used to indicate the degree of fragmentation. If a population is fragmented, an "F" may be entered in addition to the number of subpopulations.

% DEC.: Estimate decline in the population of the species in its geographic range in percent.

YR/GN: Decline in the population in percent as recorded in years or number of generations.

MAT. IND.: Estimated numbers of individuals in the wild. If specific numbers are unavailable, estimate the general range of the population size (e.g., 100 - 500, 5,000 - 10,000).

DQ (Data Quality): data on which the population estimate is based.

> 1 = Recent (<10 years) census or population monitoring
> 2 = Recent (<10 years) general field study
> 3 = Recent (<10 years) anecdotal field sightings
> 4 = Indirect information (trade numbers, habitat availability, older data).
> 5 = Guesstimates

If there are different data quality in parts of range, this should be noted.

THREATS: Immediate or predicted events that are or may cause significant population declines. NOTE ** these can be described in more detail on the Taxon Data Sheet.
NOTE ** if a threat exists that is not listed, a new code can be devised.

> C = Climate
> D = Disease
> G = Genetic problems
> Hyb = Hybridization
> I = Human interference, disturbance, or persecution
> Ic = Interspecific competition
> Ice = Interspecific competition from exotics
> L = Loss of habitat
> Lf = Loss of habitat because of fragmentation
> M = Marine perturbations, including El Nino Southern Oscillation and other shifts
> P = Predation
> Ps = Pesticides
> Pl = Powerlines
> Po = Poisoning
> Pu = Pollution
> S = Catastrophic events
> > Sd: drought
> > Sf: fire
> > Sh: hurricane
> > St: tsunami
> > Sv: volcano
> W = War

TRDE (TRADE): Are live specimens of the taxon currently in trade?

> Y = Yes
> P = Probably in trade
> F = Likely to be in trade in the future
> N = No

Once these data are recorded, taxa are assigned a New IUCN Red List Category of Threat (see Appendix II, Section IV). The process of assigning a taxon to a category of threat relies heavily on the data recorded in the previous columns. The process for making these evaluations is illustrated in Figure 1. For taxa suspected to be threatened (Critical, Endangered, or Vulnerable), criteria listed Table 1 are used to make

the assignment to a threat category. The criteria used to make the assessment (e.g., population reduction criteria, extent of occurrence criteria, probability of extinction, etc.) should be recorded on the Taxon Data Sheet under "Criteria based on."

IUCN: Status according to New IUCN Red List criteria:

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that its last individual has died.

EXTINCT IN THE WILD (EW)   A taxon is Extinct in the Wild when it is known only
to survive in cultivation, in captivity, or as a naturalized population (or population) well outside the past range.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when it is facing an extremely high risk of extinction
in the wild in the immediate future as defined by the criteria listed in Table 1.

ENDANGERED (EN)
A taxon is Endangered when it is not Critical but is facing a very high risk of extinction
in the wild in the near future, as defined by the criteria listed
in Table 1.

VULNERABLE (VU)
A taxon is Vulnerable when it is not Critical or Endangered but is facing a high risk
of extinction in the wild in the medium-term future, as defined by the criteria listed in Table 1.

CONSERVATION DEPENDENT (CD)
Taxa which do not currently qualify under any of the categories above may be
classified as Conservation Dependent. To be considered Conservation Dependent, a taxon must be the focus of a continuing taxon-specific or habitat-specific conservation program which directly affects the taxon in question. The cessation of this program would result in the taxon qualifying for one of the threatened categories above.

LOWER RISK (LR)
A taxon is Low Risk when it has been evaluated and does not qualify for any of the categories Critical, Endangered, Vulnerable, Susceptible, Conservation Dependent, or Data Deficient.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it has not yet been assessed against the criteria.

Any of the above criteria with N or R denotes the status of the species at a National or Regional level.

The next step is then to determine what kinds of INTENSIVE ACTION may be needed for the conservation of the taxon. Column heads for intensive action are:

REC. (RECOMMENDATIONS):

PHVA: Is a Population and Habitat Viability Assessment Workshop recommended?
NOTE ** A detailed model of a species' biology is frequently not needed to make sound managment decisions.
Y = yes
N = no
P = pending (further data from surveys or other research is needed)

Research/Management: There should be a clear relationship between threats and subsequent outlined re-

CAMP SUMMARY DATA TABLE

Species	Location	Habit	Family	Area sq. km.	Occup sq. km.	Locs /Frg.	% Dec	Yr/Gn	Mat. Ind.	Data qual.	Thre	IUCN	Recs	Cult
Adhatoda beddomei C.B. Clarke	Agastyamalai, Gingee hills	Shrub	Acanthaceae	7500	< 1	5	Unk	Unk	Unk	2	I, L	CR	P, R, C	Yes
Aerva wightii Hook. f	Unk	Herb	Amaranthaceae	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	DD	PP	No
Ampelocissus araneosa Planchon	Southern peninsular India	Climber (h)	Vitacae	1,00,000	< 10,000	Yes	50	20	Unk	3	L, Ice	VU	NP, R, C, G	No
Aristolochia bracteolata Lam.	Peninsular India	Herb	Aristolochiaceae	> 5,00,000	< 1,00,000	Nil	No	Nil	Unk	3	Nil	LR	NP, NR, NC, G	No
Aristolochia tagala Cham.	Throughout India	Climber (h)	Aristolochiaceae		< 1,00,000	Nil	20 - 50	Unk	Unk	2	I, Ov	VU / N	P, C, G	No
Asparagus rottleri Baker	Unk	Herb	Liliaceae	Unk	Unk	Unk	Unk	Unk	Unk	Unk	L	DD	PP, R	No
Buchanania lanzan Sprengel	Indo-burma	Tree	Anacardiaceae		> 1,00,000	Nil	?	Unk	Unk	3	Unk	DD	PP, R, G	Yes
Cleome burmanni Wight & Arn.	Peninsular India	Herb	Capparidaceae	Unk		Yes	Yes	Unk	Unk	3	L	DD	NP, R, C	No
Commiphora wightii (Arn.) Bhandari	Arids of Deccan, western, NW India	Tree	Burseraceae	Unk	Unk	Unk	Unk	Unk	Unk	2	I	VU / R	P, C, G	No
Coscinium fenestratum Coleb. (Gaertn.)	Indo-malaya	Climber (w)	Menispermaceae	Unk	Unk	Unk	80	10	Unk	2	I, L	CR	P, R, C	Yes
Cycas circinalis L.	All India	Tree	Cycadaceae	Unk	Unk	Unk	50	20	Many	3	I, L	VU / N CR / R	P, R, C	Yes
Cyclea fissicalyx Dunn.	Southern Western Ghats	Climber (h)	Menispermaceae	Unk	Unk	< 5	Unk	Unk	Unk	4	Unk	E	P, R	No
Elaeagnus conferta Roxb.	Hills of peninsular India	Straggler	Elaeagnaceae	50,000	5,000	Yes	25	10	Many	2	I, L	LR	NP, R, NC	No
Embelia ribes Burm. f	Central and south-ern Western Ghats	Climber	Myrisinaceae	50,000	< 10,000	Yes	25	10	Unk	4	I, L	LR	NP, R, NC	No

Species	Location	Habit	Family	Area sq. km.	Occup sq. km.	Locs /Frg.	% Dec	Yr/Gn	Mat. Ind.	Data qual.	Thre	IUCN	Recs	Cult
Gardenia gummifera L.	Penninsular India	Shrub	Rubiaceae	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	LR	NP, R	No
Glycosmis macrocarpa Wight	S. Western Ghats of Kerala and T.N.	Shrub	Ru taceae	> 5,000	Unk	Unk	Unk	Unk	Unk	2	Lf	LR	NP, R, NC	No
Holostemma ada-kodien Shu ltes	C. And S.W. Ghats & deccan Plateaux	Twiner	Asclepiadeceae	< 50,000	5,000	Yes	35	10	Unk	2	I, Ov	VU	P, C	Yes
Hydnocarpus macrocarpa (Bedd.) Warb.	South Western Ghats	Tree	Flacourtiaceae	< 20,000	Unk	Yes	50	20	Unk	5	Ov, Lf	VU	NP, R, NC	No
Kaempferia galanga L.	Indo-malaya	Herb	Zingiberaceae	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	CR/R	P, R	Yes
Kingiodendron pinnatum (Roxb. ex DC.) Harms	Evergreen forests of Kerala	Tree	Caesalpiniaceae	< 10,000	Unk	Unk	50	10	Unk	2	Ov, I	E	P, R, C	Unk
Madhuca diplostemon (Clarke) Royen	Found only under cultivation	Tree	Sapotaceae	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	E	PP, R	No
Madhuca insignis (Radlk) H.J. Lam.		Tree	Sapotaceae	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	EX	PP, R	No
Myristica malabarica Lam.	Dakshina Kannada to Kanya Kumari	Tree	Myristicaceae	40,000	10	Yes	> 30	10	Unk	2	L, I	E	P, R, C	No
Ochreinauclea missionis (Wallich ex G. Don) Ridsdale	Dakshina Kannada Top Slip, Pathamthita	Tree	Rubiaceae	> 5,000	Unk	Yes	50	10	Unk	2	L, I	VU	P, R, C, G	Yes
Operculina turpethum (L.) Silva Manso	Indo-malaya, T.N., Kerala	Climber(h)	Convolvulaceae	> 5,000	Unk	No	Unk	Unk	Unk	2	Ov	LR	NP, R, NC	No
Piper barberi Gamble	Kerala	Climber	Piperaceae		1	Yes	Unk	Unk	Unk	1	L	CR	P, R, C	Yes
Piper longum L...	Kerala, T.N.	Straggler	Piperaceae	> 5,000	< 1,000	No	Unk	Unk	Many	2	L, Ov	LR	NP, R, G	Yes
Plectranthus vettiveroides (Jacob) Singh & Sharma		Herb	Lamiaceae	Nil	Nil	Nil	Nil	Nil	Nil	4	Nil	EW	P, G	Yes

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Species	Location	Habit	Family	Area sq. km.	Occup sq. km.	Locs /Frg.	% Dec	Yr/Gn	Mat. Ind.	Data qual.	Thre	IUCN	Recs	Cult
Pterocarpus santalinus L. f.	South Eastern Ghats	Tree	Fabaceae	< 5,000	< 1,000	No	No		Unk	2	Ov	E	P, R, G	Yes
Rauvolfia serpentina Benth. ex Kurz	Moist deciduous & evergreen forests	Shrub	Apocynaceae	> 10,000	< 500	No	50	10	Very few	2	I, L, Ov	E	P, R	Yes
Saraca asoca (Roxb.) Willd.	C. And S. Western Ghats, Sri Lanka	Tree	Caesalpiniaceae	< 5,000	Unk	Yes	Unk	Unk	125	2	L, I	VU E/R	P, R	Yes
Syzygium travancoricum Gamble	T.N. and Kerala	Tree	Myrtaceae	> 5,000	Unk	No	Unk	Unk	< 200	2	L, I	CR	P, R, C, G	No
Trichopus zeylanicus Gaertn. Sub sp. travancoricus Burkill ex Narayanan	Extreme Southern Western Ghats	Herb (tuber-ous)	Dioscoriaceae	< 5,000	< 1,000	Yes	Yes	Unk	< 1000	2	I, Ov	CR	P, R, C, G	Yes
Utleria salicifolia Beddome.	Grassland slopes of Southern India	Shrub	Asclepiadaceae	< 1,000	< 50	Yes	50	20	Unk	2	I, Ov	CR	P, R, C, G	Yes
Vateria indica L.	Karnataka, T.N., Kerala	Tree	Dipterocarpacae		> 5,000	Yes	50	20 / 2	Unk	2	L, I, Ov	LR	P, R	Yes
Woodfordia fruticosa (L.) Kurz	All India	Tree	Lythraceae			No	No		Unk	2	Nil	LR	NP, R, NC	Yes

Research/Management: There should be a clear relationship between threats and subsequent outlined research/management actions. The "Research/Management" column provides an integrated view of actions to be taken, based on the listed threats. Research management can be defined as a management program which includes a strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the bird species to that activity. The categories within the column are as follows:

T = Taxonomic and morphological genetic studies

T1 = Translocations

S = Survey - search and find

M = Monitoring - to determine population information

Hm = Habitat management - management actions primarily intended to protect and/or enhance the species' habitat (e.g., forest management)

Lm = Limiting factor management - "research management" activities on known or suspected limiting factors. Management projects have a research component that provide scientifically defensible results.

Lr = Limiting factor research - research projects aimed at determining limiting factors. Results from this work may provide management recommendations and future research needs.

Lh = Life history studies

O = other (list specifically on Taxon Data Sheet)

CULT:
Need for cultivation program for the taxon either for commercial, domestic (gardens), or conservation purposes.

Kingiodendron pinnatum

Threats

Various threats were noted to affect the taxa. Of the seven different threats, human interference and habitat loss were most common. The participants felt that a new category of Over exploitation was required for medicinal plants to distinguish it from human interference because they faced an additional threat in the form of being harvested for local or commercial use. The other threats were loss of habitat due to fragmentation and competition from exotic species. The table shows the number of plants affected by the different threats.

Types of Threats that Affect the Medicinal Plants

HUMAN INTERFERENCE
17

LOSS OF HABITAT
16

NIL
3

COMPET. FROM EXOTICS
1

UNKNOWN
7

OVER EXPLOITATION
11

FRAGMENTATION
2
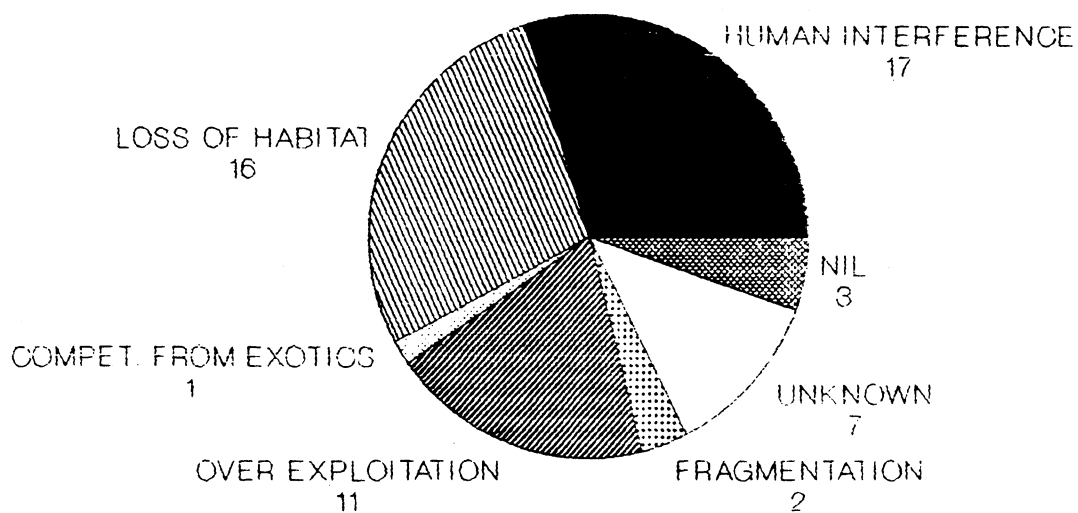
N = 36

Threatened Medicinal Plants in Southern India - IUCN Red List Categories of Threat.

Mace-Stuart Category	Number of taxa	Percent of total
Extinct	1	2.77
Extinct in the wild	1	2.77
Critical	8	22.25
Endangered	7	19.44
Vulnerable	6	16.66
Low risk	9	25
Data deficient	4	11.11

THREATS							
Species	Loss of Habitat	Human Interfer-ence	Loss of Habitat due to Fragmentation	Inter-specific Competition from Exotics	Over Exploi-tation	Nil	Un-known
Adhatoda beddomei C. B. Clarke	Yes	Yes	-	-	-	-	-
Aerva wightii Hook. f	-	-	-	-	-	-	Yes
Ampelocissus araneosa Planchon	Yes	-	-	Yes	-	-	-
Aristolochia bracteolata Lam.	-	-	-	-	-	Yes	-
Aristolochia tagala Cham.	-	Yes	-	-	Yes	-	-
Asparagus rottleri Baker	Yes	-	-	-	-	-	-
Buchanania lanzan Sprengel	-	-	-	-	-	-	Yes
Cleome burmanni Wight & Arn.	Yes	-	-	-	-	-	-
Commiphora wightii (Arn.) Bhandari	-	Yes	-	-	-	-	-
Coscinium fenestratum (Gaertn.) Coleb.	Yes	Yes	-	-	-	-	-
Cycas circinalis L.	Yes	Yes	-	-	-	-	-
Cyclea fissicalyx Dunn.	-	-	-	-	-	-	Yes
Elaeagnus conferta Roxb.	Yes	Yes	-	-	-	-	-
Embelia ribes Burm. f	Yes	Yes	-	-	-	-	-
Gardenia gummifera L.	-	-	-	-	-	-	Yes
Glycosmis macrocarpa Wight	-	-	Yes	-	-	-	-
Holostemma ada-kodien Shultes	-	Yes	-	-	Yes	-	-
Hydnocarpus macrocarpa (Bedd.) Warb.	-	-	Yes	-	Yes	-	-

Species	Loss of Habitat	Human Interfer- ence	Loss of Habitat due to Fragmentation	Inter-specific Competition from Exotics	Over Exploi- tation	Nil	Un- known
Kaempferia galanga L.	-	-	-	-	-	-	Yes
Kingiodendron pinnatum (Roxb. ex DC.) Harms	-	Yes	-	-	Yes	-	-
Madhuca diplostemon (Clarke) Royen	-	-	-	-	-	-	Yes
Madhuca insignis (Radik) H. J. Lam.	-	-	-	-	-	-	Yes
Myristica malabarica Lam.	Yes	Yes	-	-	-	-	-
Ochreinauclea missionis (Wallich ex G. Don) Ridsdale	Yes	Yes	-	-	-	-	-
Operculina turpethum (L.) Silva Manso	-	-	-	-	Yes	-	-
Piper barberi Gamble	Yes	-	-	-	-	-	-
Piper longum L.	Yes	-	-	-	Yes	-	-
Plectranthus vettiveroides (Jacob) Singh & Sharma	-	-	-	-	-	Yes	-
Pterocarpus santalinus L. f.	-	-	-	-	Yes	-	-
Rauvolfia serpentina (L.) Benth. ex Kurz	Yes	Yes	-	-	Yes	-	-
Saraca asoca (Roxb.) Willd.	Yes	Yes	-	-	-	-	-
Syzygium travancoricum Gamble	Yes	Yes	-	-	-	-	-
Trichopus zeylanicus Gaertn. Sub sp. *travancoricus* Burkill ex Narayanan	-	Yes	-	-	Yes	-	-
Utleria salicifolia Beddome.	-	Yes	-	-	Yes	-	-
Vateria indica L.	Yes	Yes	-	-	Yes	-	-
Woodfordia fruticosa (L.) Kurz	-	-	-	-	-	Yes	-

Recommendations

Survey, research, genetic management and PHVA were some of the recommendations considered for the taxa. Depending on the status at present, these recommendations were made. 12 taxa were considered to be not very well studied in the wild for their distribution and survey was recommended. Research in the form of habitat management, life history studies and monitoring was recommended for 22 taxa. It was felt by the group that Population and Habitat Viability Assessments be held for 20 taxa since enough information was available of their biology and distribution and their status was not very good in the wild. 5 taxa were considered under pending since their position was very threatened in the wild but also very little information on their biology was available. 11 taxa were opted out of PHVAs.

