

# ZOOS' PRINT

*News of Networks working for Metapopulation Management of Rare Fauna and Flora  
-- in India and Elsewhere -- Published by Zoo Outreach Organisation / C.B.S.G., India*

Biodiversity Conservation Prioritisation Project (BCPP) India

Endangered Species Project

Conservation Assessment and Management Plan  
(C.A.M.P.) Workshops

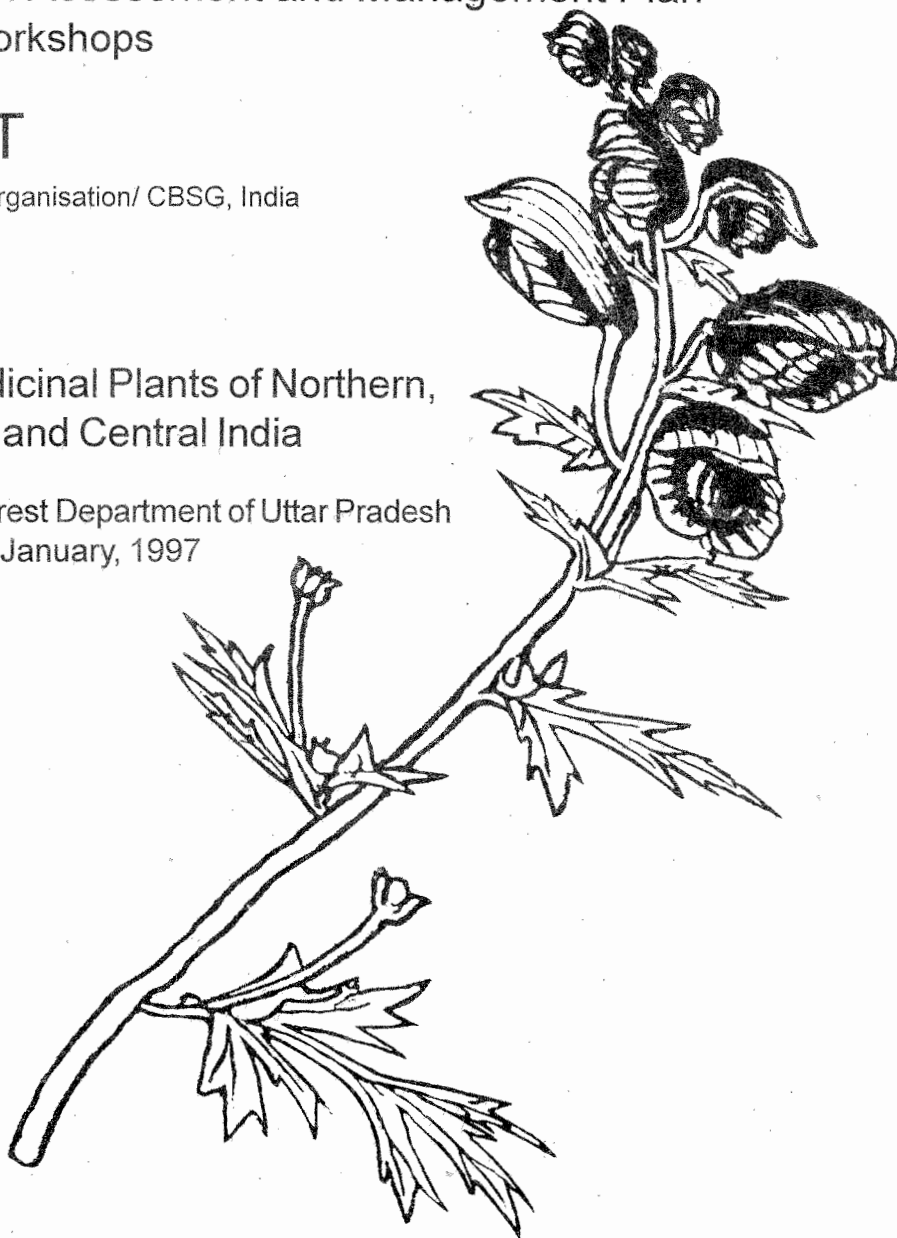
## REPORT

by Zoo Outreach Organisation/ CBSG, India

1998

Selected Medicinal Plants of Northern,  
Northeastern and Central India

Hosted by the Forest Department of Uttar Pradesh  
Lucknow 21 - 25 January, 1997



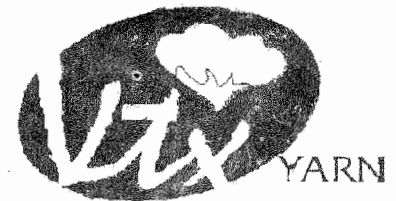
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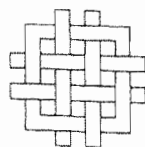


Authored by the participants

Edited by Sanjay Molur and Sally Walker

Selected Medicinal Plants of Northern,  
Northeastern and Central India

Hosted by the Forest Department of Uttar Pradesh  
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# ZOOS' PRINT

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**Biodiversity Conservation Prioritisation Project, India — Endangered Species Project  
Conservation Assessment and Management Plan (C.A.M.P.) Workshops**

**Selected Medicinal Plants of Northern, Northeastern and Central India  
Hosted by Forest Department of Uttar Pradesh, Lucknow 21-25 January, 1998**

**Introduction**

All of 1997 Zoo Outreach Organisation / CBSG, India was involved in a big project to organise conservation assessment workshops for prioritising as much of the biodiversity of India as possible for biodiversity conservation. This Project, formidable in itself, was just a small piece of a larger project called the Biodiversity Conservation Prioritisation Project, coordinated by World Wide Fund for Nature, India. The other components of the Project included prioritisation of sites and development of strategies for biodiversity conservation.

India was selected by the Biodiversity Support Programme to undertake this project for the country with a mind to establish a model for other countries to follow. So far the tasks associated with the Convention on Biodiversity have stumped many nations - there is no easy way for such a large task. The B.S.P. is a consortium of organisations which provide funding for implementing the Biodiversity Convention. The organisations which funded the BCPP were U.S.A.I.D., the Nature Conservancy, and the World Resources Organisation. The World Wide Fund for Nature, India coordinated the activities and organised three workshops of conservation players to plan, check and finally report on the project.

For our component of the Project (Endangered Species Prioritization), as well as two other projects -- Threatened medicinal plants and Wild relatives of domestic animals and plants, the Salim Ali Institute of Ornithology and Natural History was the coordinator, led by Dr. Ajith Kumar, Scientist.

ZOO / CBSG, India developed a project to prioritise species using the IUCN Red List Criteria. The groups of organisms covered included Selected Medicinal Plants of Northern, Northeastern and Central India, Selected Soil Invertebrates of Southern India, Indian Amphibians, Indian Reptiles, Indian Mangroves and selected associated Algae, Fish and Invertebrates, Indian Mammals and Indian Freshwater Fishes. All of these workshops could be completed successfully only with a great deal of cooperation and support from many organisations, not only those directly involved in the workshop as host but also those which sent their scientists for five days of work, collaborators, and those helping from a distance. All of them deserve an individual thanks; this is a collective thanks at this time however.