PHVA (Population and Habitat Viability Assessment) workshops differ from CAMPs in that they focus on a single species rather than a broad taxonomic group or region. PHVAs combine analytic and simulation techniques to develop holistic, realistic and achievable recovery plans for threatened species. VORTEX, a computer simulation programme developed by Dr. Robert Lacy of the Chicago Zoological Society, is used to examine the effects of an array of variables on the survivability of populations.

Management recommendations

IUCN RED LIST CATEGORY	No. of TAXA	PHVA	SUR-VEY	RE-SEARCH	GENETIC MNGMT	CULTIVA-TION
Extinct	1	0	1	0	0	0
Extinct in Wild	1	1	0	0	1	0
Critical	7	7	2	7	3	6
Endangered	6	5	2	6	1	2
Vulnerable	8	6	1	2	4	5
Low Risk	9	1	2	5	2	3
Data Deficient	4	0	4	2	1	0
TOTAL	36	20	12	22	12	15

Most of the taxa were noted to be either being interfered with by humans or over exploited for commercial benefits. For some taxa where propogation technology was specialised or easy, the locals or some botanical institutes had already started cultivation. However, only a few taxa are being cultivated widely. Most of them are either as experimental plots in some research institute or plantation crop in scattered forest departments. In some cases where it was not done, cultivation was recommended and this was for 15 taxa. Cultivation in highly exploited taxa was recommended both for conservation and to supply the local market to avoid harvesting the wild plants. For taxa whose numbers had reduced to very low levels and fragmented either in the wild or in cultivation, genetic management was recommended to keep the stock healthy. 12 taxa were recommended for such an action.

SURVEY 12 / P.H.V.A. 20 / CULTIVATION 15 / GENETIC MANAGEMENT 12 / RESEARCH 22
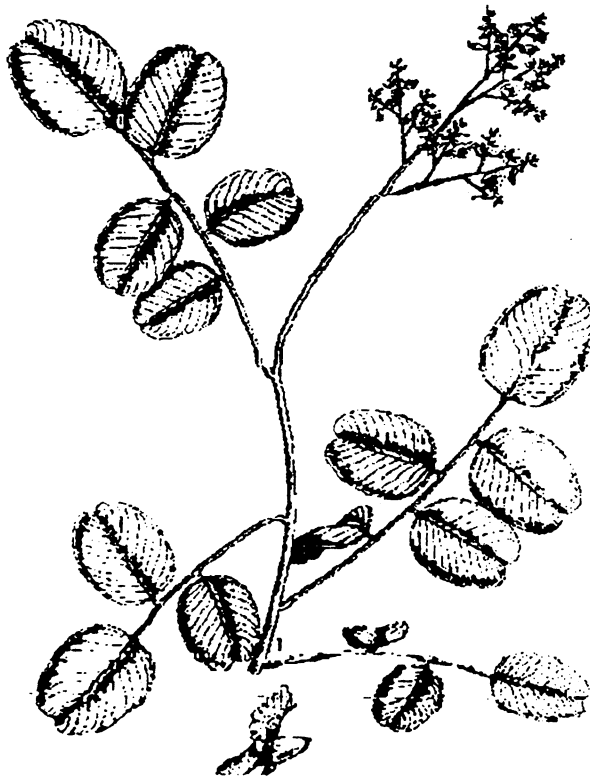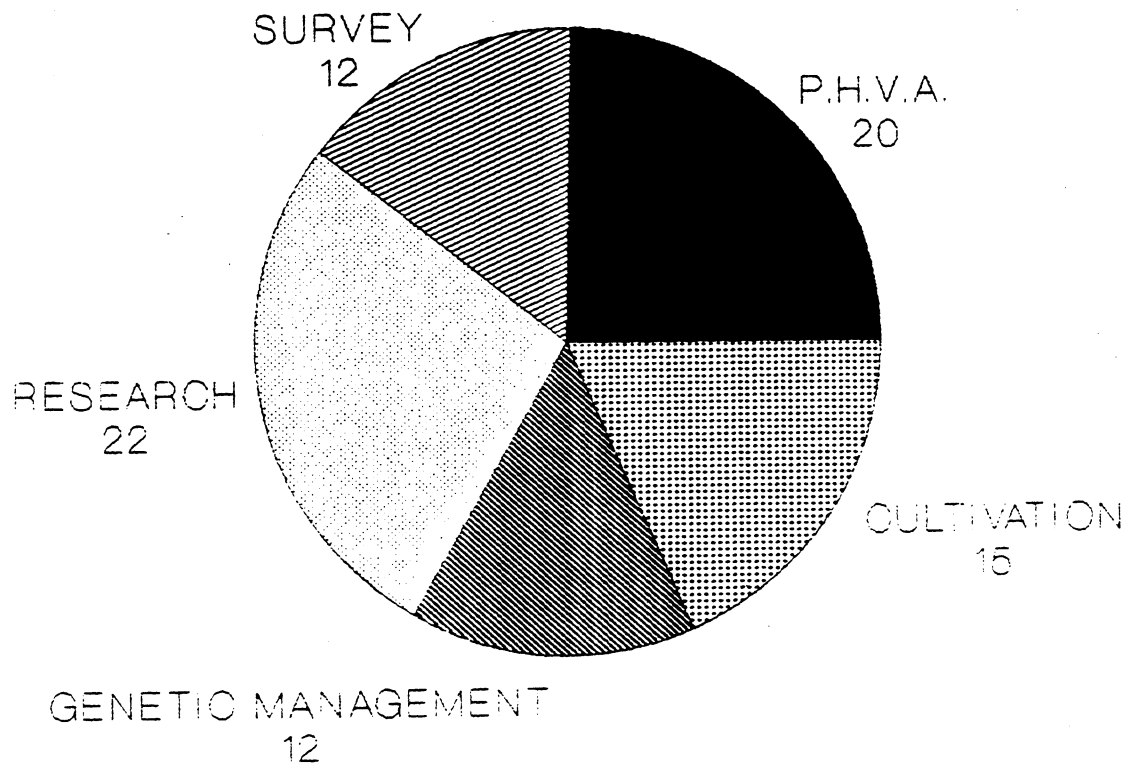
Pterocarpus santalinus

RECOMMENDATIONS

Species	PHVA	Survey	Monito-ring	Habitat Mana-gement	Life History Studies	Genetic Mana-gement	Cultiva-tion	Others
Adhatoda beddomei C. B. Clarke	Yes	Yes	Yes	-	-	-	Yes	See T.D.S.
Aerva wightii Hook. f	Pending	Yes	-	- •	-	-	-	-
Ampelocissus araneosa Planchon	No	-	-	-	-	Yes	Yes	-
Aristolochia bracteolata Lam.	No	-	-	-	-	Yes	No	-
Aristolochia tagala Cham.	Yes	-	-	-	-	Yes	Yes	-
Asparagus rottleri Baker	Pending	Yes	-	-	-	-	-	See T.D.S.
Buchanania lanzan Sprengel	Pending	Yes	Yes	-	-	Yes	-	-
Cleome burmanni Wight & Am.	No	Yes	Yes	-	-	-	Yes	-
Commiphora wightii (Arn.) Bhandari	Yes	-	-	-	-	Yes	Yes	-
Coscinium fenestratum (Gaertn.) Coleb.	Yes	-	-	Yes	Yes	-	Yes	-
Cycas circinalis L.	Yes	-	-	Yes	-	-	Yes	-
Cyclea fissicalyx Dunn.	Yes	Yes	-	-	-	-	-	-
Elaeagnus conferta Roxb.	No	-	-	-	-	-	No	See T.D.S.
Embelia ribes Burm. f	No	-	-	-	-	-	No	See T.D.S.
Gardenia gummifera L.	No	-	-	-	-	-	-	See T.D.S.
Glycosmis macrocarpa Wight	No	Yes	Yes	-	-	-	No	-
Holostemma ada-kodien Shultes	Yes	-	-	-	-	-	Yes	-
Hydnocarpus macro-carpa	No	Yes	Yes	Yes	-	-	No	-

Species	PHVA	Survey	Monito-ring	Habitat Mana-gement	Life History Studies	Genetic Mana-gement	Cultiva-tion	Others
Kaempferia galanga L.	Yes	Yes	-	-	-	-	-	See T.D.S.
Kingiodendron pinnatum (Roxb. ex DC.) Harms	Yes	-	Yes	-	-	-	Yes	See T.D.S.
Madhuca diplostemon (Clarke) Royen	Pending	Yes	Yes	-	Yes	-	-	-
Madhuca insignis (Radik) H. J. Lam.	Pending	Yes	-	-	-	-	-	-
Myristica malabarica Lam.	Yes	-	-	Yes	-	-	Yes	See T.D.S.
Ochreinauclea missionis (Wallich ex G. Don) Ridsdale	Yes	-	Yes	-	-	Yes	Yes	-
Operculina turpethum (L.) Silva Manso	No	Yes	Yes	-	-	-	No	-
Piper barberi Gamble	Yes	-	Yes	Yes	-	-	Yes	-
Piper longum L.	No	-	Yes	-	-	Yes	-	-
Plectranthus vettiveroides (Jacob) Singh & Sharma	Yes	-	-	-	-	Yes	-	-
Pterocarpus santalinus L. f.	Yes	-	-	Yes	-	Yes	-	-
Rauvolfia serpentina (L.) Benth. ex Kurz	Yes	-	Yes	-	-	-	-	-
Saraca asoca (Roxb.) Willd.	Yes	-	Yes	-	-	-	-	-
Syzygium travancoricum Gamble	Yes	-	Yes	-	Yes	Yes	Yes	See T.D.S.
Trichopus zeylanicus Gaertn. Sub sp. *travancoricus* Burkill ex Narayanan	Yes	-	Yes	-	-	Yes	Yes	-
Utleria salicifolia Beddome.	Yes	-	Yes	Yes	-	Yes	Yes	-
Vateria indica L.	Yes	-	Yes	-	-	-	-	-
Woodfordia fruticosa (L.) Kurz	No	-	Yes	-	-	-	No	-

REPORT

CAMP Workshop for Selected S. Indian Medicinal Plants

CBSG CBSG, India ZOO

Taxon Data Sheets

Saraca asoca
(Roxb.) Willd

Species (& synonyms):   ***Adhatoda beddomei*** **C.B.Clarke**
                                               (= *Justicia beddomei*)

Taxonomic status: Species

Habit: Under shrub
Habitat: Wet evergreen forest

Distribution;   Agasthyamala (Western ghats), Reported from
                                               Gingee hills by K. Ramamurthy (1960), South Arcot,
                                               T.N. (Eastern ghats).
— Range-km^2:   7,500
— Area Occupied-km^2:   < 1 (.4 ha)
— Fragmentation (# subpopulations ?):   5 fragmented populations

Wild Population;   ?
— % Decline:
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   General field study (2)

Field Studies (Who & Dates, Ref.):   General floristic study

Threats (Key):   Human Inerference (I), Loss of habitat (L)

Trade: Traded locally (P)

Other Comments: ENDEMIC. Recently located at Agasthyamala
                                               Medicinal Plants Conservation Areas of FRLHT's *in
                                               situ* conservation programme and adjacent hills.
                                               Plants collected from Agasthyamala are being
                                               cultivated at TBGRI, Trivandrum. Collections now
                                               present in Madras Herbarium.

Status:
— IUCN (Revised):   Critically Endangered
— Criteria based on: Extent of occurrence
— CITES: Not Listed

Recommendations:
— PHVA: Yes
— Research management (Code):   Status survey in Agasthyamala. Population biology
                                               and reproductive biology to be researched in view of
                                               lack of seed setting. (S, M). Micro and macropropa-
                                               gation studies for large scale propagation.
— Cultivation Program: Yes
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical gardens:
— Commercial /Domestic:
— Herbaria (or Seed banks)
— Research Institutions: At TBGRI, Kottakkal (in thousands) and elsewhere; good
                                               populations.TBGRI has developed a protocol for further
                                               propagation

TAXON DATA SHEET

Species (& synonyms):	*Adhatoda beddomei* C.B.Clarke (= *Justicia beddomei*)
Taxonomic status:	Species
Habit:	Under shrub
Habitat:	Wet evergreen forest
Distribution;	Agasthyamala (Western ghats), Reported from Gingee hills by K. Ramamurthy (1960), South Arcot, T.N. (Eastern ghats).
— Range-km^2:	7,500
— Area Occupied-km^2:	< 1 (.4 ha)
— Fragmentation (# subpopulations ?):	5 fragmented populations
Wild Population;	?
— % Decline:	
— Time/Rate (Years or generations):	
— # Mature Individuals:	
Data Quality (Key, Sources, Dates):	General field study (2)
Field Studies (Who & Dates, Ref.):	General floristic study
Threats (Key):	Human Inerference (I), Loss of habitat (L)
Trade:	Traded locally (P)
Other Comments:	ENDEMIC. Recently located at Agasthyamala Medicinal Plants Conservation Areas of FRLHT's *in situ* conservation programme and adjacent hills. Plants collected from Agasthyamala are being cultivated at TBGRI, Trivandrum. Collections now present in Madras Herbarium.
Status:	
— IUCN (Revised):	Critically Endangered
— Criteria based on:	Extent of occurrence
— CITES:	Not Listed
Recommendations:	
— PHVA:	Yes
— Research management (Code):	Status survey in Agasthyamala. Population biology and reproductive biology to be researched in view of lack of seed setting. (S, M). Micro and macropropagation studies for large scale propagation.
— Cultivation Program:	Yes
— Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	
— Botanical gardens:	
— Commercial /Domestic:	
— Herbaria (or Seed banks)	
— Research Institutions:	At TBGRI, Kottakkal (in thousands) and elsewhere; good populations.TBGRI has developed a protocol for further propagation

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TAXON DATA SHEET

Species (& synonyms):	*Aerva wightii* Hook. f
Taxonomic status:	Species
Habit:	Herb
Habitat:	Dry deciduous / scrub jungle

Distribution;
-- Range-km^2:   ?
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates):	Indirect
Field Studies (Who & Dates, Ref.):	None
Threats (Key):	Not known
Trade:	Not known
Other Comments:	Not recorded since 1914. During recent surveys of the Medicinal Plants Conservation Areas of FRLHT's *in situ* conservation programme, the species could not be located in its natural distributional range.

Status:
-- IUCN (Revised):   Data Deficient
-- Criteria based on:
-- CITES:

Recommendations:
-- PHVA: Pending
-- Research management (Code):   Intensive surveys in the natural range of distribution; prepare illustration of this plant and circulate among botanists, foresters and the local people to locate and identify the population

-- Cultivation Program:
-- Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):   Nil
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institutions

Species (& synonyms):	*Ampelocissus araneosa* Planchon
Taxonomic status:	Species
Habit:	Tendril climber
Habitat:	Evergreen/semievergreen forests,
Distribution;	Southern Peninsular India. Endemic
-- Range-km^2:	1,00,000
-- Area Occupied-km^2:	<10,000
-- Fragmentation (# subpopulations ?):	Fragmented
Wild Population;	
-- % Decline:	50
-- Time/Rate (Years or generations):	20 years
-- # Mature Individuals:	
Data Quality (Key, Sources, Dates):	Anecdotal Field sightings (3)
Field Studies (Who & Dates, Ref.):	General floristic studies
Threats (Key):	Loss of habitat (L) Interspecific competetion from competitors (Ice)
Trade:	Used in Ayurveda and Sidha preparations
Other Comments:	ENDEMIC. This species has been recorded in several recently published district floras of southern Western Ghats region and Eastern Ghats.
Status	
-- IUCN (Revised):	Vulnerable
-- Criteria based on:	
-- CITES:	Not listed
Recommendations:	
-- PHVA:	No
-- Research management (Code):	
-- Cultivation Program:	Yes
-- Genetic Management:	Conservation of genetic diversity
Cultivated Population (Current Status & Locations & Difficulty):	None
-- Botanical Gardens:	
-- Commercial/Domestic:	
-- Herbaria (or Seed banks):	
-- Research Institution:	

TAXON DATA SHEET

Species (& synonyms):   **_Aristolochia bracteolata_ Lam.**
                                               (= _Aristolochia bracteata_ Retz.)

Taxonomic status: Species

Habit: Herb
Habitat: A weed in the cultivated lands of black cotton soil and along margins of dry forests.

Distribution;   Penninsular India
— Range-km^2:   >5,00,000
— Area Occupied-km^2:   50,000 - 99,000
— Fragmentation (# subpopulations ?):   Nil

Wild Population;
— % Decline: Not declining
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   Anecdotal field sightings (4)

Field Studies (Who & Dates, Ref.):   General floristic studies

Threats (Key):   Nil

Trade: For Ayurvedic formulations

Other Comments: A very widely distributed species : often grows as weed in cotton fields.

Status:
— IUCN (Revised):   Low Risk
— Criteria based on:
— CITES: Not listed

Recommendations:
— PHVA: No
— Research management (Code):
— Cultivation Program: No
— Genetic Management: Conservation of genetic diversity

Cultivated Population (Current Status & Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institution:

TAXON DATA SHEET

Species (& synonyms):   *Aristolochia tagala* **Cham.**

Taxonomic status: Species

Habit: Climber
Habitat: Evergreen and semi evergreen forest

Distribution;   Throughout India
— Range-km^2:   5,00,000 - 9,00,000
— Area Occupied-km2:
— Fragmentation (# subpopulations ?):   Nil

Wild Population;
— % Decline: 20 to 50
— Time/Rate (Years or generations):
— # Mature Individuals

Data Quality (Key, Sources, Dates):   General floristic studies (2)

Field Studies (Who & Dates, Ref.):

Threats (Key):   Over exploitation (Ov)

Trade: Yes.