The BCPP CAMPs as well as earlier ones organised by the Foundation for Revitalisation of Local Health Traditions, Bangalore created much interest in the process of Conservation Assessment and Management Plans. Many other requests for CAMPs have been received and are waiting final organisation action or funding. They are Non-timber Forest Products of Madhya Pradesh, Strand Vegetation of Indian Coasts, Orchids of the Western Ghats, Endemic Trees of Northeast India, Large bodied Spiders of India, Corals of India, Marine Algae, Dragonflies, and Butterflies of NE India. These subjects are more subtle than BCPP CAMPs which were a first pass over the basic biological units of the country.

Knowing that the BCPP project would be of interest and importance to the Indian conservation community, both zoo and field, Zoo Outreach Organisation used the pages of ZOOS' PRINT to report on the workshop news from time to time, including checklists, status reports; etc. We will continue to do this with upcoming workshops.

Now, since we are unable to produce Reports for everyone inexpensively we are again relying on ZOOS' PRINT to convey the essence of the Reports, as they are all of importance to us in conservation. The next few issues of ZOOS' PRINT will contain as much of the 7 Reports as we can fit into about 40 pages, leaving a few pages for other news and articles. We will be holding many articles for Special Subject Issues later in the year or early next year. For some of the workshops, all of the material can fit in 40 pages of ZOOS' PRINT. This issue, for example, contains all of the Medicinal Plants Report. The Invertebrate Report also will probably fit in one issue. For most of the other workshops which took up as many as 500 species, only about one fourth of the material can be covered. We will be providing Reports on disk for Indians only as well as hard copy. The policy for distribution of this information outside of India has not been decided as yet.

Please continue to send articles. We will interrupt the flow of CAMP Reports from time to time with a regular issue, and will surely use your article either in the small space left from Report issues, in a regular issue, or in a later, perhaps a Special Issue.

ZOO / CBSG, India made many new friends doing the BCPP CAMP Workshops. We salute them, as well as old friends, and welcome them to the group of networks that form Zoo Outreach Organisation.

# **Biodiversity Conservation Prioritisation Project (BCPP) India Conservation Assessment and Management Plan (C.A.M.P.) Workshop for Selected Medicinal Plants of Northern, Northeastern and Central India**

## **Sponsors**

This project has been sponsored as a part of the Biodiversity Conservation Prioritisation Project (BCPP) of the World Wide Fund for Nature - India. The BCPP is funded by the Biodiversity Support Program - (BSP). The BSP is a USAID - funded consortium of the World Wildlife Fund, The Nature Conservancy and the World Resources Institute.

## **Host**

Forest Department of Uttar Pradesh

## **Coordinators / Facilitators**

World Wide Fund for Nature, India, Coordinator  
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Conservation Breeding Specialist Group, India, Organiser / Facilitators

## **Collaborating Institutions**

National Botanical Research Institute  
Central Institute of Medicinal and Aromatic Plants  
Foundation for Revitalisation of Local Health Traditions  
..... Many others listed with Author's of the Report

## **Special Thanks**

A special thanks to the Conservation Breeding/Specialist Group, SSC, IUCN which developed the C.A.M.P. process and provided advice, training, other technical support from time to time throughout the BCPP CAMP Workshops. Appreciation is also due to the Species Survival Commission of the World Conservation Union for developing the IUCN Red List Criteria, a sophisticated yet flexible system, Providing a means of assessing the conservation status of all manner of plant and animal groups for their conservation status.

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## EXECUTIVE SUMMARY

### Introduction

The Biodiversity Conservation Prioritisation Project, India undertook a prioritisation exercise for species, sites and strategies for conservation. The Endangered Species Subgroup selected the Conservation Assessment and Management Plan Workshop Process and the IUCN Red List Criteria (Revised, 1994) for assessing conservation status of species.

A Conservation Assessment and Management Plan (C.A.M.P.) Workshop was conducted for selected medicinal plants of northern, northeastern and central India to assess their status in the wild. The Workshop took place from 21<sup>st</sup> to 25<sup>th</sup> January 1997 in Lucknow at the Kukrail Crocodile Centre and was hosted by the Uttar Pradesh Forest Department. Other local collaborators in Lucknow were the National Botanical Research Institute, Central Institute for Medicinal and Aromatic Plants and Central Drug Research Institute. The Workshop was attended by 45 participants from 25 institutes with expertise ranging from field biology to forest management.

Seventy-five taxa of medicinal plants were assessed, thirty-seven taxa from northern India, eighteen taxa from northeastern India, eighteen taxa from Central India and two taxa with their distribution in both northern and northeastern India. The selection of the plants for assessment was left to the discretion of the participants on the basis of their expertise, following a discussion and consensus of the workshop of what would define a medicinal plant and what were the regions to be assessed.

The expertise available at the workshop included reputed field biologists with years of field study in various areas as well as those currently conducting studies. One participant had previous experience of compiling 3 volumes of Red Data Books for plants in India in 1987 to 1990 with the then current IUCN categories. Participants worked in four working groups for five days and assessed 75 taxa. Information for every taxa was entered on "Taxon Data Sheets" in which details of the taxon distribution, population numbers, habitat structure, threats affecting the taxa, population decline and the quality of data provided for the taxa are given here. This information was used to assess the status of the taxon and assign a category of threat according to the IUCN Red List categories. Taxon specific recommendations were also made after categorisation for use in conservation action planning.

### Results

Thirty-three medicinal plants of the 75 taxa considered during the workshop were assessed as Critically Endangered, 17 as Endangered, 16 as Vulnerable, 7 as Lower Risk near threatened and 2 as Data Deficient. The high percentage of medicinal plants facing threat as given in this result may not reflect the actual situation for all medicinal plant taxa in India because these 75 represent better studied plants which may have been selected for assessment due to concern for conservation in the first instant. There are more than 7000 plants said to be medicinal in India. The sample assessment does, however, give

a warning of swing towards threatened status that medicinal plants are facing in the wild in India. Threats to medicinal plants are similar to the threats that most fauna and flora face today — loss of habitat, fragmentation, and interference all due to human needs that result in shrinking wild habitats. For medicinal plants additional threats from exploitation are a disadvantage. Domestic and export needs of India's growing pharmaceutical industries and a liberalised economy have resulted in large-scale extraction of plants from the wild for medicine preparations. According to the Workshop, eighty-nine percent of the taxa assessed here are under threat from being exploited from the wild and due to trade. Of the 67 taxa being traded, 89% are threatened; i.e. they are either Critically Endangered, Endangered or Vulnerable. The Ministry of Environment and Forests, Government of India recently assigned a number of plants to a Negative List of Exports, more than 50% of which were assessed by the Lucknow workshop.