Other Comments: High consumption by the medicine manufacturers.
                                                                Regulate collection from wild

Status:
— IUCN (Revised):   Vulnerable at National level
— Criteria based on:
— CITES: Not listed

Recommendations:
— PHVA: Yes
— Research management (Code):
— Cultivation Program: Promote cultivation — to cater to the market needs
— Genetic Management: Conserve genetic diversity

Cultivated Population (Current Status
& Locations & Difficulty):   Nil
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institution:

Species (& synonyms):   ***Asparagus rottleri* Baker**

Taxonomic status: Species

Habit: Herb
Habitat: Not known

Distribution;
-- Range-km^2:
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates):   Nil

Field Studies (Who & Dates, Ref.):   General floristic studies

Threats (Key):   Loss of habitat (L)

Trade: Not known

Other Comments:

Status
-- IUCN (Revised):   Data Deficient
-- Criteria based on:
-- CITES: Not listed

Recommendations:
-- PHVA: Pending
-- Research management (Code):   Survey to locate the plants (S)
-- Cultivation Program: Propagate through micro- and macro- methods
-- Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institutions

TAXON DATA SHEET

Species (& synonyms):	*Buchnania lanzan* Sprengel.
Taxonomic status:	Species
Habit:	Medium size tree
Habitat:	Deciduous forests and thickets
Distribution;	Indo-Burma
— Range-km^2:	>5,00,000
— Area Occupied-km^2:	>1,00,000
— Fragmentation (# subpopulations ?):	Not fragmented but scattered
Wild Population;	
— % Decline:	?
— Time/Rate (Years or generations):	
— # Mature Individuals:	
Data Quality (Key, Sources, Dates):	3
Field Studies (Who & Dates, Ref.):	General floristic studies by V. Ramakantha in Bidar and parts of Gulbarga.
Threats (Key):	General deforestation leadinnng to habitat loss (L).
Trade:	Already in trade (F).
Other Comments:	Fruits traded. Used in sweetmeat preparations and seeds used as a substitute for cashews and as spice. Low viability of seeds. Nursery techniques not yet developed. Not browsed by cattle, a factor that aids the survival of the plant in the wild.
Status:	
— IUCN (Revised):	Data Deficient
— Criteria based on:	
— CITES:	Not listed
Recommendations:	
— PHVA:	Pending
— Research management (Code):	Status survey (S) and monitoring (M); species biology
— Cultivation Program:	
— Genetic Management:	Conservation of genetic diversity
Cultivated Population (Current Status & Locations & Difficulty):	
— Botanical Gardens:	
— Commercial/Domestic:	Forest nursery in the Karnataka Forest Dept. (about 1,200)
— Herbaria (or Seed banks):	
— Research Institute:	

TAXON DATA SHEET

Species (& synonyms): ***Cleome burmanni* Wight & Arn.**

Taxonomic status: Species. Confused with *C. rutidosperma*

Habit: Small herb
Habitat: Around agricultural fields

Distribution; Peninsular India
-- Range-km^2:
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?): Fragmented

Wild Population;
-- % Decline: Yes
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates): 3

Field Studies (Who & Dates, Ref.): Recently collected by Dr. Ramachandran, in Ramanathapuram, T.N.

Threats (Key): Habitat loss (L)

Trade:

Other Comments: Insufficient data

Status:
-- IUCN (Revised): Data Deficient
-- Criteria based on:
-- CITES:

Recommendations:
-- PHVA: No
-- Research management (Code): Species biology, status survey (S) and monitoring (M)
-- Cultivation Program: Yes
-- Genetic Management:

Cultivated Population (Current Status & Locations & Difficulty):
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute:

TAXON DATA SHEET

Species (& synonyms):   ***Commiphora wightii* (Arn.) Bhandari**
                                (= *Commiphora mukul* Engl.)

Taxonomic status: Species

Habit: Small tree
Habitat: Dry zones of Deccan and Western India
                                Common in N.W. arid zone of India

Distribution;
-- Range-km^2:   ?
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality, (Key, Sources, Dates):   3

Field Studies (Who & Dates, Ref.):   General floristic studies

Threats (Key):   Human interference (I), Over exploitation (Ov)

Trade: High quantity trade of gum resin

Other Comments: Over exploited from wild; Govt. of India has banned
                                the export of this species. Gum resin yields "guggul", an
                                important part of ayurvedic formulations.

Status:
-- IUCN (Revised):   Vulnerable in southern India; Data Deficient globally
-- Criteria based on:
-- CITES: Not listed

Recommendations:
-- PHVA: Yes
-- Research management (Code):
-- Cultivation Program: Yes
-- Genetic Management: Yes

Cultivated Population (Current Status
& Locations & Difficulty):
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute:

TAXON DATA SHEET

Species (& synonyms):   *Coscinium fenestratum* (Gaertn.) Coleb.

Taxonomic status: Species

Habit: Woody climber
Habitat: Wet forests

Distribution;
-- Range-km^2:   Indo-Malaya
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;
-- % Decline: 80
-- Time/Rate (Years or generations):   10 years
-- # Mature Individuals:

Data Quality, (Key, Sources, Dates):   2

Field Studies (Who & Dates, Ref.):

Threats (Key):   Human interference (I), Habitat loss (L)

Trade: Yes

Other Comments: Govt. of India has banned the export of this plant and its
                                                         parts since March '94. Being recommended for CITES I.
                                                         Stem is used as substitute for turmeric. Valuable for
                                                         medicinal (ayurvedic) preperations. Starts flowering at
                                                         the age of 15 years but not allowed to reach that stage
                                                         by harvesters in the wild

Status:
-- IUCN (Revised):   Critically Endangered
-- Criteria based on:
-- CITES: Rec. for Appendix I to CITES Authority

Recommendations:
-- PHVA: Yes
-- Research management (Code):   Habitat management (Hm), Life history studies (Lh)
-- Cultivation Program: Required
-- Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):   Difficult to raise under cultivation
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute: Few individuals cultivated at TBGRI and Kottakal.

Species (& synonyms):   *Cycas circinalis* L.

Taxonomic status: Species (Gymnosperm)

Habit: Small tree
Habitat: Moist to dry forest including grasslands

Distribution;   India; more in peninsular India
— Range-km^2:
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?):

Wild Population;
— % Decline: 50
— Time/Rate (Years or generations):   20 years
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   3

Field Studies (Who & Dates, Ref.):   General floristic studies. Field studies by Fr. C.J.
                                               Saldanha

Threats (Key):   Loss of habitat (L), human interference (I)

Trade: Sold as an ornamental plant.

Other Comments: Due to removal of leaves for decorative purpose, cone
                                               formation is affected and thereby regeneration. May go
                                               extinct in the near future.

Status:
— IUCN (Revised):   Vulnerable at National level; Critically Endangered at
                                               Regional level
— Criteria based on:
— CITES: Not listed

Recommendations:
— PHVA: Yes
— Research management (Code):   Habitat management (Hm)
— Cultivation Program: Should be studied and standardized
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic: Often grown as ornamental plant
— Herbaria (or Seed banks):
— Research Institute:

TAXON DATA SHEET

Species (& synonyms):   *Elaeagnus conferta* Roxb.

Taxonomic status: Species

Habit: Straggler
Habitat: 400 - 1000m elevation & open areas and in semi-evergreen forests

Distribution;   Hills of peninsular India.
-- Range-km^2:   50,000
-- Area Occupied-km^2:   10% of range. Evenly spread and widespread.
-- Fragmentation (# subpopulations ?):   Yes.

Wild Population;
-- % Decline: 25%
-- Time/Rate (Years or generations):   10 years.
-- # Mature Individuals: Large.

Data Quality (Key, Sources, Dates):   First hand information. Recent through general field study (2)

Field Studies (Who & Dates, Ref.):   Collection for floristic studies by Fr. C.J. Saldanha

Threats (Key):   Habitat destruction (L) by human interference (I), disturbance.

Trade: Not in trade.

Other Comments: Tasty fruit. Medicinal use by tribals reported. Irulas are known to collect. Deforestation is under control and so not high risk.

Status:
-- IUCN (Revised):   Low Risk.
-- Criteria based on:
-- CITES: Not listed.

Recommendations:
-- PHVA: No.
-- Research management (Code):   Specific status to be studied
-- Cultivation Program: Not required.
-- Genetic Management:

Cultivated Population (Current Status & Locations & Difficulty):   Nil
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institutes:

TAXON DATA SHEET

Species (& synonyms):	*Embelia ribes* Burm f.
Taxonomic status:	Species
Habit:	Climber
Habitat:	Moist deciduous forest and evergreen forests
Distribution;	Central and southern Western Ghats
-- Range-km^2:	50,000
-- Area Occupied-km^2	5,000 - 10,000
-- Fragmentation	Severely fragmented
Wild Population;	
-- % Decline:	25
-- Time/Rate (Years or generations):	10 years
-- # Mature Individuals:	Unknown
Data Quality (Key, Sources, Dates):	Field studies over 20 years therefore old and anecdotal (4)
Field Studies (Who & Dates, Ref.):	Sparse field studies over the last 10 years. Not sufficient data available.
Threats (Key):	Human interference (I) -- collected for pickles, medicinal value, habitat loss (L)
Trade:	High quantity of seeds used for trade
Other Comments:	No recent data in the last 10 years. Stem is cut to collect sap for medicinal purpose. Fruits are edible and traded
Status:	
-- IUCN (Revised):	Low risk
-- Criteria based on:	
-- CITES:	
Recommendations:	
-- PHVA:	No
-- Research management (Code):	Further studies required
-- Cultivation Program:	No
-- Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	Not cultivated; difficult to cultivate
-- Botanical Gardens:	
-- Commercial/Domestic:	
-- Herbaria (or Seed banks):	
-- Research Institutes:	

TAXON DATA SHEET

Species (& synonyms): *Gardenia gummifera* L.

Taxonomic status: Species

Habit: Shrub/ small tree
Habitat: Dry deciduous

Distribution; Peninsular India
— Range-km^2:
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?):

Wild Population;
— % Decline:
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality, (Key, Sources, Dates): General field studies and literature (4)

Field Studies (Who & Dates, Ref.):

Threats (Key):

Trade: Gum collected from this plant is sold

Other Comments: Fairly common; sparsely distributed

Status:
— IUCN (Revised): Low risk
— Criteria based on:
— CITES:

Recommendations:
— PHVA: No
— Research management (Code): Studies on impact of extraction methods
— Cultivation Program:
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institute:

Species (& synonyms):   ***Glycosmis macrocarpa* Wight**

Taxonomic status: Species

Habit: Shrub
Habitat: Semi-evergreen forest

Distribution;   Southern Western Ghats of Kerala and Tamil Nadu
— Range-km^2:   > 5,000
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?):

Wild Population;   In Silent Valley; Sholayar, Periyar, Kulathupuzha
— % Decline: Unknown
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   Recent field collection and herbarium studies

Field Studies (Who & Dates, Ref.):   Detailed study by K.N. Nair at TBGRI

Threats (Key):   Population fragmented

Trade: Not known

Other Comments: Mistaken for *G. pentaphylla.* Herbarium specimens
                                                       to be checked and field characters to be recorded.

Status:
— IUCN (Revised):   Low Risk
— Criteria based on:
— CITES:

Recommendations:
— PHVA: No
— Research management (Code):   Survey (S) and monitoring (M)
— Cultivation Program: No
— Genetic Management: No

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institute:

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TAXON DATA SHEET

Species (& synonyms):   *Holostemma ada-kodien* Shultes
(= *Holostemma annulare* (Roxb.) K Schumann)

Taxonomic status: Species

Habit: Tuberous, twiner
Habitat: Dry & moist deciduous forests, in open areas

Distribution;   Central and Southern Western Ghats and parts of
Deccan Plateau
— Range-km^2:   <50,000
— Area Occupied-km^2:   10% of total range
— Fragmentation (# subpopulations ?):   Highly scattered

Wild Population;
— % Decline: 35
— Time/Rate (Years or generations):   10 years
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   Recent surveys (2)

Field Studies (Who & Dates, Ref.):   Recent field survey in Kerala State conducted for
floristic and ethnobotanical studies

Threats (Key):   Human interference in terms of overexploitation for me
dicinal purpose, and over browsed (I and Ov).

Other Comments:

Trade: High quantity usage for Ayurvedic purpose. Highly
priced tubers (Rs.100/kg) Over exploited. Overgrazing
prevents regeneration in the wild. Export prohibited since
March 1994.

Status:
— IUCN (Revised):   Vulnerable
— Criteria based on:
— CITES:

Recommendations:
— PHVA: Yes.
— Research management (Code):   No
— Cultivation Program: Needs *ex-situ* conservation
— Genetic Management: No

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institute: TBGRI and Medicinal Plants Conservation Park of
FRLHT's *ex-situ* conservation programme; no problem in
propagation

TAXON DATA SHEET

Species (& synonyms): *Hydnocarpus macrocarpa* (Bedd.) Warb.

Taxonomic status: Species

Habit: Tree
Habitat: Evergreen forest

Distribution; Southern Western Ghats
— Range-km^2: <20,000
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?): Fragmented

Wild Population; Not known
— % Decline: 50
— Time/Rate (Years or generations): 20 years
— # Mature Individuals:

Data Quality (Key, Sources, Dates): Guesstimates (5)

Field Studies (Who & Dates, Ref.): General floristic studies

Threats (Key): Fruits overcollected (Ov), Habitat fragmented and degraded (Lf).

Trade: Yes, in fruits

Other Comments:

Status:
— IUCN (Revised): Vulnerable
— Criteria based on:
— CITES:

Recommendations:
— PHVA: No
— Research management (Code): Survey (S), monitoring (M), habitat management (Hm); standardised cultivation techniques
— Cultivation Program: No
— Genetic Management: No

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institute:

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TAXON DATA SHEET

Species (& synonyms):   *Kaempferia galanga* L.

Taxonomic status: Species

Habit: Herb
Habitat: Low altitude grasslands.

Distribution;   Indo-Malaya
-- Range-km^2:
-- Area Occupied-km^2
-- Fragmentation (# subpopulations ?):

Wild Population;
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates):   Older data. TBGRI publications (4)

Field Studies (Who & Dates, Ref.):

Threats (Key):

Trade: Yes, for Ayurvedic medicine

Other Comments: Last collection (?) 1979 from Silent Valley RF
                                           Doubtful about occurance in wild. Cultivated for root
                                           tubers

Status:
-- IUCN (Revised):   Critically Endangered at regional level
-- Criteria based on:
-- CITES:

Recommendations:
-- PHVA: Yes, for reintroduction
-- Research management (Code):   Study of entire biology. Search and find in Silent Valley
                                           and similar habitats

-- Cultivation Program:
-- Genetic Management: Yes

Cultivated Population (Current Status
& Locations & Difficulty):   Grown extensively; now essentially a cultivated species in
                                           India
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute:

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Species (& synonyms):	*Kingiodendron pinnatum* (Roxb. ex DC.) Harms
Taxonomic status:	Species
Habit:	Large tree (> 30 mts tall)
Habitat:	Moist deciduous and evergreen forest
Distribution; in Kerala.	Observation in natural habitat done by Dr. Pandurangan
	Sparse distribution in deciduous forest
-- Range-km²:	
-- Area Occupied-km²:	
-- Fragmentation (# subpopulations ?):	
Wild Population;	Kerala
-- % Decline:	50
-- Time/Rate (Years or generations):	10 years
-- # Mature Individuals:	
Data Quality (Key, Sources, Dates):	Recent general field studies in Kerala (2)
Field Studies (Who & Dates, Ref.):	
Threats (Key):	Over exploitation (Ov), Injuries due to resin collection (I)
Trade:	Tree timber
Other Comments:	Only matured trees are sighted; low viability reported from Forest Department of Kerala. Needs *ex-situ* con servation. Bark is used for varnish; resin for wood polish
Status:	
-- IUCN (Revised):	Endangered
-- Criteria based on:	
-- CITES:	
Recommendations:	
-- PHVA:	Yes
-- Research management (Code):	Monitoring (M), population biology needs research; reintroduction into the wild
-- Cultivation Program:	Yes
-- Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	Not known
-- Botanical Gardens:	
-- Commercial/Domestic:	
-- Herbaria (or Seed banks):	
-- Research Institute:	

TAXON DATA SHEET

Species (& synonyms):   ***Madhuca diplostemon* (Clarke) Royen**

Taxonomic status: Species

Habit: Tree
Habitat:

Distribution;
— Range-km^2:
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?):

Wild Population;
— % Decline:
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   Known only from type collection

Field Studies (Who & Dates, Ref.):   Not located during floristic studies

Threats (Key):

Trade:

Other Comments: Taken from Red Data Book

Status:
— IUCN (Revised):   Endangered
— Criteria based on:
— CITES:

Recommendations:
— PHVA: Pending
— Research management (Code):   Search in the type locality for locating the species (S),
life history studies (Lh)

— Cultivation Program:
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institute:

Species (& synonyms):   ***Madhuca insignis* (Radlk) H.J. Lam**

Taxonomic status: Species

Habit: Tree
Habitat: Habitat not reported

Distribution;
-- Range-km^2:
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;
– % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates):   Flora of Karnataka, Vol. 1 (4)

Field Studies (Who & Dates, Ref.):   No recent collections

Threats (Key):

Trade:

Other Comments: Collected by Metz about 150 years ago and deposited in Hohenacker Herbarium in Mangalore; sheet number 397. No studies done further.

Status:
– IUCN (Revised):   Possibly Extinct.
– Criteria based on:
– CITES:

Recommendations:
– PHVA: Pending
-- Research management (Code):   Intensive survey (S)
-- Cultivation Program:
– Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
– Botanical Gardens:
– Commercial/Domestic:
– Herbaria (or Seed banks):
– Research Institute:

Species (& synonyms):   *Myristica malabarica* Lam.

Taxonomic status: Species

Habit: Tree
Habitat: Evergreen and Myristica swamps

Distribution;   Kanyakumari to Dakshina Kannada
-- Range-km^2:   40,000
-- Area Occupied-km^2:   10
--Fragmentation (# subpopulations ?):   Highly scattered

Wild Population;
-- % Decline: > 30
-- Time/Rate (Years or generations):   10 years
-- # Mature Individuals: --

Data Quality (Key, Sources, Dates):   Recent survey for Kerala and Karnataka (whole range)
                                           (2).

Field Studies (Who & Dates, Ref.):   For revisionary works being carried out. Population
                                           studies done for those in Karnataka - Srinivas Singh
                                           (IISc) and Dr. N. N. Kurian (Calicut Unversity) Reproduc-
                                           tive biology, morphogenetics of wild species of *Myristica*
                                           in Kerala

Threats (See key):   Habitat modification; swamps are being drained for
                                           irrigation; loss of habitat due to human interference (L
                                           and I)

Trade: Often grown as ornamental plant; seed aril traded mixed
                                           with *Myristica fragrans.*

Other Comments: Low seed viability due to loss of habitat and unfavourable
                                           soil condition for germination. Pollination difficulties
                                           observed due to dioecious nature in a population

Status:
-- IUCN (Revised):   Vulnerable
-- Criteria based on:
-- CITES:

Recommendations:
-- PHVA: Yes
-- Research management (Code):   Study of pollination biology. Scientific habitat manage-
                                           ment of swamps (Hm)
-- Cultivation Program: Yes
-- Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute:

Species (& synonyms):   *Ochreinauclea missionis* (Wallich. ex G.Don) Ridsdale

Taxonomic status: Species

Habit: Tree
Habitat: Evergreen and along stream side

Distribution;   Kerala - Pathamthitta; Karnataka - Dakshin
          Kannada, T.N. - Topslip
-- Range-km^2:   > 5,000
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations?):   Yes

Wild Population;
-- % Decline: > 50%
--Time/Rate (Years or generations):   In 10 years; four scattered populations in Dakshin
          Kannada, Wyanad, Silent Valley, Anamalais. In
          1989, 75 mature individuals were recorded near Athira-
          pally Medicinal Plants Conservation Areas of FRLHT's *in-
          situ* conservation programme

-- # Mature Individuals:

Data Quality (Key, Sources, Dates):   General field study (2)

Field Studies (Who & Dates, Ref.):

Threats (Key):   Loss of habitat (L) and human interference (I)

Trade: Locally used.

Other Comments: ENDEMIC. Known in pockets. Population studies
          required. Bark for medicinal purposes. Leaves for
          feeding livestock; nutritive values being analysed.
          Propagation techniques being developed.

Status:
-- IUCN (Revised):   Vulnerable
-- Criteria based on: Extent of occurrence
-- CITES: Not Listed.

Recommendations:
-- PHVA: Yes
-- Research management (Code):   Population monitoring.
-- Cultivation Program: Required
-- Genetic Management: Yes

Cultivated Population: (Current Status
& Locations & Difficulty)
-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institutes: Few individuals at TBGRI, stem cuttings established

TAXON DATA SHEET

Species (& synonyms):   *Operculina turpethum* (L.) Silva Manso

Taxonomic status: Species

Habit: Climber
Habitat: Moist/dry deciduous forest; open areas around villages

Distribution: Indo-Malaya, T.N. and Kerala
— Range-km^2:   > 5000
— Area Occupied-km^2:
— Fragmentation (# subpopulations ?):   No

Wild Population:
— % Decline:
— Time/Rate (Years or generations):
— # Mature Individuals:

Data Quality (Key, Sources, Dates):   General field study (2)

Field Studies (Who & Dates, Ref.):   Dr. Anil Kumar - 1989

Threats (Key):   Over exploitation (Ov)

Trade: Medicinal plant; high consumption - for ornamental purposes

Other Comments: Used by pharmaceutical industries

Status
— IUCN (Revised):   Low Risk
— Criteria based on   Extent of occurrence.
— CITES: Not listed.

Recommendations:
— PHVA   No
— Research management (Code):   Survey (S) and monitor (M) for wild populations in southern Western Ghats
— Cultivation Program: No
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Institutes:

Species (& synonyms):	*Piper barberi* Gamble
Taxonomic status:	Species
Habit:	Climber
Habitat:	Moist evergreen forest
Distribution:	Kerala
— Range-km^2	
— Area Occupied-km^2:	1
— Fragmentation (# subpopulations ?):	Yes
Wild Population;	
— % Decline:	
— Time/Rate (Years or generations):	
— # Mature Individuals:	Few.
Data Quality (Key, Sources, Dates):	Census & population monitoring (1)
Field Studies (Who & Dates, Ref.):	MSSRF - 1994, IFGTB - 1975, BSI
Threats (Key):	Loss of habitat (L)
Trade:	No trade known.
Other Comments:	ENDEMIC. Available in low fragmented population & needs monitoring. Collection from wild for germplasm.

Status:
— IUCN (Revised):   Critically endangered
— Criteria based on: Extent of occurrence and population estimates.
— CITES: Not listed.

Recommendations:
— PHVA: Yes
— Research management (Code):   Monitoring (M) & Habitat management (Hm)
— Cultivation Program: Yes
— Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty):
— Botanical Gardens:
— Commercial/Domestic:
— Herbaria (or Seed banks):
— Research Insitutions: Few individuals are being maintained at TBGRI

0

TAXON DATA SHEET

Species (& synonyms):	*Piper longum* L.
Taxonomic status:	Species.
Habit:	Straggler
Habitat:	Moist deciduous and evergreen
Distribution;	Kerala, T.N. (common)
— Range-km^2:	> 5,000
— Area Occupied-km^2:	< 1,000
— Fragmentation (# subpopulations ?):	No
Wild Population;	
— % Decline:	
— Time/Rate (Years or generations):	
— # Mature Individuals:	Large number
Data Quality (Key, Sources, Dates):	General field study (2)
Field Studies (Who & Dates, Ref.):	MSSRF, BSI, IFGTB, KASC
Threats (Key):	Loss of habitat; over exploitation (L and Ov)
Trade:	Yes
Other Comments:	Extensively cultivated for medicinal purposes- particularly for the spikes.
Status:	
— IUCN (Revised):	Low Risk
— Criteria based on:	Extent of occurrence.
— CITES:	Not listed.
Recommendations:	
— PHVA:	No
— Research management (Code):	Population monitoring & genetic studies
— Cultivation Program:	
— Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	Widely cultivated for consumption
— Botanical Gardens:	
— Commercial/Domestic:	Spices Board is promoting cultivation for commerce
— Herbaria (or Seed banks):	
— Research Institutions:	

TAXON DATA SHEET

Species (& synonyms):   ***Plectranthus vettiveroides*** **(Jacob) Singh & Sharma**
                                             (= *Coleus vettiveroides* Jacob)

Taxonomic status: Species.

Habit: Herb
Habitat: Known only under cultivation

Distribution;   No
-- Range-km^2:
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?):

Wild Population;   No wild population
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals:

Data Quality (Key, Sources, Dates):   Herbarium data (4)

Field Studies (Who & Dates, Ref.):   No field studies undertaken

Threats (See key):   Not applicable

Trade: Internal trade for ayurvedic medicines

Other Comments: This plant may be identical to *C. zeylanicus*, a Sri
                                             Lankan species. Taxonomic status needs examination.

Status:
-- IUCN (Revised):   Extinct in the wild nationally; Identity should be resolved
                                             for further categorization

-- Criteria based on:
-- CITES: Not included

Recommendations:
-- PHVA: Yes
-- Research management (Code):   Not applicable
-- Cultivation Program:
-- Genetic Management: Yes

Cultivated Population (Current Status
& Locations & Difficulty):
-- Botanical Gardens: Yes
-- Commercial/Domestic: Yes
-- Herbaria (or Seed banks):   Yes
-- Research Institutes:

TAXON DATA SHEET

Species (& synonyms):	*Pterocarpus santalinus* L. f.
Taxonomic status:	Species
Habit:	Tree
Habitat:	Dry deciduous forest
Distribution;	Soutern Eastern Ghats
— Range-km^2:	< 5,000
— Area Occupied-km^2:	< 1,000
— Fragmentation (# subpopulations ?):	No.
Wild Population;	
— % Decline:	No
— Time/Rate (Years or generations):	
— # Mature Individuals:	Distribution restricted to southern Eastern Ghats
Data Quality (Key, Sources, Dates):	Field study (2)
Field Studies (Who & Dates, Ref.):	IFGTB & IWST - genetic mapping
Threats (Key):	Commercial exploitation for products
Trade:	Yes.
Other Comments: o	ENDEMIC. Recently, plantations have been raised. High timber species. Diabetes bowls made. No population reported from three states of Kerala, Karnataka and Tamil Nadu
Status:	
— IUCN (Revised):	Endangered
— Criteria based on:	Extent of occurrence.
— CITES:	Listed.
Recommendations:	
— PHVA:	Yes
— Research management (Code):	Habitat management (Hm)
— Cultivation Program:	
— Genetic Management:	Genetic mapping, germplasm conservation
Cultivated Population (Current Status & Locations & Difficulty):	
— Botanical Gardens:	
— Commercial/Domestic:	Observed in Cuddapah as plantations; trials on in Karnataka
— Herbaria (or Seed banks):	
— Research Institution:	

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TAXON DATA SHEET

Species (& synonyms):	*Rauvolfia serpentina* (L.) Benth. ex Kurz
Taxonomic status:	Species
Habit:	Under shrub
Habitat:	Moist deciduous forest (degraded) / evergreen
Distribution;	Most of India
— Range-km^2:	>10,000
— Area Occupied-km^2:	>500
— Fragmentation (# subpopulations ?):	No
Wild Population;	
— % Decline:	50
— Time/Rate (Years or generations):	10 years
— # Mature Individuals:	Very few
Data Quality (Key, Sources, Dates):	General field studies (2)
Field Studies (Who & Dates, Ref.):	MSSRF, IFGTB, BSI, Mangalore University
Threats (Key):	Human interference (I), Habitat loss (L), Over exploitation (Ov)
Trade:	Yes
Other Comments:	Widely cultivated for medicinal value. Not endemic. Seeds germinate well.
Status:	
— IUCN (Revised):	Endangered
— Criteria based on:	Population reduction
— CITES:	Not listed
Recommendations:	
— PHVA:	Yes
— Research management (Code):	Monitoring (M)
— Cultivation Program:	No.
— Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	
— Botanical Gardens:	
— Commercial/Domestic:	Cultivated by Maharastra Forest Department
— Herbaria (or Seed banks):	
— Research Institution:	

TAXON DATA SHEET

Species (& synonyms): **_Saraca asoca_ (Roxb.) Willd**

Taxonomic status: Species

Habit: Tree
Habitat: Evergreen

Distribution: Southern and central Western Ghats, Karnataka, Kerala, Tamil Nadu and Sri Lanka.
-- Range-km^2: < 5,000
-- Area Occupied-km^2:
-- Fragmentation (# subpopulations ?): Yes

Wild Population;
-- % Decline:
-- Time/Rate (Years or generations):
-- # Mature Individuals: About 125 plants at Trichur, Nelliampathy and Achankovil

Data Quality (Key, Sources, Dates): General field studies (2)

Field Studies (Who & Dates, Ref.): MSSRF, IFGTB, BSI, Mangalore Univ., KASC

Threats (Key): Loss of habitat (L), Human interference (I)

Trade: Yes, exported

Other Comments: Commonly cultivated - medicinal and sacred tree. Not endemic. Recently sighted at Kolur Ghats. Exploited for ornamental and bark use

Status:
-- IUCN (Revised): Vulnerable; Endangered in the three states
-- Criteria based on: Extent of occurrence
-- CITES: Not listed.

Recommendations:
-- PHVA: Yes
-- Research management (Code): Monitoring to determine population (M)
-- Cultivation Program: Cultivation & collection of germ plasm.
-- Genetic Management:

Cultivated Population (Current Status
& Locations & Difficulty): Commonly cultivated in most botanical gardens of southern India

-- Botanical Gardens:
-- Commercial/Domestic:
-- Herbaria (or Seed banks):
-- Research Institute:

TAXON DATA SHEET

Species (& synonyms):	*Syzygium travancoricum* Gamble
Taxonomic status:	Species
Habit:	Tree
Habitat:	Evergreen
Distribution;	T.N., Kerala
-- Range-km2:	> 5,000
-- Area Occupied-km2:	
-- Fragmentation (# subpopulations ?):	No
Wild Population;	
-- % Decline:	
-- Time/Rate (Years or generations):	
-- # Mature Individuals:	Below 200
Data Quality (Key, Sources, Dates):	General field study (2)
Field Studies (Who & Dates, Ref.):	MSSRF, IFGTB, KFRI, KASC.
Threats (Key):	Loss of habitat (L); human interference (I)
Trade:	Local trade
Other Comments:	ENDEMIC. S.W.Ghats. 15 to 20 trees seen in a particular area in Quilon Distt. at Guddrikal by A.G. Pandurangan. Fruits are edible; bark used for local folk tradition. Vast tracts of natural habitats at Kulathipuzha converted to paddy fields.
Status:	
IUCN (Revised):	Critically endangered
Criteria based on:	Population estimate.
CITES:	Not listed.
Recommendations:	
-- PHVA:	Yes
-- Research management (Code):	Taxonomic (T), monitoring (M), life history (Lh)
-- Cultivation Program:	Yes
-- Genetic Management:	Yes
Cultivated Population (Current Status & Locations & Difficulty):	
-- Botanical Gardens:	
-- Commercial/Domestic:	
-- Herbaria (or Seed banks):	
-- Research Institution:	

TAXON DATA SHEET

Species (& synonyms):   *Trichopus zeylanicus* Gaertn. sub sp. *travancoricus*
                               Burkill ex Narayanan

Taxonomic status: Sub species.

Habit: Tuberous herb
Habitat: Evergreen forest

Distribution;   Extreme southern Western Ghats
-- Range-km²: < 5,000
-- Area Occupied-km²: < 1,000
-- Fragmentation (# subpopulations ?):   Yes

Wild Population;
-- % Decline: Yes
-- Time/Rate (Years or generations):
-- # Mature Individuals: < 1,000

Data Quality (Key, Sources, Dates):   General field studies (2)

Field Studies (Who & Dates, Ref.):   TBGRI, MSSRF, IFGTB, BSI

Threats (Key):   Human interference (I), Over exploitation (Ov)

Trade: Only local use

Other Comments: Taxonomic studies to be undertaken.

Status:
-- IUCN (Revised):   Critically endangered
-- Criteria based on: Population estimate, Extent of occurrence
-- CITES: Not listed.

Recommendations:
-- PHVA: Yes
-- Research management (Code): Monitoring (M)
-- Cultivation Program: Cultivation required for sustainable utilisation
-- Genetic Management: Yes

Cultivated Population (Current Status
& Locations & Difficulty):
-- Botanical Gardens:
-- Commercial/Domestic: Under cultivation by tribals in Kerala in a buy-back
                               scheme by TBGRI

-- Herbaria (or Seed banks):
-- Research Institution:

Species (& synonyms):   *Utleria salicifolia* Beddome.

Taxonomic status: Species

Habit: Shrub
Habitat: Grass lands and slopes

Distribution;   Southern India (Endemic and anomalous)
— Range-km^2:   < 1,000
— Area Occupied-km^2:   < 50
— Fragmentation (# subpopulations ?):   Yes

Wild Population;
— % Decline: 50
— Time/Rate (Years or generations):   20 years
— # Mature Individuals: Occasional

Data Quality (Key, Sources, Dates):   General field study (2)

Field Studies (Who & Dates, Ref.):   KFRI (Dr. Sashidharan), TBGRI,

Threats (Key):   Human interference (I) and Over exploitation (Ov)

Trade: Yes, for folk medicine use only

Other Comments: ENDEMIC. Tuberous roots used for pickling.

Status:
— IUCN (Revised):   Critically endangered
— Criteria based on: Area and decline
— CITES: Not listed

Recommendations:
— PHVA: Yes
— Research management (Code):   Habitat management (Hm), monitoring (M), propaga-
                                        tion studies
— Cultivation Program: Yes
— Genetic Management: Yes

Cultivated Population (Current Status
& Locations & Difficulty):
—   Botanical Gardens:
—   Commercial/Domestic:
—   Herbaria (or Seed banks):
—   Research Institutions :   Grown in TBGRI garden; few individuals

TAXON DATA SHEET

Species (& synonyms):   *Vateria indica* L.

Taxonomic status: Species

Habit: Tree
Habitat: Evergreen to semi evergreen

Distribution;   Karnataka, T.N., Kerala
Range-km²: > 30,000
Area Occupied-km²: > 5,000
Fragmentation (# subpopulations ?):   Fragmented

Wild Population;
– % Decline: 50
– Time/Rate (Years or generations):   Twenty years or two generations (20 years = age of maturity)

– # Mature Individuals:

Data Quality (Key, Sources, Dates):   General field study (2)

Field Studies (Who & Dates, Ref.):   BSI, ICFRE, MSS, CTS, KASC. 1990's (recent).

Threats (Key):   Human interference (I), Loss of habitat (L), Exploitation by industry (Ov)

Trade: Softwood industry. Trade of gum resin for medicinal use.

Other Comments: ENDEMIC. Although heavily exploited, there is no severe threat due to good natural regeneration.

Status:
– IUCN (Revised):   Low risk
– Criteria based on: Extent of occurrence.
– CITES: Not listed.

Recommendations:
– PHVA: Yes
– Research management (Code):   Monitoring to determine population in area of occurrence

– Cultivation Program:
– Genetic Management: No

Cultivated Population (Current Status
& Locations & Difficulty):   Cultivated on private lands
– Botanical Gardens:
– Commercial/Domestic:
– Herbaria (or Seed banks):
– Research Institution:

TAXON DATA SHEET

Species (& synonyms):	***Woodfordia fruticosa* (L.) Kurz**
Taxonomic status:	Species
Habit:	Small tree
Habitat:	Open waste land, degraded areas
Distribution;	All over India up to sub Himalayas
-- Range-km^2:	> 5,00,000
-- Area Occupied-km^2:	> 5,000
-- Fragmentation (# subpopulations ?):	No
Wild Population;	
-- % Decline:	?
-- Time/Rate (Years or generations):	
-- # Mature Individuals:	
Data Quality (Key, Sources, Dates):	General field studies (2)
Field Studies (Who & Dates, Ref.):	CTS
Threats (Key):	None
Trade:	Yes. Flowers traded for ayurvedic use
Other Comments:	In southern India, it grows in coastal lateritic belts. Flowers are used in Ayurvedic formulations and are also used for gelling and imparting flavour.
Status:	
-- IUCN (Revised):	Low risk
-- Criteria based on:	Extent of occurrence
-- CITES:	Not listed.
Recommendations:	
-- PHVA:	No
-- Research management (Code):	Population monitoring (M)
-- Cultivation Program:	No
-- Genetic Management:	
Cultivated Population (Current Status & Locations & Difficulty):	
-- Botanical Gardens:	
-- Commercial/Domestic:	Grown in many gardens
-- Herbaria (or Seed banks):	
-- Research Institution:	

REPORT

CAMP Workshop for Selected S. Indian Medicinal Plants

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Working Group Reports

Saraca asoca
(Roxb.) Willd

Working Group for Genetic Management

Members: Vinay Tandon, Dr. N. Sashidharan, Dr. A.G. Pandurangan

Action Points for Conservation of Genetic Diversity of Threatened Medicinal Plant species of southern India

1. Survey and location of populations of these species in the wild within and outside MPCA network, keeping in mind district ecological niches.

2. Collection of seeds from at least 50 individuals per population. Test for viability.

3. Long and medium term seed storage of those species with (1) National Bureau of PGR (and MSSRF upgrade have Med term (20 years)) regional facilities like at MSSRF, Madras.
* NBPGR, New Delhi and FRLHT, Bangalore already agreed in principle to such an arrangement.

4. Ensuring that the priority "threatened" plants are grown in all the 'herbal' gardens being set up under *ex situ* Medicinal Plants Conservation Parks in the FRLHT project.

5. The threatened species are also introduced into existing botanical gardens in the three states through local arrangements. Local level research tie-ups between universities/ research institutes and these herbal/Botanic gardens for (with earmarked species preferably with easy access to wild populations).
   1) Breeding biology
   2) Autecology
Funding for such research through pharmaceutical industry and through universities/research bodies, etc. by employing JRFs/SRFs leading to Ph.D. work.

6. A database developed within FRLHT to record presence, accessions, any other *ex situ* propagation activities with respect to these species with periodic indexes published.

7. Reintroduction programme on a pilot scale be made for selected MPCAs and progress of reintroduced species monitored.

8. Morphologically, ecotypically and genetically distinct accessions of threatened as well as economically and clinically important medicinal plants be brought together and raised in field gene banks proposed to be established in collaboration with universities / research institutions under FRLHT project.

9. Explore possibilities of developing a long term seed storage facility within a research institution in southern India, e.g. TBGRI, Trivandrum, Kerala or MSSRF, Madras.

10. Explore and test possibilities of enrichment of genetic diversity of selected species (priority) within in situ MPCAs, possibly through cross-pollination from other geographically separate populations.

11. Look at multiple-use of species to help diversified funding/use by interested agencies.

12. Studies on Reproductive biology of selected species encouraged through JRFs/SRFs in *in situ* areas leading to Ph.D. work.