The factors that are used in a categorisation of threat on taxon status are 1. Population reduction; 2. Restricted distribution; 3. Population size; 4. Number of mature individuals and 5 Probability of extinction. The degree of threat depending on each or any of these five criteria determines the threat category. Of the threatened medicinal plants, 90 % of those assessed at the workshop are threatened due to population reduction in the wild because of several factors including trade. Thirty percent are affected also due to highly restricted distribution in the wild while only two taxa are threatened due to very few numbers of individuals left in the wild.

Recommendations for future conservation action were proposed for every taxon. Of the threatened taxa 47 were recommended for intensive survey, 73 for monitoring, 2 for taxonomic studies, 1 for genetic studies, 38 for husbandry research, 68 for habitat management, 35 for life history studies, 33 for limiting factor research and 62 for further taxon specific assessments through Population and Habitat Viability Assessment Workshops. Cultivation was recognised as the most important recommendation in terms of a taxon survival plan and for sustainable utilisation.

### CAMP methodology

The Conservation Assessment and Management Plan process is a methodology for rapid assessment of taxa in the wild. This methodology is a rational and objective method of assigning threat categories and deriving recommendations for conservation action plans through participatory group inputs from many stakeholders. A CAMP process is a platform for a congregation of 10 to 40 experts from related fields such as field biologists, ecologists, habitat experts, wildlife managers, forest officials, captive managers, university researchers, academicians, non-governmental organisations, policy makers and other relevant stakeholders. The CAMP Workshop is organised and conducted by objective facilitators who do not have a professional or personal stake in the outcome of the assessments.

Table 1. Alphabetical list of medicinal plant taxa (with families) assessed at the BCPP CAMP, Lucknow

No.	Taxon	Family	Category*	Criteria**
1.	<i>Aconitum balfourii</i> Stapf	Ranunculaceae	CR	(A1acd; B1, 2abc)
2.	<i>Aconitum deinorrhizum</i> Stapf	Ranunculaceae	CR	(A1acd; B1, 2abc)
3.	<i>Aconitum falconeri</i> Stapf	Ranunculaceae	CR	(B1, 2abc)
4.	<i>Aconitum ferox</i> Wall. Ex Ser.	Ranunculaceae	CR	(A1acd; B1, 2abc)
5.	<i>Aconitum heterophyllum</i> Wall. ex Royle	Ranunculaceae	CR	(B1, 2abcde)
6.	<i>Aconitum violaceum</i> Jacq. ex Stapf	Ranunculaceae	CR	(A1acd; B1, 2abc)
7.	<i>Acorus calamus</i> L.	Araceae	VU	(B1, 2bc)
8.	<i>Angelica glauca</i> Edgew.	Apiaceae	CR	(A1acd)
9.	<i>Aquilaria malaccensis</i> Lam.	Thymelaeaceae	CR	(A1acd)
10.	<i>Arnebia benthamii</i> (Wall. ex G.Don) Johnston	Boraginaceae	CR	(A1acd)
11.	<i>Atropa acuminata</i> Royle ex Lindl.	Solanaceae	CR	(A1acd)
12.	<i>Baliospermum montanum</i> Muell.-Arg.	Euphorbiaceae	LR nt	
13.	<i>Berberis aristata</i> DC.	Berberidaceae	EN	(A1acd)
14.	<i>Berberis chitria</i> Lindl.	Berberidaceae	EN	(B1, 2c)
15.	<i>Berberis kashmirana</i> Ahrendt.	Berberidaceae	CR	(A1acd; B1, 2abc)
16.	<i>Berberis lycium</i> Royle var. <i>simplensis</i> Ahrendt.	Berberidaceae	EN	(B1, 2c)
17.	<i>Berberis petiolaris</i> Wall. ex G.Don var. <i>garhwalana</i> Ahrendt.	Berberidaceae	CR	(A1acd; B1, 2abc)
18.	<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	VU	(A1acd; B1, 2c)
19.	<i>Bunium persicum</i> Boiss Fedtsch.	Apiaceae	EN	(A1acd)
20.	<i>Butea monosperma</i> var. <i>lutea</i> (Witt.) Maheswari	Papilionaceae	DD	
21.	<i>Celastrus paniculata</i> Willd.	Celastraceae	LR nt	
22.	<i>Cinnamomum tamala</i> (Ham.) Nees & Eberm.	Lauraceae	LR nt	
23.	<i>Clerodendrum colebrookianum</i>	Verbenaceae	VU	(A1acd)
24.	<i>Clerodendrum serratum</i> (L.) Moon	Verbenaceae	VU	(A1c)
25.	<i>Coptis teeta</i> Wall.	Ranunculaceae	CR	(A1acd)
26.	<i>Cordia rothii</i> Roem & Schultz	Ehretiaceae	LR nt	
27.	<i>Costus lacerus</i>	Zingiberaceae	DD	
28.	<i>Craterostigma plantagineum</i> Hochst.	Scrophulariaceae	CR	(B1, 2c)
29.	<i>Curculigo orchoides</i> Gaertn.	Amaryllidaceae	VU	(A1acd)
30.	<i>Curcuma angustifolia</i> Roxb.	Zingiberaceae	LR nt	
31.	<i>Curcuma caesia</i> Roxb.	Zingiberaceae	CR	(A1acd)
32.	<i>Dactylorhiza hatagirea</i> D.Don	Orchidaceae	CR	(A1acd)
33.	<i>Delphinium denudatum</i> Wall. ex Hook.f. & Thoms.	Ranunculaceae	CR	(A1c; B1, 2c)
34.	<i>Dioscorea deltoidea</i> Wall. ex Kunth.	Dioscoreaceae	CR	(A1acd)
35.	<i>Drymia indica</i> (Roxb.) Jessop.	Liliaceae	VU	(A1acd)
36.	<i>Evolvulus alsinoides</i> L.	Convolvulaceae	LR nt	
37.	<i>Fritellaria roylei</i> Hook.	Ariaceae	CR	(A1acd)
38.	<i>Gastrochilus longiflora</i>	Zingiberaceae	CR	(B1, 2c)
39.	<i>Gentiana kurroo</i> Royle	Gentianaceae	CR	(A1acd)
40.	<i>Gloriosa superba</i> L.	Liliaceae	EN	(A1acd; B1, 2c)
41.	<i>Gymnema sylvestre</i> (Retz) R. Br.	Asclepiadaceae	VU	(A1acd; B1, 2c)
42.	<i>Hedychium coronarium</i> Koering	Zingiberaceae	EN	(B1, 2c)
43.	<i>Hedychium spicatum</i> Ham. ex Sm.	Zingiberaceae	VU	(A1acd)
44.	<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	EN	(A1acd)
45.	<i>Hydnocarpus kurzii</i>	Flacourtiaceae	EN	(A1cd)
46.	<i>Ilex khasiana</i>	Aquifoliaceae	CR	(B1, 2c; C2b; D)
47.	<i>Inula racemosa</i> Hook.f.	Asteraceae	CR	(A1acd)
48.	<i>Jurinea dolomiaea</i> Boiss.	Asteraceae	LR nt	
49.	<i>Lavatera cashmeriana</i> Cambess	Malvaceae	EN	(B1, 2c)
50.	<i>Luvunga scandens</i>	Rutaceae	CR	(B1, 2c; C2b; D)
51.	<i>Meconopsis aculeata</i>	Papavaraceae	CR	(A1acd; B1, 2c)
52.	<i>Nardostachys jatamansi</i> DC.	Valerianaceae	CR	(A1acd)
53.	<i>Nepenthes khasiana</i>	Nepenthaceae	CR	(B1, 2c)
54.	<i>Operculina turpethum</i> (L.) Silva Manso	Convolvulaceae	VU	(A1acd)
55.	<i>Paeonia emodi</i> Wall. Ex Royle	Paeoniaceae	VU	(A1acd; B1, 2c)
56.	<i>Panax pseudoginseng</i>	Araliaceae	CR	(B1, 2c)
57.	<i>Picrorhiza kurrooa</i> Royle ex Benth.	Scrophulariaceae	EN	(A1acd)
58.	<i>Podophyllum hexandrum</i> Royle	Podophyllaceae	CR	(A1acd)
59.	<i>Polygonatum verticillatum</i> (L.) All.	Liliaceae	EN	(A1acd)

No.	Taxon	Fami <sup>1</sup>	Category <sup>2</sup>	Criteria <sup>3*</sup>
60.	<i>Prezowskia tangutica</i>	Solanaceae	CR	(B1, 2c)
61.	<i>Rauvolfia serpentina</i> Benth. ex Kurz.	Apocyanaceae	EN	(A1acd)
62.	<i>Rheum australe</i> D.Don	Polygonaceae	VU	(A1acd)
63.	<i>Rheum nobile</i>	Polygonaceae	EN	(A1cd; B1, 2c)
64.	<i>Rhododendron anthopogon</i>	Ericaceae	VU	(A1ac)
65.	<i>Rhus semialata</i>	Anacardiaceae	VU	(A1cd)
66.	<i>Saussurea costus</i> (Falc.) Lipsch.	Asteraceae	CR	(B1, 2ce)
67.	<i>Saussurea gossypiphora</i> D.Don	Asteraceae	CR	(B1, 2c)
68.	<i>Saussurea obvallata</i> (DC.) Edgew.	Asteraceae	EN	(A1ac)
69.	<i>Saussurea simpsoniana</i> (Field & Gard.) Lipsch.	Asteraceae	EN	(A1acd; B1, 2c)
70.	<i>Swertia angustifolia</i> Buch.-Ham. ex D.Don var. <i>angustifolia</i>	Gentianaceae	En	(B1, 2c)
71.	<i>Swertia chirayita</i> (Roxb. ex Flem.)	Gentianaceae	CR	(A1cd)
72.	<i>Taxus wallichiana</i> Zeuc.	Taxaceae	CR	(A1cd)
73.	<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	VU	(A1acd)
74.	<i>Tylophora indica</i> (Burm.f.) Merriell	Asclepiadaceae	VU	(A1acd)
75.	<i>Valeriana jatamansi</i>	Valerianaceae	CR	(A1acd)

The assessment is also followed by research and conservation recommendations for every taxon. CAMPs provide a rational and comprehensive means of assessing priorities for intensive management within the context of the broader conservation needs of threatened taxa.

The Conservation Breeding Specialist Group developed the CAMP process methodology first for identifying priorities in captive management planning for the global zoo community,

which needed to know the *in situ* conservation status of species in their care. The methodology, however, has proved so effective for assessing status in the wild that it has been recognised by IUCN SSC Specialist Groups, governmental and non-governmental agencies, conservation action planners and policy makers all over the world. The CAMP methodology is emerging as an effective means of conducting biodiversity inventory, identification and monitoring, thus satisfying Agenda Item 7 in the Conservation on Biological Diversity.

## Wildlife Ecology and Conservation, a new journal from Taiwan

A new interdisciplinary bilingual (English/ Chinese) wildlife journal has been created under the auspices of the Department of Wildlife Conservation, National Pingtung University of Science and Technology (Taiwan, ROC). The main objectives of Wildlife Ecology and Conservation are to increase communication among English and Chinese speaking wildlife professionals globally and to promote the development of wildlife conservation in general. Wildlife Ecology and Conservation will be published yearly and the first issue is expected to be out during June 1998. Submissions may be based on original research, review, new techniques and policy aspects of wildlife biology, wildlife ecology, wildlife management and human dimension on wildlife conservation. Each issue will cover referred articles, case studies, subject reviews, short communications, announcements, letters, opinions and comments. Manuscripts will be peer-reviewed by two or more referees and the following scientists are in the editorial board: D.L. McCullough (USA), C. Sun(USA), R.D. Taber (USA), P.F. Scanlon (USA), P. Muller (Germany), C.M. Harrison (England), H. Kawanabe (Japan), H. Ota (Japan), K. Pei (Taiwan), Y.T. Day (Taiwan), and G. Agoramoorthy (Taiwan). Manuscripts must be in English or Chinese and kept within 15 pages. Authors will receive 50 reprints free of cost.

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Summary Data Table for selected taxa of medicinal plants of northern, northeastern and central India