Working Group for Assigning Threatened
IUCN Red List Categories

Members: Dr. M. P. Nayar, Dr. B. V. Shetty, Dr. V. S. Ramachandran, Dr. P. Balasubramanian

A) Criteria of area of occupancy:

For determining the threatened categories like critically endangered, endangered, vulnerable, etc. of a taxon, one of the criteria taken into consideration is the extent of occurrence of the taxon. It is felt that this cannot always be applied for plant taxa, as populations/numbers of a taxon occurring in different vegetational types/regions are likely to vary in an unit area -- even in an adjacent areas of evergreen forests, moist deciduous forests, dry deciduous forests, etc.

The problem is likely to be more acute when the situation in wet green forests is compared with that in the arid areas. Although the area of occupancy of a taxon is an important criteria in determining the status of the taxon, the whole concept has to be modified in the light of what has been stated above, for plants. This is emphasized because the package of species in a smaller geographical area, that is in wet evergreen forests is much more compared to that in a dry deciduous/ moist deciduous forest, etc.

Commiphora wightii

Working Group for Reintroduction and Management of Critically Endangered Plants

Members: Dr. N Sashidharan, Dr. S.R. Ramesh, Dr. A.G. Pandurangan, C.K. Sreedharan

1.   Systematic surveys should be designed and carried out in the natural habitat of the species with the help of local people to assess the population size and identify areas where a maximum number of individuals are concentrated. Such areas can be demarcated for *in situ* conservation.

2.   The population structure should be analysed to determine whether individuals at all growth stages are adequately represented.

3.   Phenological processes – like flowering and fruiting – should be monitored.

4.   Constraints affecting phenological process and also establishment of seedlings should be identified.

5.   Limiting factors – such as fire and grazing – should be considered while preparing management practices.

6.   Artificial methods of propogation for species where natural regeneration is severely affected should be adopted.

7.   Propagation techniques should be standardised.

8.   Supplementation of natural regeneration in critical areas may be done by the reintroduction of propagules into natural habitat.

9.   Raise plants in different ex situ centres for conservation.

10.   Alternatives should be provided if depletion in the natural habitat is due to consumption by local people.

11.   Over exploitation for trade must be regulated.

12.   A comprehensive plan for creating awareness about the importance of conservation among people through the help of media and their publicity materials should be developed and implemented.
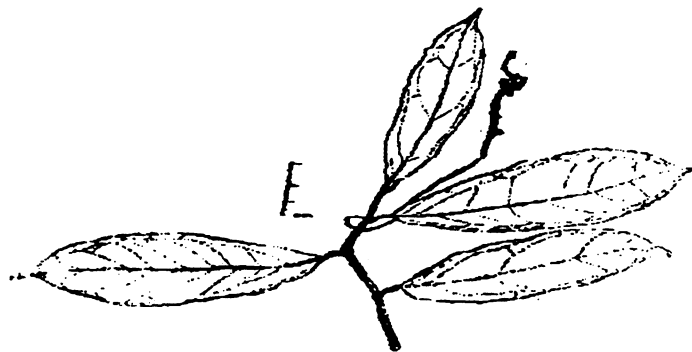
Piper barberi

Working Group for Survey and Monitoring of Threatened Medicinal Plants

Members: Dr. M. P. Nayar, Dr. B. V. Shetty, Dr. V. S. Ramchandran, Dr. P. Balakrishnan

I. The following methodologies are suggested:
a. Identification of the threatened taxa through (i) survey of literature (ii) scrutiny of herbaria.
b. Determination of the range of distribution of species from (i) and (ii).
c. Grid mapping through computer - geographical information systems

II Field studies:

d. Use of landsat imageries of the areas in order to find out ecological needs
e. Terrestrial heterogeneity of the area, eg. gradients, contours, water bodies, patchy or canopy forests, flooding, landslides
f. Edaphic heterogeneity, eg. types of soil, nutrient level, pH level, low productivity habitat.
g. Weather/climate seasonality, phenology of plants, windward and leeward ranges, rainfall, tempera-ture, diurnal temperature variations
h. Successional changes, canopy openings, river bank deposition and erosion
i. Natural and man-made perturbances
j. Mutualists and keystone species
k. Autecology of the species, predator, mortality, defense mechanism of plants, seed dispersal and germination

III Quantification Studies : Transect/quadrat methods

Monitoring -- look for loopholes in the whole spectrum of activities and plug it in time
1. Seasonal monitoring for the herbaceous forms; annual or biannual monitoring for arborescent forms
2. Taxa weightage of priority species occuring in adjacent protected areas (network analysis)
3. Protection of such priority conservation areas by forest department

Comments on M.P. Nayar's report

Action points for improved Botanical Surveys and herbarium mananagement (esp. records) by Govt./ Autonmous organisations.

Explanation : There are a number of herbaria in the country. The oldest and largest among these belong to the BSI. Many other smaller herbaria (recognised and un-recognised) have sprung up recently. The Computer Centre of B.S.I. has started activities for networking all the Herbaria of B.S.I. at Coimbatore.

Problem: Herbaria work independently, not networked, access not easy. In records co-ordinators in terms of latitude/ longitude not available resulting in not being able to know location sites. Botanical surveys need to be systematic and periodic help in monitoring population, vegetation changes. Consider to decentralize survey work involving ther agencies, NGOs

Answer: Botanical Survey of India is a national agency and all scientific workings an have access on prior information.

Look at populations in more qualified terms.

Type of data recorded and its standardisation on herbarium labels - critically evaluated.

Answer: Botanical Survey of India have field books and it is necessary to exmine the field book where critical data is given. National or regional herbarium have a stake in the country's basic biodiversity access and B.S.I. is working on the Flora of India which is a work of a magnitude which requires number of scientists. The work involves production of 35 volumes. If there is provision of more scientists, quanti-fication work can be done.

Working Group for Cultivation for Utilisation
--Export of Plant Material

Members: Vinay Tandon, D.K. Ved

Cultivation:

Popularisation of medicinal plants increases the demand for medicinal plants -- both in terms of quantity from individual species and the number of species. Presently, 95% (approx.) of the demand for medicinal plants are met through collections from the wild and only 5% is being met from cultivated source.

Lack of technology on agronomic practices and multiplication of medicinal plant species is one of the main causes for the increased dependence on wild source. Agro-technology for about 40 species of medicinal plants are standardised by CIMAPS, Lucknow. This is too small a number compared to more than 500 number of species being traded in the classical and folk health systems.

Research in the field of propagation of various species, such as multiplication, agronomic practices, nursery practices, seed viability, storage, etc.. that are being used locally and are needed for export, should be carried out on a priority basis. *Kaempferia galanga* is one such example where in the dependence on the wild source has been completely eliminated in Kerala. Popularisation of species with proven tecnology and in great demand in trade, is the need of the hour to broaden the resource base.

Marketing tie-up with the manufacturers needs to be ensured in order to ensure guaranteed returns to the cultivators. Effective enforcement of legislation on the removal from wild source is essential to eliminate competition from wild source, which may be cheaper and generally preferred over the cultivated source. Value addition at local levels need to be considered to make cultivation of medicinal plants more attractive and if required, with tie up for marketing arrangements with the main manufacturing units.

Export:

Export of goods in general are regulated by the Ministry of Commerce. The negative list of items banned for export are published by this Ministry. Imposition of export ban when the plant materials are in short supply is essential. It is advisable to lift the bar on export for those species in mass cultivation, in order to make cultivation of medical plants profitable and more popular. A close liaison between the Ministry of Environment and Forests and the Ministry of Commerce is necessary for a correct assessment of the demand and supply situation.
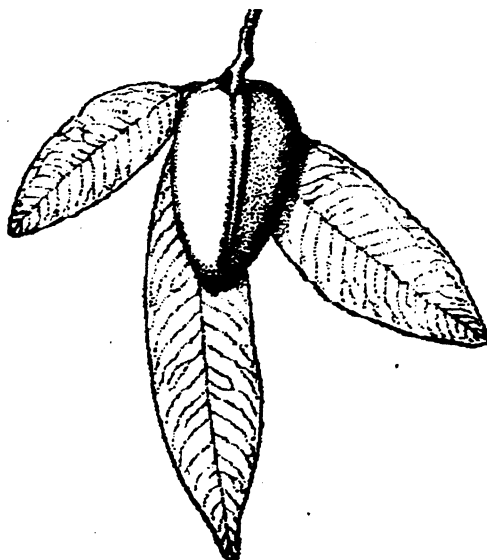
Myristica malabarica

Working Group for Threat Status Assessment
at Regional/National level

Members: D. K. Ved, B. Majumdar, Dr. Cecil J. Saldanha, Dr. B.V. Shetty, Arun Subbiah, V. Ramakantha

1. The IUCN categories for threat assessment in the proposed format are for assessment at the global level.

2. These categories may not be totally appropriate unless the status at the regional/national level is also indicated.

3. The objective of threat assessment is to arrive at a package of management prescriptions for conservation at the local/regional level. Hence the threat status at regional level is of great relevance.
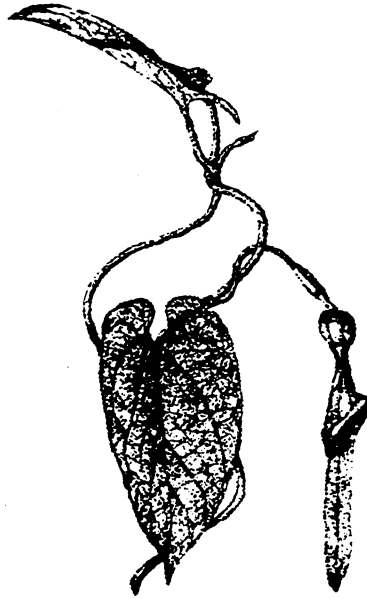
Aristolochia tagala

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REPORT

CAMP Workshop for Selected S. Indian Medicinal Plants

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Section III

Reference Material

Saraca asoca
(Roxb.) Willd

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In addition to the above, following participants contributed in the planning session for the workshop held on 18.10.94 at FRLHT, Bangalore (but could not attend the CAMP workshop)

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Features

Draft IUCN Red List Categories, Version 2.2

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I. Introduction

The threatened species categories now used in Red Data Books and Red Lists have been in place, with some modification, for almost 30 years. Since their inception they have become widely recognized internationally, and they are now used in a whole range of publications and listings produced by IUCN as well as by numerous governmental and non-governmental organizations. The Red Data Book categories provide an easily and widely understood method for highlighting those species under higher extinction risk, so as to focus attention on conservation measures designed to protect them. The system has worked well under the existing definitions, and underlies many valuable conservation assessments and management plans. However, with the increasing recognition that the resources available for conservation are very limited and need to be allocated rationally among many different demands, the categories have been used more frequently for setting priorities for conservation action. It is this change in emphasis that has provoked recent moves to revise the category definitions.

The need to revise the categories has been recognized for some time. In 1984, the SSC held a symposium, "The Road to Extinction" (Fitter & Fitter 1987) which examined the issues in some detail, and at which a number of options were considered for the revised system. However, no single proposal resulted. The current phase of development began in 1987 with a request from the SSC Steering Committee to develop a new approach that would provide the conservation community with useful information for action planning.

The revision has several aims: to provide an explicit system that can be applied consistently by different people; to improve objectivity by providing those using the criteria with clear guidance on how to evaluate different factors that affect risk of extinction; to provide a system which will facilitate comparisons across widely different taxa; and to give people using threatened species lists a better understanding of how individual species were classified. In this document, proposals for new definitions for Red List categories are presented. The general aim of the new system is to provide an objective framework for the classification of species according to their extinction risk. This is intended to be equally applicable across taxa, and to be useful in the planning of conservation actions.

The proposals presented in this document result from a continuing process of drafting, consultation and validation exercises, and re-drafting. It is clear that the production of a large number of draft proposals has led to some confusion, especially as each draft has been used for classifying some set of species for conservation purposes. To clarify matters, and to open the way for future modifications as and when they become necessary, a system for version numbering is now being introduced as follows:

Version 1.0: Mace & Lande (1991)
The first paper discussing a new basis for the categories, and presenting numerical criteria especially relevant for large vertebrates.

Version 2.0: Mace et al. (1992)
A major revision of Version 1.0, including numerical criteria appropriate to all organisms and introducing the non-threatened categories.

Version 2.1: IUCN (1993)
Following an extensive consultation process within SSC, a number of changes were made to the details of the criteria, and fuller explanation of basic principles was included. A more explicit structure clarified the significance of the non threatened categories.

Version 2.2: 1994 (this paper)

Following further comments received and additional validation exercises, some minor changes to the criteria have been made. In addition, the Susceptible category present in Versions 2.0 and 2.1 has been subsumed into the Vulnerable category. A precautionary application of the system is emphasized.

In future, any application of the criteria should include the appropriate version number as given above.

In the rest of this document, the proposed system is outlined in several sections. The Preamble presents some basic information about the context and structure of the proposal, and the procedures that are to be followed in applying the definitions to species. This is followed by a section giving definitions for terms used in a specific fashion within the definitions. Finally the definitions are presented, followed by the quantitative criteria used for classification within the threatened categories. It is important for the effective functioning of the new system that all sections are read and understood, and the guidelines followed.

II. Preamble

The following points present important information on the use and interpretation of the categories (=Critically Endangered, Endangered, etc.), criteria (= A to E), and sub-criteria (=a, b, etc., i, ii, etc.):

1. Taxonomic Level and Scope of the Categorization Process

The criteria can be applied to any taxonomic unit at or below the species level. The term "taxon" in the following notes, definitions, and criteria is used for convenience, and may represent species or lower taxonomic levels, including forms that are not yet formally described. There is a sufficient range among the different criteria to enable the appropriate listing of taxa from the complete taxonomic spectrum, with the exception of microorganisms. The criteria may also be applied within any specified geographical or political area al-

though special notice should be taken of point 11 below. In presenting the results of applying the criteria, the unit and area under consideration should be made explicit. The categorization process should only be applied to wild populations reproducing naturally inside their natural range, and to populations resulting from benign introductions (defined in the draft IUCN Guidelines for Reintroductions as "...an attempt to establish a species, for the purpose of conservation, outside its recorded distribution, but within an appropriate habitat and eco-geographical area").

2. Nature of the Categories

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as "threatened." The threatened species categories form a part of the overall scheme. It will be possible to place all taxa into at least one of the categories (see Fig. 1).

3. Role of the Different Criteria

For listing as Critically Endangered, Endangered, or Vulnerable, there are five quantitative criteria; meeting any one of these criteria qualifies a taxon for listing at that level of threat. The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. Even though some criteria will be inappropriate for particular taxa and some taxa will never qualify under particular criteria however close to extinction they come, there should be criteria appropriate for assessing threat levels for any taxon (other than microorganisms). The relevant factor is whether any one criterion is met, not whether all are appropriate or all are met.

4. Derivation of Quantitative Criteria

The quantitative values in the criteria associated with threatened categories were developed through wide consultation, and are set at what are generally judged to be appropriate levels, even if no formal justification for these values exists. The levels for different criteria within categories were set independently but

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14 *Species*
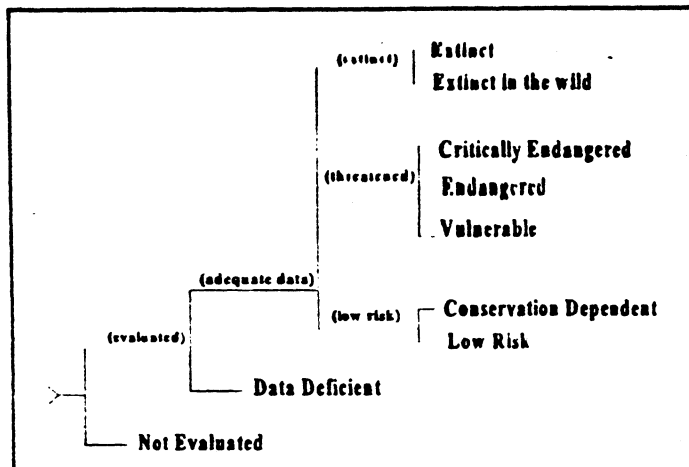
Figure 1. Structure of the Categories.

against a common standard. Some broad consistency between them was sought. However, a given taxon should not be expected to meet all (A E) criteria in a category; meeting any one criterion is sufficient.

5. Implications of Listing

Listing in the categories of Not Evaluated and Data Deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time as an assessment is made, species listed in these categories should not be treated as if they were non-threatened, and it will be appropriate (especially for Data Deficient forms) to give them the same degree of protection as threatened taxa, at least until their status can be evaluated.

Extinction is seen as a probabilistic or chance process. Thus, a listing in a higher extinction risk category implies a higher expectation of extinction, and over the time-frames under consideration more taxa listed here are expected to go extinct (without effective conservation action) than taxa listed in the lower risk categories. However, the fact that some taxa listed at high risk persist, does not necessarily mean their initial assessment was inaccurate.

6. Data Quality and the Importance of Inference and Projection

The criteria are clearly quantitative in nature. However, the absence of high-quality data should not deter attempts to apply the criteria, as methods involving estimation, inference, and projection are emphasized to be sufficient throughout. Inference and projection may be based on extrapolation of current or potential threats into the future and their rate of change, or on extrapolation of factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonably be supported. Suspected or inferred patterns in either the recent past, present, or near future can be based on any of a series of related factors, and these factors should be specified.

Taxa at risk from threats posed by future events of low probability but with severe consequences (catastrophes) should be identified by the criteria (e.g. small distributions, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible, or nearly so (pathogens, invasive organisms, hybridization).

7. Uncertainty

The criteria should be applied on the basis of the available evidence on taxon numbers, trend and distribution, making due allowance for statistical and other uncertainties. In cases where a wide variation in estimates is found, it is legitimate to apply the precautionary principle and use the lowest *credible* estimate.

Where data are insufficient to assign a category (including Low Risk), the category of "Data Deficient" may be assigned. However, it is important to recognize that this category indicates that data are inadequate to determine the degree of threat faced by a taxon, not necessarily that the taxon is poorly known. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, it is important to attempt threatened listing, even though there may be little direct information on the biological status of the taxon itself. The category "Data Deficient" is not a threatened category, although it indicates a need to obtain more information on such species to determine their appropriate listing.

8. Conservation Actions in the Listing Process

The criteria for the threatened categories are to be applied to a taxon irrespective of whether conservation action is taking place. In cases where it is only conservation action that prevents the taxon from meeting the threatened criteria, the designation of "Conservation Dependent" is appropriate. It is important to emphasize here that a taxon requires conservation action even if it is not listed as threatened.

9. Documentation

All taxon lists including categorization resulting from these criteria should state the version number of the category definitions as well as the criteria and sub-criteria that were met. No listing can be accepted as valid unless at least one criterion is given. If more than one criterion or sub-criterion was met, then each should be listed. However, failure to mention a criterion should not necessarily imply that it was not met. Therefore, if a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic down-listing. Instead, the taxon should be re-evaluated with respect to all criteria to indicate its status. The factors responsible for triggering the criteria, especially where inference and projection are used, should at least be logged by the evaluator, even if they cannot be included in published lists.

10. Threats and Priorities

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the likelihood of extinction under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and even perhaps the taxonomic distinctiveness of the subject.