Species and Family	Habit	Range	Area	No. of loc./F	% decl.	Year/gen.	Pop. no.	Data quality	Threat	IUCN cat.	Crit use	Research recom.	Cult. rec.	Lev diff
<i>Aconitum balfourii</i> Ranunculaceae	Herb	B	A	Many; F	80	10 yr.	Unk	2, 4	Hm, Lf, I, Ov, T	CR-N	PR, RD	S, M, Lr, Hm, Lh, P	1, 2, 3	3
<i>Aconitum deorrhizum</i> Ranunculaceae	Herb	A	A	Few; F	80	10 yr.	Unk	2, 4, 5	L, Lf, T, Ov, Hm	CR	PR, RD	S, M, H, T, P, Lr, Lh, Hm	1, 3, 4	3
<i>Aconitum falconeri</i> Ranunculaceae	Herb	A	A	< 6; F	60	10 yr.	Unk	2, 4, 5	Hm, Lf, I, T	CR	RD	M, Lr, Hm, H, P	1, 3, 4	3
<i>Aconitum ferox</i> Ranunculaceae	Herb	A	A	Few; F	80	10 yr.	Unk	2, 4	Lf, Ov, Hm, T	CR-R	PR, RD	T, S, M, P, Hm, Lr, H	1, 3, 4	3
<i>Aconitum heterophyllum</i> Ranunculaceae	Herb	C	A	~ 30; F	60	40 yr.	Unk	2, 5	L, Ov, I, Hm, T	CR-N	RD	S, M, Hm, Lr, H, P	1, 2, 3, 4	3
<i>Aconitum violaceum</i> Ranunculaceae	Herb	B	A	Few; F	80	10 yr.	Unk	2, 4	Hm, Lf, I, Ov, T	CR-N	PR, RD	S, M, Hm, Lr, H, P	1, 3, 4	3
<i>Acorus calamus</i> Araceae	Herb	C	C	> 10; F	10	20 yr.	Unk	1, 3	L, Hm, T	VU-R	RD	M, Hm	1, 4	1
<i>Angelica glauca</i> Apiaceae	Herb	D	D	Many; F	90	10 yr.	Unk	2	Hm, Ov, T	CR-R	PR	S, M, Lh, H, P	1, 3, 4	Unk
<i>Aquilaria malaccensis</i> Thymelaeaceae	Tree	D	C	Unk	80	3 gen.	Unk	2, 4	L, Hm, I, H, Ht, T	CR-N	PR	M, Hm, P	1, 4	1
<i>Arnebia benthamii</i> Boraginaceae	Herb	D	D	Unk	> 80	10 yr.	Unk	2, 3	Ov, H, Hm, T	CR-N	PR	S, M, Hm, Lr, H, P	1, 3, 4	3
<i>Aitopa acuminata</i> Solanaceae	Herb	C	C	Unk	> 80	10 yr.	Unk	2	Ov, L, H, T	CR-N	PR	S, M, Hm, Lr, Lh, P	1, 4	2
<i>Baliospermum montanum</i> Euphorbiaceae	Herb	D	D	Unk	50	30 yr.	Unk	2, 3	Ov, L, Hm, T	LRnt -R	--	S, M, Lh, H, PP	1, 3, 4	Unk
<i>Berberis aristata</i> Berberidaceae	Shrub	D	D	Many; F	50	10 yr.	Unk	2, 4, 5	Hm, Lf, I, T	EN-R	PR	M, Hm, Lr	1, 4	1
<i>Berberis chitria</i> Berberidaceae	Shrub	D	B	Few; F	40	10 yr.	Unk	2, 4, 5	Hm, Ov, I	EN-N	RD	M, Hm, Lh, H, P	1, 3, 4	Unk
<i>Berberis kashmirana</i> Berberidaceae	Shrub	A	A	Few; F	80	10 yr.	Unk	4, 5	Lf, Ov, Hm, T	CR	PR, RD	S, M, Hm, P	1, 4	1
<i>Berberis lycium</i> var. <i>simlensis</i> Berberidaceae	Shrub	B	B	Few; F	70	3 gen.	Unk	2, 4, 5	Lf, Ov, Hm, T	EN	RD	S, M, Hm, P	1, 4	1
<i>Berberis petiolaris</i> var. <i>garhwatalana</i> Berberidaceae	Shrub	A	A	1	80	10 yr.	Unk	2, 4, 5	Hm, Lf, I, Ov, T	CR	PR, RD	S, M, Hm, P	1, 4	1
<i>Bergenia ciliata</i> Saxifragaceae	Herb	D	C	Many; F	40	10 yr.	Unk	2, 4	Hm, I, Ov, T	VU-N	PR, RD	M, Hm, H	1, 3, 4	2
<i>Bunium persicum</i> Apiaceae	Herb	C	C	Many; F	> 50	< 10 yr.	Unk	2, 5	Ov, Hf, Tp	EN-N	PR	S, M, Hm, Lh, Lr, H	1, 3, 4	3
<i>Butea monosperma</i> var. <i>lutea</i> Papilionaceae	Tree	C	B	~ 20; F	Unk	Unk	Unk	2	Unk	DD-R	--	S, M, Lh, Lr	1, 3	2
<i>Celastrus paniculata</i> Celastraceae	Liana	D	B	Unk	50	40 yr.	Unk	3	Ov, L, Hm, Tp	LRnt -R	--	S, M, Hm, Lh, H, PP	1, 3	Unk
<i>Cinnamomum tamala</i> Lauraceae	Tree	D	D	Many; F	> 20	20 yr.	Unk	2, 5	L, Ov, T	LRnt -R	--	M, Hm, Lh, H, P	1, 3	Unk
<i>Clerodendrum serratum</i> Verbenaceae	Shrub	D	D	Unk	50	20 yr.	Unk	3	L, Ov, Hm, T	VU-R	PR	M, Hm, Lr, PP	1	2
<i>Coptis teeta</i> Ranunculaceae	Herb	B	A	~ 10; F	80	10 yr.	Unk	2	Ov, L, T	CR	PR	M, Hm, O, P	1, 4	1

Species and Family	Habit	Range	Area	No. of loc./F	% decl.	Year/gen.	Pop. no.	Data quality	Threat	IUCN cat.	Crit use.	Research recom.	Cult. rec.	Lev diff
<i>Cordia rosthii</i> Ehretiaceae	Tree	D	D	Unk	30	30 yr.	Unk	3, 4	L, Ht, T	LRnt-R	--	S, M, Hm, Lr	1, 3	2
<i>Costus lacernus</i> Zingiberaceae	Shrub	Unk	Unk	Unk	Unk	Unk	Unk	4	Unk	DD-N	--	S, Lh, PP	P	Unk
<i>Craterostigma planagineum</i> Scrophulariaceae	Herb	A	A	1	80	30 yr.	Unk	2, 3	L, Hm, Tr, T	CR-R	RD	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Curculigo orchioides</i> Amaryllidaceae	Herb	D	D	Many; F	> 60	20 yr.	Unk	2, 3	L, Ov, T	VU-R	PR	M, Hm, Lh, H, P	1, 3	Unk
<i>Curcuma angustifolia</i> Zingiberaceae	Herb	C	B	Many	< 20	10 yr.	Unk	2, 3	Ov, L, Lf, I, T	LRnt-R	--	M, Hm, PP	2, 4	1
<i>Curcuma caesia</i> Zingiberaceae	Herb	D	A	~ 5	90	10 yr.	Unk	3	Hm, Ov, Tp	CR-R	PR	S, M, Hm, PP	1, 4	1
<i>Dactyloctenium aegyptium</i> Asteraceae	Herb	D	D	Many; F	> 80	10 yr.	Unk	2	Ov, Hm, T	CR-R	PR	S, M, Hm, Lr, H, P	1, 3	2
<i>Delphinium denudatum</i> Ranunculaceae	Herb	B	A	Few; F	> 80	10 yr.	Unk	2	L	CR-N	PR, RD	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Dioscorea deltoidea</i> Dioscoreaceae	Herb	D	D	Many; F	> 80	10 yr.	Unk	2, 5	L, Ov, Hm, T	CR-N	PR	S, Hm, M, Lr, P	1	2
<i>Drymia indica</i> Liliaceae	Shrub	B	B	~ 100	60	20 yr.	Unk	2	Ov, L, Hm, T	VU-R	PR	S, M, Lh, Hm, H, P	1, 3	Unk
<i>Evolvulus alsinoides</i> Convolvulaceae	Herb	D	D	Many	< 10	30 yr.	Unk	2, 3	L, Ov, Hm, T	LRnt-R	--	M, Hm, H, Lh	3	Unk
<i>Fritillaria roylei</i> Ariaceae	Herb	D	D	Unk	> 80	10 yr.	Unk	2	L, Ov, Hm, T	CR-N	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Gastrochilus longiflora</i> Zingiberaceae	Herb	B	A	2; F	20	20 yr.	Unk	2, 3	L, Hm, T	CR-N	RD	S, M, Lr, Hm, P, O	1, 3	3
<i>Gentiana kurroo</i> Gentianaceae	Herb	D	D	Many; F	> 80	10 yr.	Unk	2, 5	L, Ov, Hm, T	CR-N	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Glottosa superba</i> Liliaceae	Herb	C	B	Many; F	50	10 yr.	Unk	2, 3, 4	Ov, L, I, Hm, Tp	EN-R	PR, RD	S, M, Hm, Lh, Lr, P	2	2
<i>Gymnema sylvestris</i> Asclepiadaceae	Climb-er	D	B	Many; F	25	10 yr.	Unk	2, 3	L, Hm, I, Tp	VU-R	PR, RD	S, M, Hm	1, 4	1
<i>Hedychium coronarium</i> Zingiberaceae	Herb	B	B	2	> 80	50 yr.	Unk	3	Ov, Hm, T	EN-R	RD	M, Hm, P	2, 4	1
<i>Hedychium spicatum</i> Zingiberaceae	Herb	D	D	Many; F	> 20	10 yr.	Unk	2, 5	Ov, L, T	VU-N	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Heracleum candicans</i> Apiaceae	Herb	D	D	Many; F	> 50	10 yr.	Unk	2	Ov, Hm, T	EN-R	PR	M, Hm, Lr, P	4	2
<i>Hydnocarpus kurzii</i> Flacourtiaceae	Tree	B	B	< 20	50	10 yr.	Unk	2, 4	L, Hm, T	EN-N	PR	M, Hm, Lh, H, P, O	1, 3	Unk
<i>Ilex khasiana</i> Aquifoliaceae	Tree	A	A	1	> 30	3 gen.	3-4	2	L	CR	RD, PE	M, Lh, Lr, H, P	1, 3	Unk
<i>Imula racemosa</i> Asteraceae	Herb	D	D	Unk	> 80	10 yr.	Unk	2	L, H, T	CR-N	PR	S, M, Hm, Lh, H, P	1, 3, 4	Unk
<i>Jurinea dolomiaca</i> Asteraceae	Herb	D	D	Unk	> 50	50 yr.	Unk	2, 3	L, Tr, T	LRnt-N	--	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Lavatera cashmeriana</i> Malvaceae	Herb	B	B	Few; F	> 80	30 yr.	Unk	2	H, Ov, T	EN	RD	S, M, Lh, H, Hm, P	1, 3	Unk
<i>Lavanga scandens</i> Rutaceae	Shrub	A	A	1	90	40 yr.	3-4	2	L, I	CR-N	RD, PE	S, Hm, M, Lh, H, P	1, 3	Unk

Species and Family	Habit	Range	Area	No. of loc./ F	% decl.	Year/ gen.	Pop. no.	Data quality	Threat	IUCN cat.	Crit use	Research recom.	Cult. rec.	Lev diff
<i>Mecopis aculeata</i> Papaveraceae	Herb	C	A	Few; F	80	10 yr.	Unk	2	L, Ov, Hm, T	CR-R	PR, RD	S, M, Hm, Lr, P	1, 4	3
<i>Nardostachys jatamansi</i> Valerianaceae	Herb	D	D	Unk	> 80	10 yr.	Unk	2, 5	L, Ov, Hm, T	CR-R	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Nepenthes khasiana</i> Nepenthaceae	Herb	B	A	6; F	50	40 yr.	Unk	1	H, L, T	CR	RD	S, M, Hm, Lr, P	1, 2, 4	3
<i>Operculina turpethum</i> Convolvulaceae	Herb	D	D	Many	40	10 yr.	Unk	2, 3	Hm, L, I, T	VU-R	PR	S, M, Hm	3, 4	1
<i>Paeonia emodi</i> Paeoniaceae	Herb	D	C	Many; F	20	10 yr.	Unk	2, 4	Hm, Lf, Ov, T	VU-N	PR, RD	S, M, Hm, Lr, P	4	2
<i>Panax pseudoginseng</i> Araliaceae	Herb	C	A	Few; F	50	10 yr.	Unk	2, 3	Hm, L, T	CR-N	RD	S, M, Hm, Lr, H, P	1, 3	3
<i>Picrohiza kurrooa</i> Scrophulariaceae	Herb	D	D	Many	> 50	10 yr.	Unk	2, 4	L, Ov, Hm, Tr, T	EN-N	PR	M, Hm, Lr, P	1, 3, 4	1
<i>Podophyllum hexandrum</i> Podophyllaceae	Herb	D	D	Many; F	> 80	10 yr.	Unk	2, 4	I, Ov, L, Hm, Lf, T	CR-N	PR	S, M, Hm, Lr, P	1, 4	3
<i>Polygonatum verticillatum</i> Liliaceae	Herb	D	D	Unk	> 50	10 yr.	Unk	2	Ov, L, Hm, T	EN-R	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Prezalskia tangutica</i> Solanaceae	Herb	A	A	1	Unk	Unk	Unk	2	Tr	CR-N	RD	S, M, Hm, Lh, H, PP	1, 3	Unk
<i>Rauwolfia serpentina</i> Apocynaceae	Herb	B	B	~100; F	> 50	10 yr.	Unk	2	L, Ov, TpE, Hm, I	EN-R	PR	S, M, H, Lr, P, O	4	3
<i>Rheum australe</i> Polygonaceae	Herb	D	D	Many; F	> 20	10 yr.	Unk	2, 5	L, Ov, Hm, T	VU-R	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Rheum noble</i> Polygonaceae	Herb	B	B	Few; F	60	10 yr.	Unk	2	L, Hm, T	EN-N	PR, RD	M, Hm, Lh, H, P	1, 3	Unk
<i>Rhododendron anthopogon</i> Rhododendraceae	Shrub	D	B	Unk	30	3 gen.	Unk	2	L, I	VU-N	PR	M, Hm, Lr, P	3	3
<i>Rhus semialata</i> Anacardiaceae	Tree	B	B	Unk	30	10 yr.	Unk	2	L, Hm, T	VU-N	PR	M, Hm	4	1
<i>Saussurea costus</i> Asteraceae	Herb	B	A	20; F	70	10 yr.	Unk	2, 4	Hm, L, Ov, T	CR-N	RD	Hm, M, G, Lr, P	1, 4	2
<i>Saussurea gossypiphora</i> Asteraceae	Herb	B	B	Few; F	30	10 yr.	Unk	2, 4	H, L, I	CR-R	RD	M, Hm, Lh, Lr, P	1, 4	3
<i>Saussurea obvallata</i> Asteraceae	Herb	B	B	Many	50	10 yr.	Unk	2, 4	Ov, Lf, H, Hm, Tp	EN-R	PR	M, Hm, Lh, Lr, P	1, 4	3
<i>Saussurea simpsoniana</i> Asteraceae	Herb	B	B	Few; F	50	10 yr.	Unk	2, 4	Hm, L, I, T	EN-R	RD	M, Hm, Lh, Lr, P	1, 4	3
<i>Swertia angustifolia</i> var. <i>angustifolia</i> Gentianaceae	Herb	B	B	Few; F	50	25 yr.	Unk	2	L, H, T	EN-R	RD	Hm, Lr, M, P	1, 4	3
<i>Swertia chiriyita</i> Gentianaceae	Herb	D	D	Many; F	> 90	10 yr.	Unk	2, 5	Ov, L, H, T	CR-R	PR	S, M, Hm, Lh, H, P	1, 3	Unk
<i>Taxus wallichiana</i> Taxaceae	Tree	B	B	Many; F	> 90	110 yr.	Unk	2, 3, 4	Hm, Tp	CR-R	PR	M, Hm, Lr, P	1, 4	2
<i>Thalictrum foliolosum</i> Ranunculaceae	Herb	D	B	Many	20	10 yr.	Unk	2, 4	Hm, L, Lf, Ov, T	VU-R	PR	S, M, Hm, P	4	1
<i>Tylophora indica</i> Asclepiadaceae	Climb-er	D	D	~300	30	10 yr.	Unk	2, 3	L, Hm, I, E, T	VU-R	PR	S, M, Lh, H, PP	1, 3	Unk
<i>Valeriana jatamansi</i> Valerianaceae	Herb	C	A	Unk	80	10 yr.	Unk	2, 4	L, Hm, Ov, T	CR-R	PR	M, Hm, Lh, H, PP	1, 3	Unk