11. Use at Regional Level

The criteria are most appropriately applied to whole taxa at a global scale, rather than to those units defined by regional or national boundaries. Regionally or nationally based threat categories are best used with two key pieces of information: the global status category for the taxon, and the proportion of the global population or range that occurs within the region or nation. However, if applied at regional or national level it must be recognized that a global category of threat may not be the same as a regional or national category for a particular taxon. For example, taxa that were classified as Vulnerable on the basis of their global declines in numbers or range might be Low Risk within a particular region where the populations were stable. Conversely, taxa classified as Low Risk globally might be Critically Endangered within a particular region where numbers were very small or declining, perhaps only because they were at the margins of their global range.

12. Re-evaluation

As circumstances change, re-evaluation of taxa against the criteria will be necessary, and listings should indicate explicitly the taxa for which re-evaluation should occur within a short time-frame (typically within 5 years), or under some specified circumstance. This is especially important for taxa listed under Low Risk, but which are close to qualifying as Vulnerable or Conservation Dependent.

13. Transfer Between Categories

There are rules to govern the movement of taxa between categories. These are as follows: (A) A taxon may be moved from a category of higher threat to a category of lower threat if

none of the criteria of the higher category has applied for 5 years or more. (B) If the original classification is found to have been erroneous (based on reanalysis of the data or new information), the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay (but see Section 9). (C) Transfer from lower risk to higher risk categories of threat should be made without delay.

14. Problems of Scale
Classification based on the sizes of geographic ranges or the patterns of habitat occupancy is complicated by problems of spatial scale. The finer the scale at which the distributions or habitats of taxa are mapped, the smaller will be the area that they are found to occupy. Mapping at finer scales reveals more areas in which the taxon is unrecorded. It is impossible to provide any strict rules for mapping taxa or habitats; the most appropriate scale will depend on the taxa in question, and the origin and comprehensiveness of the distributional data. However, the thresholds for some criteria (e.g. Critically Endangered) necessitate mapping at a fine scale (in units of one square kilometer or finer).

III. Definitions

Population
Population is defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population numbers are expressed as numbers of mature individuals only. In the case of taxa biologically dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used.

Subpopulations
Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little exchange (typically one successful migrant individual or gamete per year or less).

Mature Individuals
The number of mature individuals is defined as the number of individuals known, estimated, or inferred to be capable of reproduction. Where the population is characterized by normal or extreme fluctuations, the minimum number should be used. This measure is intended to count individuals capable of reproduction and should therefore exclude individuals that are environmentally, behaviorally, or otherwise reproductively suppressed in the wild. In the case of populations with biased adult or breeding sex ratios it is appropriate to use lower estimates for the number of mature individuals which take this into account. Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals). In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.

Generation
Generation may be measured as the average age of parents in the population.

Continuing Decline
A continuing decline is a recent, current, or projected future decline whose causes are not known or not adequately controlled and so is liable to continue unless remedial measures are taken. Natural fluctuations will not normally count as a continuing decline, but an observed decline should not be considered to be part of a natural fluctuation unless there is evidence for this.

Severe Decline
A severe decline (criterion A) is a reduction in the number of mature individuals of at least the amount (%) stated over the time period (years) specified, although the decline need not still be continuing. A severe decline should not be interpreted as part of a natural fluctuation unless there is good evidence for this. Downward trends that are part of natural fluctuations will not normally count as a severe decline.

Extreme Fluctuations
Extreme fluctuations occur in a number of taxa where population size or distribution area var-

ies widely, rapidly, and frequently, with a variation greater than one order of magnitude.

Severely Fragmented

Severely fragmented is defined as the case where increased extinction risks result from the fact that most individuals within a taxon are found in small and relatively isolated subpopulations. These small subpopulations may go extinct, with a reduced probability of recolonization.

Extent of Occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure does not take account of discontinuities or disjunctions in the spatial distributions of taxa (but see "Area of Occupancy"). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of Occupancy

Area of occupancy is defined as the area within the "extent of occurrence" (see definition) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of a taxon (e.g. colonial nesting sites, feeding sites for migratory taxa). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon. The criteria include values in km², and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small (see Figure 2).

Quantitative Analysis

A quantitative analysis is defined here as the technique of population viability analysis (PVA), or any other quantitative form of analy-
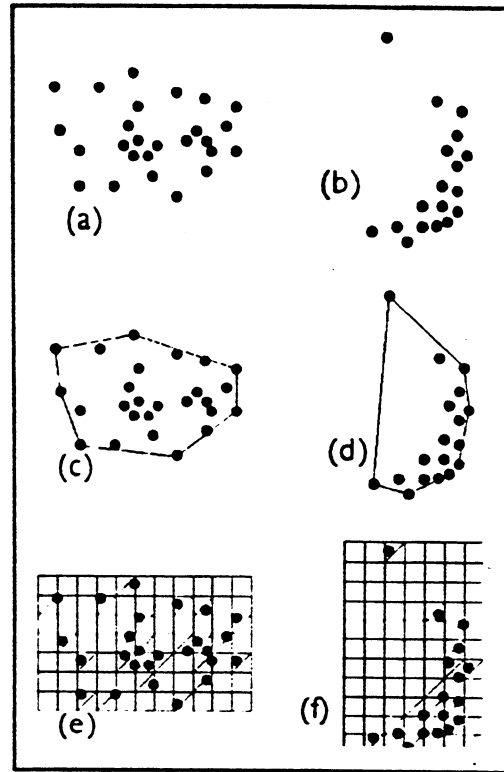
Figure 2. Two examples of the distinction between extent of occurrence and area of occupancy. (a) and (b) are the spatial distribution of known, inferred, or projected sites of occurrence. (c) and (d) show one possible boundary to the extent of occurrence, which is the measured area within this boundary. (e) and (f) show one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

sis, which estimates the extinction probability of a taxon or population based on the known life history and specified management or non-management options. In presenting the results of quantitative analyses, the structural equations and the data should be explicit.

IV. The Categories

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that its last individual has died.

Extinct in the Wild (EW)

A taxon is **Extinct in the Wild** when it is known only to survive in cultivation, in captivity, or as a naturalized population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered (CR)

A taxon is **Critically Endangered** when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by *any of* the criteria (A to E) on page 20.

Endangered (EN)

A taxon is **Endangered** when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by *any of* the criteria (A to E) on pages 20-21.

Vulnerable (VU)

A taxon is **Vulnerable** when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by *any of* the criteria (A to E) on pages 21-22.

Conservation Dependent (CD)

Taxa that do not currently qualify as Critically Endangered, Endangered, or Vulnerable, may be classified as Conservation Dependent. To be considered **Conservation Dependent**, a taxon must be the focus of a continuing taxon-specific or habitat-specific conservation program which directly affects the taxon in question. The cessation of this conservation program would result in the taxon qualifying for one of the threatened categories above.

Low Risk (LR)

A taxon is **Low Risk** when it has been evaluated and does not qualify for any of the categories Critically Endangered, Endangered, Vulnerable, Conservation Dependent, or Data Deficient. It is clear that a range of forms will

be included in this category including: (i) those that are close to qualifying for the threatened categories (ii) those that are of less concern and (iii) those that are presently abundant and unlikely to face extinction in the foreseeable future. It may be appropriate to indicate into which of these three classes taxa in Low Risk seem to fall. It is especially recommended to indicate an appropriate interval, or circumstance, before re-evaluation is necessary for taxa in the Low Risk class, especially for those indicated in (i) above.

Data Deficient (DD)

A taxon is **Data Deficient** when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. DD is therefore not a category of threat or Low Risk. Listing of taxa in this category indicates that more information is required. Listing a taxon as DD acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, or if there are reasonable chances of unreported surveys in which the taxon has not been found, or that habitat loss has had an unfavorable impact, threatened status may well be justified.

Not Evaluated (NE)

A taxon is **Not Evaluated** when it is has not yet assessed against the criteria.

V. The Criteria for Critically Endangered, Endangered, and Vulnerable

Critically Endangered (CR)

A taxon is **Critically Endangered** when it is facing an extremely high risk of extinction in

the wild in the immediate future, as defined by *any of* the following criteria (A to E):

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred, or suspected severe decline of at least 80% during the last 10 years or 3 generations for which data are available, based on (and specifying) **any of** the following: (a) direct observation; (b) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (c) actual or potential levels of exploitation; (d) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors, or parasites.

2. A severe decline of at least the rate specified in A1 that is projected, observed, inferred, or suspected to be likely to occur in the near future, based on (and specifying) any of (b), (c), or (d) above.

B. Extent of occurrence estimated to be less than 100 km² or area of occupancy estimated to be less than 10 km², *and* estimates indicating *any two of* the following:

1. Severely fragmented *or* found only at a single location.

2. Continuing decline, observed, inferred, or projected, in *any of* the following: (a) extent of occurrence; (b) area of occupancy; (c) area, extent, and/or quality of habitat; (d) number of locations or subpopulations; (e) number of mature individuals.

3. Extreme fluctuations in *any of* the following: (a) extent of occurrence; (b) area of occupancy; (c) number of locations or subpopulations

C. Population estimated to number less than 250 mature individuals *and either:*

1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer *or*

2. A continuing decline, observed, projected, or inferred, in numbers of mature

individuals *and* population structure in the form of either (a) severely fragmented (i.e. no population estimated to contain more than 50 mature individuals); (b) all individuals are in a single subpopulation.

D. Population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 5 years or 2 generations, whichever is the longer.

Endangered (EN)

A taxon is **Endangered** when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by *any of* the following criteria (A to E):

A. Population reduction in the form of *either of* the following:

1. An observed, estimated, inferred, or suspected severe decline of at least 50% during the last 10 years or three generations for which data are available, based on (and specifying) *any of* the following: (a) direct observation; (b) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (c) actual or potential levels of exploitation; (d) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. A severe decline of at least the rate specified in A1 that is projected, observed, inferred, or suspected to be likely to occur in the near future, based on (and specifying) any of (b), (c), or (d) above.

B. Extent of occurrence estimated to be less than 5,000 km² *or* area of occupancy estimated to be less than 500 km², *and* estimates indicating *any two of* the following:

1. Severely fragmented *or* found only at no more than five locations.

2. Continuing decline, inferred, observed or projected, in *any of* the following: (a) extent of occurrence; (b) area of occu-

pancy; (c) area, extent and/or quality of habitat; (d) number of locations or subpopulations; (e) number of mature individuals .

3. Extreme fluctuations in *any of* the following: (a) extent of occurrence; (b) area of occupancy; (c) number of locations or subpopulations

C. Population estimated to number less than 2,500 mature individuals and *either:*

   1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer, *or*

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals *and* population structure in the form of *either* (a) severely fragmented (i.e. no population estimated to contain more than 250 mature individuals); (b) all individuals are in a single subpopulation.

D. Population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or 5 generations, whichever is the longer.

Vulnerable (VU)

A taxon is **Vulnerable** when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by *any of* the following criteria (A to E):

A. Population reduction in the form of *either of* the following:

   1. An observed, estimated, inferred, or suspected severe decline of at least 50% during the last 20 years or 5 generations for which data are available, based on (and specifying) *any of* the following: (a) direct observation; (b) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (c) actual or potential levels of exploitation; (d) the effects of introduced taxa, hybridiza-

tion, pathogens, pollutants, competitors, or parasites.

   2. A severe decline of at least the rate specified in A1 that is projected, observed, inferred, or suspected to be likely to occur in the near future, based on (and specifying) any of (b), (c), or (d) above.

B. Extent of occurrence estimated to be less than 20,000 km² or area of occupancy estimated to be less than 2,000 km², and estimates indicating *any two of* the following:

   1. Severely fragmented *or* found at no more than ten locations.

   2. Continuing decline, inferred, observed, or projected, in *any of* the following: (a) extent of occurrence; (b) area of occupancy; (c) area, extent, and/or quality of habitat; (d) number of locations or subpopulations; (e) number of mature individuals .

   3. Extreme fluctuations in *any of* the following: (a) extent of occurrence; (b) area of occupancy; (c) number of locations or subpopulations

C. Population estimated to number less than 10,000 mature individuals and *either:*

   1. An estimated continuing decline of at least 20% within 10 years or 3 generations, whichever is longer, *or*

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals *and* population structure in the form of *either* (a) severely fragmented (i.e. no population estimated to contain more than 1,000 mature individuals); (b) all individuals are in a single subpopulation.

D. Population very small or restricted in the form of *either of* the following:

   1. Population estimated to number less than 1000 mature individuals.

   2. Population is characterized by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the ef-

fects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and ... thus capable of becoming Critically Endangered or even Extinct in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

VI. Some Examples of the Application of the Criteria

During the process of developing the new draft Red List categories and criteria, it has become clear that it is very hard to understand how the proposed new system actually works without seeing some worked examples of particular species. To assist in understanding the process, eight species have been chosen as examples. Most of these species are not particularly well-known, thus demonstrating that the criteria do not require large amounts of quantitative data to be available before they can be applied.

Ceratotherium simum

The white rhinoceros *Ceratotherium simum* is the least threatened of the world's five species of rhinoceros. The northern subspecies is Critically Endangered and is restricted to Garamba National Park in Zaire, where only 33 animals survive. The southern subspecies is largely confined to South Africa, where it has been increasing for many years under strict protection, and now numbers more than 6,000 individuals.

Criterion A. The species does not qualify as Threatened, since it is not in decline, nor is there any sign of breakdown in the protection system in South Africa that would result in a high level of poaching.

Criterion B. The species does not qualify as Threatened, since its area of occupancy is greater than 2,000 km².

Criterion C. The species does not qualify as Threatened, since although it has a population of less than 10,000 mature individuals, it is not in decline.

Criterion D. The species does not qualify as Threatened, since its population is greater than 1,000 mature individuals.

Conservation Dependent. The species certainly qualifies, since the cessation of the conservation programme in South Africa would result in the species qualifying as Threatened very rapidly.

Conclusion. List as Conservation Dependent.

Columba mayeri

The pink pigeon *Columba mayeri* is endemic to Mauritius, where it has declined to a tiny population of around 20 birds. A newly reintroduced popuation at a different site might offer the only hope for the species in the wild. Since the species obviously satisfies criterion D for Critically Endangered, it is not essential to test it against the other criteria. However, a Population Viability Analysis has been carried out on this species, which indicates a probability of extinction in the wild of 50% in two generations, hence qualifying as Critically Endangered.

Conclusion. List as Critically Endangered under Criteria D and E.

Eos cyanogenia

The black-winged lory *Eos cyanogenia* is a parrot that is restricted to the small Indonesian islands of Biak, Manim, Meos Num, Numfor, and Supiori. The species has almost certainly declined as a result of loss of forest habitat, though it is still reported to be relatively common on forested areas of Biak. International trade has accelerated since 1987, giving cause for concern for this species, especially in view of its very restricted distribution.

Criterion A. Given the number of birds reported in international trade, and the small wild population, a postulated decline of 50% in

the last ten years, or a projected decline of 50% in the next ten years, is supportable. The species can therefore be listed as Endangered under criterion A.

Criterion B. The species is likely to have a distribution of less than 20,000 km², and is in decline, and since its distribution is severely fragmented, it satisfies this criterion at the Vulnerable level.

Criterion C. The species almost certainly satisfies this criterion at the Vulnerable level, since its population is believed to be less than 10,000 mature individuals, and its rate of decline is probably at least 20% during the last 10 years.

Conclusion. Since the species qualifies as Endangered under criterion A1c and Vulnerable under criteria B1 & B2e and C1, the former takes precedence, and it is listed as Endangered.

Eretmochelys imbricata

The hawksbill turtle *Eretmochelys imbricata* is a very widespread species, known to nest in at least 60 countries in the tropics and subtropics, but suspected to nest in more. Compared with some other marine turtle species, the total numbers appear to be quite small (a minimum of 15,000 - 25,000 females nest annually). It can be inferred that the relative rarity of the hawksbill is largely the result of prolonged over-exploitation for eggs and the international tortoiseshell trade.

Criterion A. Assuming the generation length to be 40 years, it is a supportable hypothesis that the species has declined by 50% over the last three generations (120 years), thus qualifying as Endangered.

Criterion B. The species does not qualify in view of its very wide distribution.

Criteria C and D. The species does not qualify, since more than 10,000 mature individuals survive.

Conclusion. List as Endangered under criterion A2c.

Dyscophus antongilii

This large frog is endemic to Madagascar, where it has a very small distribution in the east of the country, mainly between Maroantsetra and Andevoranto, and further south around Ambatovaky. The species favours swamps, shallow pools and water ditches, and although the status of the species is poorly known, it can be found in large concentrations. It is probably suffering from loss of habitat. The species appeared in the international pet trade prior to its listing on Appendix I in 1987.

Criteria A. It is unlikely that the decline in this species has amounted to, or will amount to, 50% in 20 years or five generations, and so does not qualify as Threatened under this criterion.

Criterion B. The area of distribution of this species is almost certainly less than 10,000 km². If it is assumed, probably correctly, that the species is in decline, and that its population is severely fragmented, then it would qualify as Vulnerable under criterion B.

Criteria C and D. Given that it can occur in large concentrations, the population of this species is probably greater than 10,000 mature individuals, and so the species does not qualify as Threatened under these criteria.

Conclusion. List as Vulnerable under criterion B1 & B2c.

Partula rosea

Partula rosea is a land snail that is endemic to the island of Huahine in French Polynesia. Its approximate range has been assessed by field biologists. Partulid snails have become extinct in recent years on all the surrounding islands following the introduction (either accidental or intentional) of the predatory snail *Euglandina rosea*. The last visit to the island by experts on *Partula* was in 1991, and no *Euglandina* were seen at that time. However, based on the colonisation of other islands in French

Polynesia, *Euglandina* is expected to invade during the next ten years.

Criterion A. Although currently stable, a decline of 50% over the next ten years is projected on the basis of the likely introduction of a predatory species, and the species thus qualifies as Endangered.

Criterion B. The species probably has an area of occupancy of less than 500 km², occurs at no more than five locations, and is facing a projected decline following the introduction of a predator, and thus qualifies as Endangered.

Criteria C and D. The species probably still has a large population, and so does not qualify under these criteria.

Conclusion. List as Endangered under criteria A2d and B1 & B2e.

Aztekium ritteri

Aztekium ritteri is one of the most unusual Mexican cacti, and is prized by cacti collectors. The population is estimated to number in the millions, but it is restricted to a single valley covering only 50 km². The species has probably declined somewhat, since it has been subject to heavy collecting for many years.

Criterion A. Although the species has probably declined, in view of its large population size, it seems unlikely that the collecting pressure has been sufficient to cause a decline of 50% over the last 20 years or five generations.

Criterion B. The species qualifies as Endangered under this criterion, in view of its area of occupancy of only 50 km², and the fact that it probably occurs in only one location, and is in decline.

Criteria C and D. The species does not qualify in view of its large population size.

Conclusion. List as Endangered under criterion B1 & B2e.

Paphiopedalum stonei

The species of slipper orchid is found in the limestone cliffs and hills of western Sarawak, Malaysia. It is in decline as a result of limestone quarrying and mining. It is also potentially at risk from international trade.