### Convention on Biological Diversity

The Convention on Biological Diversity adopted in Nairobi in May 1992 and signed by more than 150 states in June 1992 at Rio de Janeiro, came into force officially in December 1993. The Convention is a "framework agreement" in that its provisions are expressed as goals and policies (as opposed to "obligations"), leaving the implementation of its provisions up to individual parties (the states) at the national level. In the Convention, the importance of non-governmental organisations in implementing the provisions was specifically mentioned.

Articles in the Convention cover objectives, terminology, principles, legislation, cooperation and strategy as applied to various issues and methodology. One of the very basic methods of organising conservation action is prioritisation. Article 7 of the Convention deals with Identification and Monitoring, calling on parties to identify components of biological diversity important for its conservation and sustainable use. Components of an "indicative list" include:

- \* Ecosystems and habitats
- \* Species and communities, and
- \* Described genomes and genes of social, scientific and economic value.

Knowledge of species and communities can reveal crucial facts necessary to the management of ecosystems and habitats as well as to the identification of important genomes and genes. Identification, listing and prioritisation of species are one of the important tasks in conservation. In India, it is well known by biologists across many taxon groups that species information has many gaps. In many instances, the species has not been surveyed or studied since its description, perhaps in the 18th or 19th century. Even species, which have been studied more recently in the 20th century, require constant attention due to the fact that the very fabric of the earth is changing so rapidly. It is common knowledge today that the ecosystems and habitats which sustain species are deteriorating exponentially as a result of population expansion, industrialisation, and the build-up of habits resulting from decades and centuries of thinking the Earth and its resources were unlimited. Awareness of this fact is, of course, the *raison d'être* for the Convention on Biological Diversity itself.

### Biodiversity Conservation Prioritisation Project – Endangered Species Component

The Biodiversity Conservation Prioritisation Project (BCPP) is an attempt to amalgamate the knowledge of government, academics, enthusiasts, and other knowledgeable persons of India to meet obligations of the Convention on Biological Diversity. This Project was funded by the Biodiversity Support Program, a consortium of organisations, USAID, World Resources Institute and the Nature Conservancy, and coordinated by World Wide Fund for Nature. It consists of three segments, sites, species and strategies for biodiversity conservation. The overall aim of the species segment is to list out species which need to be conserved for their biodiversity value in order of priority, under categories of medicinal and economic

value, wild relatives of domesticated and cultivated species and other endangered fauna, flora and micro-organisms.

An Endangered Species Subgroup decided to use the IUCN criteria to assess the conservation status of a large part of Indian species diversity. A workshop "process" called the Conservation Assessment and Management Plan (CAMP) developed by the Conservation Breeding Specialist Group, SSC, IUCN was selected by the subgroup as the methodology to use for conducting the assessments. CBSG, India, a Regional Network of the Conservation Breeding Specialist Group was asked to conduct the "CAMP" workshops on the basis of their experience and expertise. The IUCN Red List criteria are central to the CAMP process.

### IUCN Red List

Earlier efforts to monitor the earth's resources and activate conservation measures include the Red Data Books of IUCN, now called the World Conservation Union. The IUCN Red Data Books have provided a guide for species conservation status for the last three decades. A few years ago, it was felt that both the categories and methodology used by individuals compiling the Red Data Books needed review. Over a seven-year period, the IUCN Criteria for Endangerment used in compiling Red Data Books, were examined, revised, reviewed and improved over six different iterations. The present system, the IUCN Red List Categories, 1994, is more objective, numerate, and consistent for all groups. The revised IUCN Red List Categories provide a methodology for assessment and categorisation, which can be applied, to any group of organisms (except microorganisms). The revised IUCN Red List criteria is being used now by conservation actioners and scientists all over the world and is considered the best possible method available today for assessing the conservation status of species.

### Conservation Assessment and Management Plan

One of the great difficulties of carrying out basic tasks such as identification and monitoring, creation of management and action plans and recovery programmes for species, is coordinating the great mass and variety of specialist knowledge and agency authority. Much time and energy is wasted in duplication of effort, territorial and ownership disputes, and inability to find and adhere to a common ground. The business community, realising the importance of effective communication and teamwork, has developed a broad spectrum of management strategies and tools which are used daily to manage time and human interaction. More and more, the conservation community is recognising the importance of using some of these tools to achieve their goals, rapidly and effectively. The Conservation Breeding Specialist Group (CBSG) of the Species Survival Commission of IUCN has pioneered the use of some of these tools in well-planned strategic problem-solving and task-performance exercises. CBSG calls these exercises "processes" because — in the contemporary conservation scenario — nothing is static except the fact of change itself.