Criterion A. The species is believed to have declined in the past, or be likely to decline in the future, by at least 50% during 10 years or three generations, and as such qualifies as Endangered.

Criterion B. The species has an area of occupancy of less than 500 km², has a fragmented distribution, and is in decline, and so qualifies as Endangered.

Criteria C and D. The species probably has a population of more than 2,500 mature individuals, and so could not qualify as Endangered under these criteria. If its population is less than 10,000 mature individual, it would qualify and Vulnerable under criterion C.

Conclusion. List as Endangered under criteria A2b and B1 & B2e.

Georgina Mace
Simon Stuart

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ANY of the following criteria may be used to assign categories:	CRITICAL	ENDANGERED	VULNERABLE
Population reduction	≥ 80% decline in last 10 yrs based on:	≥ 50% decline in last 10 yrs or 2 generations	≥ 50% decline in last 20 yrs or 5 generations based on:
		a) direct observation OR b) decline in area of occupancy, occurrence and/or habitat quality OR c) actual or potential levels of exploitation OR d) introd. taxa, hybridization, pathogens, pollutants, competitors or parasites	
	OR	OR	OR
	≥ 80% decline/10yrs predicted in near future	≥ 50% decline/10 yrs or 2 generations predicted in near future	≥ 50% decline/20 yrs or 5 generations predicted in near future
Extent of occurrence	Est. <100 km² or area of occupancy est. <10 km², AND TWO of the following:	Est. <5,000 km² or area of occupancy est. <500 km², AND TWO of the following:	Est. <20,000 km² or area of occupancy est. <2,000 km², AND TWO of the following:
	Severely fragmented OR single location.	Severely fragmented OR ≤ 5 locations	Severely fragmented OR ≤ 10 locations
		Decline in ANY of the following: a) extent of occurrence b) area of occupancy c) area, extent, and/or quality of habitat d) # of locations or subpopulations e) # of mature individuals	
		Extreme fluctuations in ANY of the following: a) extent of occurrence b) area of occupancy c) # of locations or subpopulations	
Population estimates	Est. <250 mature indivs. AND:	Est. <2,500 mature indivs. AND:	Est. <10,000 mature indivs. AND:
	Decline ≥25% within 3 yrs or one generation, whichever is longer	Decline ≥15% within 5 yrs or 2 generations, whichever is longer	Decline ≥20% within 10 yrs or 3 generations, whichever is longer
	OR	OR	OR
	Decline in mature individuals AND population structure EITHER a) no pop. w/> 50 mature indivs. OR b) all indivs. in single subpop.	Decline in mature individuals AND population structure EITHER a) no pop. w/>250 mature indivs. OR b) all indivs. in single subpop.	Decline in mature individuals AND population structure EITHER a) no pop. w/>1,000 mature indivs. OR b) all indivs. in single subpop.
# of mature individuals	Est. < 50 mature individuals	Est. < 250 mature individuals	Est. < 1,000 mature individuals
Probability of extinction	≥ 50% within 5 yrs or 2 generations, whichever is longer	≥ 20% within 20 yrs or 5 generations, whichever is longer.	≥ 10% within 100 yrs

Anacardium occidentale Linn	Anacardiaceae
Anthocephalus indicus A. Rich	Rubiaceae
Aphanamixis polystachya (Wall.) Parker	Meliaceae
Areca Catechu Linn	Arecaceae
Azadirachta indica A. Juss	Meliaceae
Balanites roxburghii Planch	Simaroubaceae
Bombax ceiba L.	Bombacaceae
Borassus flabellifera L.	Arecaceae
Boswellia serrata Roxb. Ex	Burseraceae
Butea monosperma (Lam.) Taub	Fabaceae
Calophyllum inophylum Linn	Clusiaceae
Cassia fistula Linn	Caesalpiniaceae
Cinnamomum zeylanicum Bl.	Lauraceae
Cocos nucifera Linn	Arecaceae
Crataeva magna (Lour.) Dc	Capparidaceae
Dalbergia sisoo Roxb.	Fabaceae
Elaeocarpus tuberculatus Roxb.	Elaeocarpaceae
Emblica officinalis Gaertn	Euphorbiaceae
Erythrina stricta Roxb.	Fabaceae
Erythrina suberosa Roxb.	Fabaceae
Euphorbia antiquorum L.	Euphorbiaceae
Euphorbia nerifolia L.	Euphorbiaceae
Feronia elephantum Corr.	Rutaceae
Ficus bengalensis L.	Moraceae
Ficus racemosa L.	Moraceae
Ficus religiosa L.	Moraceae
Ficus retusa L.	Moraceae
Ficus isjahela Burm F.	Moraceae
Flacourtia indica (Burm) Herr	Flacourtiaceae
Garcinia gummigutta (L.) Rob	Cluciaceae
Gardenia resinifera Roth	Rubiaceae
Gmelina arborea Roxb	Erbenaceae
Holoptelea integrifolia (Roxb.)	Ulmaceae
Hydnocarpus wightiiana BL	Flacourtiaceae
Madhuca longifolia (Koen) Macbr	Sapotaceae
Mallotus phillipensis (Lam.) Mull - Arg	Euphorbiaceae
Mangifera indica L.	Anacardiaceae
Michelia champaca L.	Magnoliaceae
Mimusops elengi L.	Sapotaceae
Mitragyna parvifolia (Roxb.) Korth	Rubiaceae
Moringa oleifera Lam	Moringaceae
Myristica fragrans Houtt	Myristicaceae
Oroxylum indicum (L.) Benth ex. Kurtz.	Bignoniaceae
Pandanus tectorius Parkinson	Pandanaceae
Phoenix zeylanica	Arecaceae
Pongamia pinnata L.	Fabaceae
Premna serratifolia L.	Verbenaceae
Pterocarpus marsupium Roxb.	Fabaceae

Problem Statement

Medicinal plants embody a paradox : they have been in vogue for thousands of years. There is an incontrovertible reason for their unceasing popularity, however. They have never ceased being a potent, economic and safe remedy for human ailments.

Unfortunately, while medicinal plants continue to meet health care needs of the vast majority of the worlds' rural population, (WHO), there has been a severe loss not only of many species in terms of number but also of indigenous knowledge and cultures associated with their use. Over 95% of the raw materials needed by herbal pharmaceuticals and the cosmetic industry is destructively collected from the wild. There is also very little medicinal plants material in gene banks. Last but not least, much of the knowledge of how to use medicinal plants rests with traditional societies whose very existence is under threat because of rapid industrialisation.

Considering the vital resource they represent, there is an urgent need to conserve as well as ensure that medicinal plants are collected and used in a non-destructive way. One basic tool in conservation is an authentic priority list of threatened medicinal plants.

The Foundation for Revitalisation of Local Health Traditions, (FRLHT), which is spearheading a medicinal plants conservation movement in Southern India, has made some headway in this area. The Foundation's work is currently focused in Kerala, Karnataka and Tamil Nadu, extremely rich in plants species diversity. The issue of conservation in these three states, then, has to be addressed in a comprehensive way. The resource base of the traditional system of Indian medicine must be strengthened and the use of medicinal plants in Primary Health Care - particularly among rural people - should be encouraged by providing easier access to and availability of these plants. Yet this can only be done by ensuring that conservation *in situ* is done in a systematic way.

A step has been taken in this direction with FRLHT drawing up a first priority list of 265 wild medicinal plants of Southern India based on listing in the Red Data Book of Indian Plants, endemic status, assessment of consumption by pharmaceutical industries and other reports.

A methodology to further refine FRLHT's list using an independent group of researchers, field managers, etc. is required. If found satisfactory it can be used on other species and categories of plants. The IUCN category of threatened plants according to various degrees of threat is time-consuming : data has to be recorded for at least 8 to 10 years. Given the immediate need for conservation of medicinal plants in Southern India, it is crucial to find a more efficient method.

What is need is a quicker but reliable and objective method of creating a workable list of threatened medicinal flora of the region, based on FRLHT's existing list, which would effectively aid *in situ* and *ex situ* conservation of these species.

A conservation assessment methodology is urgently required so that action plans and management plans can be created more rationally.

ROLE OF FRLHT

The Foundation for Revitalisation of Local Health Traditions (FRLHT) Bangalore is currently engaged in medicinal plants conservation in Kerala, Karnataka and Tamil Nadu. These states form the southern part of peninsular India. A geographical and forest area statement is given below.

State	Geo. Area	Forest Area	Forest Cover
KARNATAKA	191791	38646	32199
KERALA	38863	11222	10292
TAMIL NADU	130058	22699	17713
Total	360712	72567	60204

From the biodiversity richness viewpoint, the southern peninsular India is one of the best.The southern western ghats (gone below 12°N latitude) have been designated as one of the 18 global biodiversity "Hotspots"by the IUCN.

The issue of conservation of medicinal plant diversity in these three states is to be addressed in a comprehensive way so that not only is the resource base of traditional systems of Indian medicine strengthened, but also use of medicinal plants in Public Health Care, PHC, particularly amongst rural people are encouraged by facilitating easier access to and availability of these plants and their use in local health traditions.

In short, the FRLHT project seeks to address the interlinked aspects of Biological as well as Cultural diversity related to the age old practices of traditional systems of medicine.

Conservation of medicinal plant diversity in the three states is an enormous task and therefore prioritisation becomes necessary. However, one of the basic tools to guide the prioritisation is the ready availability of a reliable and authentic list of medicinal plants of the region under different categories of threat particulaly as assigned by the IUCN.

The present IUCN method of categorising various degrees of threat to plants is time taking under which data needs to be recorded for atleast 8 to 10 years. Given the time frame for the project and the immediacy of conservation of medicinal plants in the region, it is not practicable to adopt this line of action. Therefore, what is needed is a rapid yet reliable and objective method to come up with a workable list of threatened medical flora of the region. This would presently suffice for any prioritised action in in situ and ex situ conservation of these species.

1.1 : EFFORTS MADE BY FRLHT SO FAR

In order to have a working list of threatened medicinal plants to direct conservation activity, the FRLHT has drawn up a first list of threatened medicinal plants of the region based on the following criteria.
1. Record of the species in the RDB on the Indian Plants published by the Botanical Survey of India,(BSI).
2. Given due weightage to endemic species of the region particularly those reportedly rare.
3. Species in high industrial demand though not reported to be rare, and
4. Species recorded as rare by various authorities in the field.

This list thus compiles 239 species of medicinal plants covering the three states. Work on further refinement and updation of this list is currently underway at FRLHT.

1.2 : NEED FOR ALTERNATIVE STRATEGY :

While, the fore-mentioned methodology has produced the first list of threatened medicinal plants for the three states, it does seem apparent that further refinement has limited scope. There is thus a need for an independent methodology using,the knowledge of Botanists, Foresters, Tribals and knowledgeable local people like medicinemen etc. as well as other experts familiar with the vegetation and flora of their areas,in a more decentralised way.

In this context FRLHT in consultation with Zoo Outreach Organisation, Coimbatore decided to hold a joint meeting of selected people to understand, consider and decide upon the role which the recently

developed methodology of (CAMP) and PHVA could be found similar and used for the generation of a list of threatened medicinal plant species of southern India. Accordingly, on 18th October, 1994 a pre-CAMP meeting was held at FRLHT, Bangalore. Issues concerning adaptation of the CAMP process for application to plants, data recording parameters and format modifications were considered. It was decided at this meeting to hold a full scale CAMP for 30 to 40 species of medicinal plants of southern India and to invite Dr. U.S. Seal, Chairman of CBSG, SSC of the IUCN to facilitate such a workshop.

The present workshop is an outcome of the first pre-CAMP meeting and is significant in that it is the firt ever CAMP being held for medicinal plants in the world and the first for plants in India. Fortunately Dr.U.S. Seal was here to technically support and facilitate the workshop held between 23rd and 25th February, 1995 at Bangalore.

1.3 : FLORISTIC DIVERSITY; ENDEMISM :

Over 15,000 species of higher plants have been recorded so far in India (total of over 45,000). Of these more than 5,000 species are reported from Southern India. According to a list of medicinal plants used in Indian Systems of Medicine (ISMS), currently being finalised by FRLHT, over 1500 species have been listed and their botanical names identified so far. Of these more than 800 species are known to occur in S.India. Further, according to an on-going study of the Ministry of Environment and Forests, GOI, entitled ALL INDIA CO-ORDINATED RESEARCH PROJECT OF ETHNOBIOLOGY, 7500 species have been recorded to have medicinal value. Of these, FRLHT has shortlisted over 1200 which are found in S.India.

This very rich diversity of plants used for medicine becomes apparent when compared to the fact that only about 30 species of plants are used in the modern allopathic system.

The conservation value of this enormous florisic diversity is further enhanced by the fact that about 100 species have been listed as endemic flowering plants for peninsular India. This represents 32% of the entire flora of the country and 14% of the flowering plants (Nayar 1977). 1193 flowering species are endemic to Southern India, constituting about 57% of the endemic flowering plants of the region.

1.4 : THREATS TO MEDICINAL PLANTS :

Nintey five percentage of medicinal plant raw material for herbal pharmaceutical industry and for export are collected from the wild. This collection, depending on part of the plant used, is generally destructive.

Medicinal plants are highly used with 80 to 90% of rural population in developing countries depending on them for their PHC needs. This coupled with urban and developed economies interest in herbs as medicines, food products and cosmetics, is greatly increasing demand and consequently destructive collection of medicinal plants. In India cultivation has been standardised for only 40 sps. by CIMAPS, Lucknow. In actual practice, however, very few species are grown on any large scale.

As a threat to medicinal plants particularly in the wild, general factors like habitat loss, population pressue, habitat fragmentation etc. also apply. That many medicinal plants are under severe threat, can be gauged from the fact that a growing number of species are being substituted in herbal preparations. FRLHT has listed 40 species which are presently being substituted.

We know that many medicinal plants are threatened and more getting threatened every year. What we do not know is the degree of threat (category) species-wise. The RED DATA BOOK OF INDIAN PLANTS (BSI 1987)I lists only 15 Southern Indian medicinal plants of which 4 are listed as ENDANGERED, 1 POSSIBLY EXTINCT; 4 as RARE, 1 as VULNERABLE; 2 as INDETERMINATE & 3 as INSUFFICIENTLY KNOWN, (IUCN RED DATA LISTIGN VERSION 2.0). The WCMC (CAMBRIDGE) DATABASE lists 41 Indian Medicinal plant species as threatened (pers. comm.)

1.5 : EXPECTED OUTCOME:

The CAMP workshop would generate a categorised list of threatened medicinal plants of Southern India, for the species considered. This list would be more reliable, authentic andconceived after arriving at consensus. Further refinements are possible with more knowledge and experience. Thus, a first threatened species list for medicinal plants would become available to prioritise and direct conservation activities with respect to these species.

FRLHT's PRIORITY LIST OF MEDICINAL PLANTS OF SOUTHERN INDIA

* = I LIST OF MEDICINAL PLANTS WHICH ARE REPORTEDLY RARE
** = II LIST OF MEDICINAL PLANTS ENDEMIC TO SOUTH INDIA BUT NOTE REPORTED AS "RARE"
*** = LIST OF MEDICINAL PLANTS BEING CONSUMED BY THE INDIGENOUS PHARMACEUTICAL INDUSTRY BUT NOT REPORTED "RARE"

(Based on published literature and comments)

HERBS

*

Asparagus rottleri Bak.	Liliaceae
Cleome burmanni Wight & Arn.	Capparidaceae
Kaempferia galanga Linn	Zingiberaceae
Trichopus zeylanicus Gaertn.	Dioscoriaceae
Achyranthes aspera var. rubro-fusca Hook.f.	Amaranthaceae
Lamprachaenium microcephalum Benth	Microcephalum

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Abutilon hirtum G. Don	Malvaceae
Abutilon indicum (Linn) Sw	Malvaceae
Acorus calamus L.	Araceae
Aerva lanata (L) Juss. ex Schultles	Amaranthaceae
Alpinia galanga Sw	Zingiberaceae
Alternathera sessils (L) R. Br. ex DC	Amaranthaceae
Amaranthus spinosus L.	Amaranthaceae
Ammania multiflora Roxb.	Lythraceae
Amorphophalus companulatus (Roxb.) Bl ex Decaisne	Araceae
Andrographis paniculata (Burm.f) Wall ex Nees	Acanthaceae
Anisomeles malabarica (L.) R.br.Ex Sims	Lamiaceae
Artemisia absinthium L.	Asteraceae
Asparagus racemosus Wild.	Liliaceae
Bacopa monnieri (L.) Pennel	Scrophulariaceae
Biophytum reinwardtii Edgw & HK. f.	Oxalidaceae
Biophytum sensitivum (L.) DC	Oxalidaceae
Boerhaavia diffusa L.	Nyctaginaceae
Calotropis gigantea (Linn) R. Br.	Asclepiadaceae
Cassia tora Linn	Caesalpiniaceae
Centella asiatica (Linn) urban	Apiaceae
Cissus quadrangularis Linn	Vitaceae
Citrullus colocynthis (L) Schrader	Cucurbitaceae
Cleome viscosa L	Cappariadaceae
Costus speciosus (Koen)sm	Costaceae

Curculigo orchioides Gaertner	Hypoxidaceae
Cyperus esculentus L.	Cyperaceae
Cyperus rotundus L.	Cyperaceae
Datura metel L.	Solanaceae
Desmodium triflorum (L.) DC	Fabaceae
Eclipta alba (L.) Hassk	Asteraceae
Elletaria cardamomum (L.) Manton	Zingiberaceae
Emilia sonchifolia (L.) Dc	Asteraceae
Euphorbia thymifolia L.	Euphorbiaceae
Evolvulus alsinoides (L.) L	Convolvulaceae
Fumaria indica (Haussk) Pugsley	Fumariaceae
Gloriosa superba L.	Liliaceae
Hedychium coronarium Koenig	Zingiberaceae
Heliotropium indicum L.	Botaginaceae
Ipomea nil (L.) Roth	Convolvulaceae
Ipomea obscura (L.) Ker-gawl	Convolvulaceae
Marsilea quadrifolia L.	Marsiliaceae
Merremia tridentata (L.) Hall.f.	Convolvulaceae
Mimosa pudica L.	Mimosaceae
Monochoria vaginalis (Burm) Presl	Pontederiaceae
Nelumbo nucifera Gaertn	Nelumbonaceae
Nigella sativa L.	Nigellaceae
Ocimum basilicum L.	Lamiaceae
Oldenlandia corymbosa L.	Rubiaceae
Oxalis corniculta L.	Oxalidaceae
Pedalium murex L.	Pedaliaceae
Phaseolus trilobus	Fabaceae
Phyllanthus amarus Schum & Thonn.	Euphorbiaceae .
Phyllanthus madraspatensis L.	Euphorbiaceae
Plumbago zeylanica L.	Plumbaginaceae
Polygonum glabrum Willd	Polygonaceae
Portulaca oleracea L.	Portulacaceae
Psoralea corylifolia L.	Fabaceae
Saccharum spontaneum L.	Poaceae
Sarcostemma acidum (Roxb) Voigt	Asclepiadaceae
Schizachyrum exile Stapf	Poaceae •
Sida acuta Burm. F.	Malvaceae
Sida cordifolia L.	Malvaceae
Solanum nigrum L.	Solanaceae
Solanum xanthocarpum Schrad & Wendl	Solanaceae
Sphaeranthus indicus L.	Asteraceae
Swertia corymbosa (Griseb) Wt. ex Clarke	Gentianaceae
Swertia lawii Bark	Gentianaceae
Tribulus terrestris L.	Zygophyllaceae

SHRUBS

*

Adhatoda beddomei C.B. Clarke	Acanthaceae
Aerva wightii Hook. f	Amaranthaceae
Elaeagnus conferta Roxb.	Elaeagnaceae
Glycosmis macrocarpa Wight.	Rutaceae
Piper barberi Gamble	Piperaceae
Piper longum L.	Piperaceae
Plectranthus vettiveroides (Jacob) Singh & Sharma	Lamiaceae
Rauvolfia serpentina (L.)Benth Ex Kurz	Apocynaceae
Utleria salicifolia Beddome	Asclepiadaceae
Woodfodia fruticosa (L.) Kurz	Lythraceae

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Nilgirianthus ciliatus (Nees)	Acanthaceae

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Adhatoda zeylanica Medic	Acanthaceae
Aloe barbadensis Mill	Liliaceae
Artemisia nilagirica (Cl.) Pamp	Asteraceae
Artemisia vulgaris L.	Asteraceae
Baliospermum montanum (Willd.) Muell - Arg.	Euphorbiaceae
Bambusa arundinacea (Retz.) (Roxb)	Bambusaceae
Bauhinia racemosa Lam	Caesalpiniaceae
Bauhinia tomentosa L.	Caesalpiniaceae
Breynia retusa (demst) Alston	Euphorbiaceae
Breynia vitis idaea (Burn.f.) Fischer	Euphorbiaceae
Caesalpinia bonduc (L.) Roxb.	Caesalpiniaceae
Calicopteris floribunda Lamk	Combretaceae
Cassia senna Vahl	Caesalpiniaceae
Cassia auriculata Linn	Caesalpiniaceae
Citrus medica Linn	Rutaceae
Clerodendrum serratum (Linn) Moon	Verbenaceae
Coccinia grandis (L) Voigt	Euphorbiaceae
Dendropthae falecata (L.f.) Eh	Loranthaceae
Desmodium biarticulatum (L.) F.V. Muell	Fabaceae
Desmodium gangeticum (L.) DC	Fabaceae
Helicteris isora L.	Sterculiaceae
Indigofera tinctoria L.	Fabaceae
Ixora coccinea L.	Rubiaceae
Jatropha curcas L.	Euphorbiaceae
Leptadenia reticulata (Retz) Wight & Arn	Ascelepiadaceae
Murraya koenighii (L) Spr.	Rutaceae
Mussaenda frondosa L.	Rubiaceae
Nerium indicum Miller	Apocynaceae
Ocimum sanctum L.	Lamiaceae
Phyllanthus reticulatus Poir	Euphorbiaceae

Phyllanthus reticulatus Poir	Euphorbiaceae
Phyllanthus rheedi W.	Euphorbiaceae
Phyllanthus urinaria L.	Euphorbiaceae
Piper nigrum L.	Piperaceae
Plumbago rosea L.	Plumbaginaceae
Rotula aquatica Lour	Boraginaceae
Salacia reticulata Wt	Hipocrataceae
Solanum indicum L.	Solanaceae
Solanum melongena Var *insanum* L.	Solanaceae
Tephrosia hirta (Buch-ham) Gamble	Fabaceae
Tephrosia purpurea (L.) Pers	Fabaceae
Toddalia asiatica (L.) Lam	Rutaceae
Trachyspermum ammi	Apiaceae
Trichosanthes cucumerina L.	Cucurbitaceae
Tylophora indica (Burm F.) Merr	Asclepiadaceae
Vernonia anthelmintica (L.) Willd	Asteraceae
Vitex negundo L.	Verbenaceae
Withania somnifera (L.) Diunal	Solanaceae
Zizyphus oenoplea (L.) Mill	Rhamnaceae
Zizyphus xylopyrus (Retz) Willd	Rhamnaceae

CLIMBER

**Aristolochia bracteolata* Lam.	Aristolochiaceae
Ampelocissus araneosa Planch	Vitaceae
Aristolochia tagala Cham.	Aristolochiaceae
Coscinium fenestratum (Gaertn) Coleb	Menispermaceae
Cyclea fissicalyx Dunn	Menispermaceae
Operculina turpethum (L.) Silva Manso	Convolvulaceae

**

Tragia bicolor Miq.	Euphorbiaceae

***

Abrus precatorius L.	Fabaceae
Adenia hondala (Gaertner) de Wilde	Passifloraceae
Aristolochia indica L.	Aristolochiaceae
Basella alba Linn	Basellaceae
Cardiospermum halicacabum Linn	Sapindaceae
Cayratia pedata Juss	Vitaceae
Clitoria ternatea Linn	Fabaceae
Crytolepsis buchanani Roem & Schult	Periplocaceae
Cyclea peltata Hk. f. & Th	Menispermaceae
Dioscorea bulbifera L.	Dioscoriaceae
Dioscorea tomentosa Heyne	Dioscoriaceae
Gymnema sylvestre (Retz) Schulles	Asclepiadaceae
Hemidesmus indicus (L.) R. Br.	Asclepiadaceae

Ipomea paniculata R. Br	Convolvulaceae
Jasminum grandiflorum L.	Oleaceae
Luffa spp.	Cucurbitaceae
Mucuna pruriens (L.) Dc	Fabaceae
Rubia cordifolia L.	Rubiaceae
Scindapsus officinalis Schott	Araceae
Tinospora cordifolia Miers	Menispermaceae
Tinospora sinensis (Lour) Merr	Menispermaceae
Tragia involucrata	Euphorbiaceae
Uncaria gambier	Rubiaceae
Ventilago madraspatna Gaertn	Rhamnaceae

TREE

*

Buchnania lanzan Sprengel	Anacardiaceae
Commiphora wightii (Arn.) Bhandari	Burseraceae
Cycas circinalis L.	Cycadaceae
Gardenia gummifera L.	Rubiaceae
Hydnocarpus macrocarpa(Bedd.) Warb.	Flacourtiaceae
Kingiodendron pinnatum (Roxb. ex Dc.)Harms.	Caesalpiniaceae
Madhuca diplostemon	Sapotaceae
Madhuca insignis (Radlk) Lam	Sapotaceae
Myristica malabarica Lam	Myristicaceae
Ochreinauclea missionis (Wallich.ex G. Don)	Rubiaceae
Pterocarpus santalinus L.f.	Fabaceae
Saraca asoca (Roxb.) Willd	Caesalpiniaceae
Syzygium travancoricum Gamble	Myrtaceae
Vateria indica L.	Dipterocarpaceae

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Cinnamomum macrocarpum Hook. f.	Lauraceae
Cinnamomum wightii Meissn	Lauraceae
Elaeocarpus serratus L.	Elacocarpaceae
Erythrina variegata L.	Fabaceae
Garcinia indica Choisy	Cluciaceae
Mesua ferrea L.	Clusiaceae

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Acacia nilotica (L) Willd. ex Del	Mimosaceae
Acacia catechu (Roxb) Willd	Mimosaceae
Aegle marmelos (L.) Corr.	Rutaceae
Alangium salvifolium (L.F.) Wang	Alangiaceae
Albizzia lebbek (L.) Willd	Mimosaceae
Albizzia odoratissima (L.F.) Benth	Mimosaceae
Alstonia scholaris (L.) R.Br.	Apocyanaceae
Anacardium occidentale Linn	Anacardiaceae

Sapindus trifoliatus auct	Sapindaceae
Schrebera swietenioides Roxb	Oleaceae
Semecarpus anacardium L.f.	Anacardiaceae
Shorea robusta Garren	Dipterocarpaceae
Spondias pinnata (L.F.) Kurz	Anacardiaceae
Sterculia foetida L.	Sterculiaceae
Sterculia pinnata	Sterculiaceae
Stereospermum suaveolens C.	Bignoniaceae
Streblus asper Lour	Moraceae
Strychnos potatorum L.f.	Strychnaceae
Symplocos racemosa Roxb.	Symplocaceae
Symplocos cochinchinensis (Lour) Moore	Symplocaceae
Syzygium caryophyllaem (L.) Alston	Myrtaceae
Syzygium cumini (L.) Skees	Myrtaceae
Tamarindus indica L.	Caesalpiniaceae
Tectona grandis L.f.	Verbenaceae
Terminalia arjuna (Roxb. ex. Dc)	Combretaceae
Terminalia belerica (Gaertn) Roxb	Combretaceae
Terminalia chebula Retz.	Combretaceae
Thespesia populnea (L.) Soland	Malvaceae
Zizyphus mauritiana Lam	Rhamnaceae

LIANA

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Embelia ribes Burm. f	Myrsinaceae
Holostemma ada-kodien Shultes	

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Chonemorpha fragrans (Moon) Alston	Apocynaceae
Decalepsis hamiltonii Wt. & Arn	Asclepiadaceae
Dioscorea glabra L.	Dioscoriaceae
Dioscorea oppositifolia L.	Dioscoriaceae
Embelia tsjeriam-cottam (R & S) Dc	Myrsinaceae
Holarrhena antidysentrica (Roth) A. Dc	Apocynaceae
Ichnocarpus frutescens (L.) R.Br	Apocynaceae
Raphidophora pertusa	Araceae

GRASS
***

Cynodon dactylon (L.) Pers	Poaceae

FERN
***

Drypteris filixmas	Pterdiophyte

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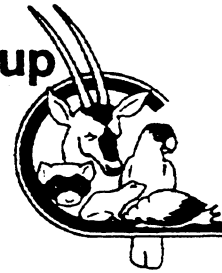Lucknow 226 016
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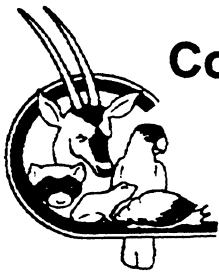
Conservation Breeding Specialist Group
Species Survival Commission, IUCN

The Conservation Breeding Specilist Group is a global network of individuals with expertise in species recovery planning, small population biology, reproductive and behavioural biology, captive animal management, and other disciplines. Part of the Species Survival Commission (SSC) of the IUCN - The World Conservation Union, the Conservation Breeding Specialist Group advises the IUCN, SSC, and other SSC Specialist Groups on the intensive management of small populations in the wild and the uses of captive propagation for conservation, in accordance with the IUCN Policy Statement for Breeding.

As we approach the 21st century, the mission of the Conservation Breeding Specialist Group becomes increasingly urgent: *"to conserve and establish viable populations of threatened species through captive propagation programs and through intensive protection and management of small and fragmented populations in the wild".*

CBSG acts as catalyst and coordinator for intensive management of threatened small populations with more than 600 members from more than 70 countries. CBSG catalyzes coordination of conservation programs worldwide, working closely with institutions committed to species conservation via captive breeding as well as governmental and non-governmental organizations concerned with species and habitat conservation in the wild. CBSG serves as a neutral stimulator and mediator in intensive species conservation management efforts providing information and technical asistance for a wide variety of programs. Because it does not represent any particular constituency, CBSG provides scientific objectivity to conservation conundrums over which individuals from different agencies may agonise, each unable to surrender their interests for political or hierarchical reasons.

Conservation Assessment and Management Plans (CAMPs)

CAMPs allow evaluation of all species and subspecies in a broad group (such as primates, cats, invertebrates on an island) to determine global priorities for intensive conservation, based primarily on status and distribution in the wild. Intensive conservation action includes: intensive research and management in the wild, collaborative research between captive and field communities, captive breeding and Population and Habitat Viability Assessment. An important outgrowth of the CAMP process is a Global Captive Action Recommendations (GCAR), which recommends strategic priorities for captive program development and resource allocation.

Since 1991, Conservation Assessment and Management Plans have been prepared for more than 20 taxonomic groups and regions including: Anatidae, Deer, Pheasants, Antelope, Felidae, Pigeons & Doves, Primates, Caprinae, Hornbills, Small Carnivores, Cranes, Parrots, (plants, invertebrates, small animals of St.Helena Island)

Population and Habitat Viability Assessment (PHVA)

PHVA is a process for assessing the extinction risk for a species and for developing management recommendations to enhance long-term survival. PHVA workshops are conducted in the range area of the species in collaboration with the wildlife agencies responsible. Also included in the PHVA process is an evaluation of the status of the species in captivity, plans for reintroduction, and problems requiring collaborative research.

More than 70 formal PHVA workshops have been carried out since 1990. Among the species for which PHVAs have been conducted since 1991, five of them have been in India: Manipur Brow-antlered deer, Asiatic lion, Lion-tailed macaque, Indian rhino, Indian gharial.

Those in other parts of the world include Hawaiian crow, Kirtland's warbler, Crested honeycreeper, Lear's macaw, Aruba island rattlesnake, Mississippi sandhill crane, Asian wild horse, Mountain zebra, Chinese river dolphin, Orangutan, Bali mynah, Florida panther, Jamaican iguana, Sandplain gerardia, Javan rhino,

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Spix's macaw, Kaka & Kea, Sumatran tiger, Karner blue butterfly, Whooping crane, and others.

Recommendations from Conservation Assessment and Management Plans, Global Captive Plans and Population and Habitat Viability Assessments, provide guidance to regional zoo associations, botanical research institutions and wildlife management authorities for implementation within their programs.

Conservation Linking Programs

Linkage between captive breeding programs, wildlife recovery planning, and restoration of threatened species in wild habitats is an ambition of zoo conservation programs. CBSG programs (CAMP, PHVA, GCAP, and GASP Workshops) are designed to facilitate cross-disciplinary linkages between professionals in zoos, wildlife agencies, and academic communities. These workshops, which have been conducted in 22 countries, are collaborative ventures which establish strategic objectives, identify specific conservation research needs, and develop practical *in situ* and captive management plans for individual species.

With the goals of prevention of extinction and recovery in the wild, training, using materials in the regional language as well as english, is provided for local participants in small population assessment and management, record keeping systems, and the concepts of regional and local collection planning for conservation. Implementation of programs may include, assistance with national or regional zoo collection planning for endangered endemic and regionally endangered species, development of a genome resource bank, establishment of a captive propagation program, support of a research program, providing special training, or assisting a reintroduction program.

History of the Conservation Breeding Specialist Group, SSC, IUCN & CBSG, India

The Conservation Breeding Specialist Group was formerly called the Captive Breeding Specialist Group until 1994, when a name change was approved by their Steering Committee, SSC and IUCN.

CBSG began in1979 as the "Zoo Liaison Committee" and had several Chairmen before Dr. U. S. Seal was appointed in 1981. CBSG then began taking a more active role in assisting zoological collections to become more meaningful in terms of a contribution to conservation of species. Dr. Seal developed a systematic breeding programme for Siberian tiger, taking into consideration the genetic and demographic characters which would insure its long-term survival in captivity and its viability as a support to *in situ* populations. Dr. Seal developed a comprehensive, computerised record system for zoos which is now internationally accepted and used by hundreds of zoos. CBSG also initiated a review of zoo Studbooks.

In 1985, CBSG became involved with the development of the recovery program for the critically endangered black-footed ferret. This effort laid the foundation for the Population Viability Assessment program, incorporating the use of a computer simulation modelling tool which later became VORTEX. Central to the development and subsequent effective recovery of the black-footed ferret were experts on breeding viverrids and mustelids who were included as advisors to develop the captive breeding program, on which the success of the recovery subsequently hinged. CBSG published a book on the black-footed ferret effort, which won a Wildlife Society Award one year later.

Over the years, wildlife managers, non-governmental organizations, governments, and the private sector became more integrally involved in CBSG's activities in addition to the captive breeding community. CBSG's network became widespread and highly effective, providing an interdisciplinary vehicle for communication and collaboration between individuals from each of the sectors mentioned above.

One of CBSG's primary strengths is that it has brought a scientific approach to defining problems and determining management strategies for conservation activities, both in captivity and in the wild. Dr.

Robert Lacy's development of the VORTEX program is a user-friendly small population biology tool which was immediately integrated into CBSG's workshops, further expanding the Population and Habitat Viability Assessment (PHVA) program. Previously PVA (Population Viability Analysis) were conducted by one man and a computer in his office. Today PHVAs are cooperative, collaborative affairs which combine field and captive data and expertise from a variety of people. PHVAs continue to provide a unique forum in which wild-life managers, academics, and captive breeding experts can work together in species management and recovery planning.

In 1991, CBSG's first satellite, CBSG India, also evolved. The formation of CBSG, India was inspired by a discussion with participants of the Wildlife Institute of India Zoo Management Course, who were interested in becoming members of CBSG. CBSG, SSC is not capable of supporting a very large membership because each member is also a member of IUCN which cannot bear the administrative burden. It was thought that a Regional Branch of CBSG could be started to involve people locally, permit an identity with the international group and spread the information farther and deeper. Dr. U. S. Seal, Chairman of CBSG, SSC, readily gave his consent for CBSG, India to form and to develop its own identity and logo. CBSG, India attracted more than 400 members in its first few months with over 95% of them from the forest, wildlife, university and zoo community.

By 1992, CAMP workshops had been conducted and PHVAs completed for 50 species. In that year CBSG held a "Strategic Futures" Workshop in which it was decided that the Programmes and Processes developed by Dr. Seal and other members of CBSG should be taught to more people so that it would not be necessary to have Dr. Seal or a member of the CBSG Staff to conduct a PHVA when required. CBSG then began a process of planning a Facilitator's Course and training people to facilitate PHVA's and CAMPs completely in-country.
CBSG, India till this date has conducted five PHVA's -- 1992 for Manipur Brow-antlered deer; 1993 for Lion-tailed macaque, Asiatic lion, Indian rhino and 1995 for Gharial.

Indian PHVAs have been unique from the start in the following ways:
1. Briefing material and Reports all emanate from India instead of the CBSG office. This is to insure that input into the exercise from start to finish is primarily from Indians.
2. Additional copies of Briefing material has been made and circulated widely to zoos, universities, Zoological Survey of India and others who need this compiled material.
3. Two Indian PHVA Briefing books have been of two and three volumes, including one volume of origi-nal material contributed specifically for the PHVA and another of technical material for veterinary workshops conducted in connection with the PHVA Workshop.
4. Educational material is developed for Indian PHVAs and circulated to zoos and NGO's which are involved in educating the public.

This CAMP for Medicinal Plants is unique in several ways,
1.   it is the first time a full CAMP has been conducted in India
2.   it is the first time a CAMP has been conducted for a medicinal plants group
3.   it is the first time a CAMP has been conducted only for plants

All PHVA and CAMP Briefing Books and the PHVA or CAMP Final Reports compiled by CBSG, India, facilitators and workshop collaborators are considered as official CBSG, SSC, IUCN publication.

CBSG, India is grateful to Dr. U. S. Seal, Chairman and to the members of the Steering Committee of CBSG, SSC, IUCN for their encouragement and permission to develop CBSG, India indigenously and independ-ently. CBSG, India is the only CBSG Satellite to date, although others are in process of coming up in In-donesia, Mexico, and China.