The Conservation Action and Management Plan Workshop

was developed by CBSG for the purpose of prioritising species for conservation action including ex situ component. Over the last decade, CBSG has conducted dozens of CAMP workshops for literally hundreds of species, using (and thereby testing) the then current iteration of the IUCN Red List Categories as their basic methodology to glean a status ranking. The IUCN Red List guidelines and criteria are used in all CAMP workshops to assess and assign a category to each species.

For the CAMP Workshop CBSG has developed a Taxon Data Sheet and a Spreadsheet format which includes parameters necessary to assess the IUCN status as well as provide other useful information necessary for creating management and action plans. The spreadsheet organises the information in a concise manner so that it is accessible at a glance. The information in this Report is organised on spreadsheets in the Report section, followed by the individual Taxon Data Sheets. A CAMP Workshop also utilises principles of management psychology to guide human interaction. A set of Guidelines for Group Interaction is presented to the workshop participants who agree as a group to work accordingly in order to complete the task. Objective Facilitators (persons trained in management skills and the workshop process) are used to lead and guide the workshop so that individual and professional bias does not affect group decisions and to assist in maintaining the integrity and focus of the workshop.

CAMP Workshops bring together a variety of specialists and enthusiasts from academic, government, managerial, and even the commercial sector to evaluate taxa for setting priorities for conservation action. The fear of loss and hope of recovery of species drives CAMP Workshops. Individuals part with unpublished information in order to contribute to a body of information which will provide strategic guidance for application of intensive management and information gathering. CAMP Workshops results, are, or should be, dynamic, leading to specific conservation activities in forest, market, classroom, courtroom — locally and nationally as well as on the international stage.

### Conservation of Medicinal Plants

Medicinal plants are receiving an enormous amount of attention today. The resurgence of interest in natural systems of medicine, in indigenous peoples and practices, the increasing use of parts or extracts or compounds made from medicinal plants, the realisation of the potential loss through both domestic and foreign trade, and the publicity engendered by the Convention on Biodiversity and GATT treaty have combined to form what is practically a “movement” for medicinal plants.

As individuals and institutions discover new properties, there are a growing number of plants being classified as “medicinal”, perhaps due to the identification of a secondary metabolite or the working out of a phytochemical composition, which determines medicinal value. Most of medicinal plants in India are so classified because of traditional practices and uses. A search of literature with unprejudiced inclusion of all species listed (in print) as “medicinal” yielded a tally of more than 7,000 species.

The importance of natural systems of medicine, all of which use

medicinal plants to a greater extent, can be realised by the fact that in March 1995 the Government of India created a new Department of Indian Systems of Medicine and Homocopathy which became functional in December of that year. Recognising that Indian systems of medicine attained a high level of development centuries ago which had stagnated to some extent, this Department was set up to solve some of the problems, such as standardisation, intellectual property rights, availability of raw materials and drugs and generally revitalise this area. This Department in its annual report has highlighted the fact that non-availability of raw materials for manufacture of ISM&H drugs has become a serious conservation problem and have proposed the creation of large “vanaspati vans” in major states to increase availability of raw materials and contribute to *in situ* conservation of medicinal plants.

In the 1991 Amendments to the Wildlife (Protection) Act, the Ministry of Environment and Forests, Government of India included six (6) species of plants, the majority of which were medicinal, for the first time.

In 1994 the Director General of Foreign Trade, on the recommendation of the Ministry of Environment and the Botanical Survey of India, notified a list of 46 species of plants in the negative list of exports, although value-added herbal formulations made from these species were allowed. CITES secretariat and others pointed out subsequently that this concession was counter productive to the *in situ* conservation of those species as they continued to be exploited. Therefore the negative list was amended in April 1996 to prohibit export of extracts and derivatives including value-added herbal formulations. However this was kept in abeyance until December 1996 as a concession to the exporters. Since that time the manufacturers and exporters have requested further concessions.

In early 1997 the Ministry of Environment, Government of India, took note of the list of 214 species of medicinal plants assessed over a period of three years in the three southern Indian medicinal plants CAMP workshops organised by FRLHT in Bangalore as well as in the northern and central Indian medicinal plants CAMP organised under the Biodiversity Conservation Prioritisation Project in Lucknow, e.g. the workshop of this report. The Ministry proposed a revision of the negative list to be worked out according to the Critically Endangered and Endangered species identified in the CAMP workshops. Further, the Ministry has proposed all the CR and EN species for inclusion under Schedule VI of the Wildlife Protection Act, 1972. In addition the Ministry has notified the State Forest Departments about the results of the assessment and requested them to take immediate conservation measures for the CR and EN species, including the exercise of care in issuing collection permits and the promotion of cultivation of those species by local people. Finally the Ministry of Environment has proposed cultivation of identified medicinal plants as one of its centrally sponsored schemes and suggested that the Department of Indian Systems of Medicine take similar action. Subsequently a Review of the status of these and other plants was reviewed by a workshop conducted by the Botanical Survey of India using a combination of information, including CAMP output. A list of

more than 30 medicinal plants were identified for the First Negative List of Exports. Second, Third and Fourth lists will be formulated according to the conservation and trade status of the plants and methods of collection.

### Goals of the Workshop on Medicinal Plants of Northern, Northeastern and Central India

1. To use populations, habitat and threat parameters to assess the conservation status and assign an IUCN Red List ranking to selected species of northern and central Indian Medicinal Plants selected by workshop participants at the BCPPP CAMP.
2. To provide information about the species which would be useful in drawing up Action Plans and Management Plans, including recommendations for *in situ* and *ex situ* management; research, survey and monitoring; cultivation; investigation of limiting factors; taxonomic and other specific research; education and activism.
3. To produce a Conservation Assessment and Management Plan Report for the selected species, which after review and comment by workshop participants, would be distributed to all parties interested in medicinal plant conservation.

### Results and Discussion

The Red Data Books of Indian Plants, (3 volumes) by M.P. Nayar and A.R.K. Sastry (1987-91) reported more than 500 species of threatened plants. This effort by the Botanical Survey of India is the most recent attempt by botanists in India to assess the status of Indian flora. Earlier efforts were by S.K. Jain and A.R.K. Sastry in 1984, Threatened Plants of India - A State-of-the-art Report compiled by Botanical Survey of India in 1980 and Nayar and Sastry used the pre-1991 version of the IUCN criteria for assessment of plants. Those criteria were: Extinct, Endangered, Vulnerable, Rare, Indeterminate, Insuffi-

ciently known and Out of Danger.

The IUCN Red List Categories have since then undergone a series of revisions to enhance their applicability to organisms other than mammals and to reflect the development of the new conservation sciences, population dynamics and conservation biology of the last two decades. The current version of the IUCN Red List Criteria is the December 1994 IUCN ratified version. This version has far more objective criteria for assessment. The categories can be divided into 5 divisions, viz. Extinct (Extinct and Extinct in the Wild), Threatened (Critically Endangered, Endangered and Vulnerable), Non-threatened (Lower Risk near threatened, conservation dependent and least concern), Data Deficient and Not Evaluated

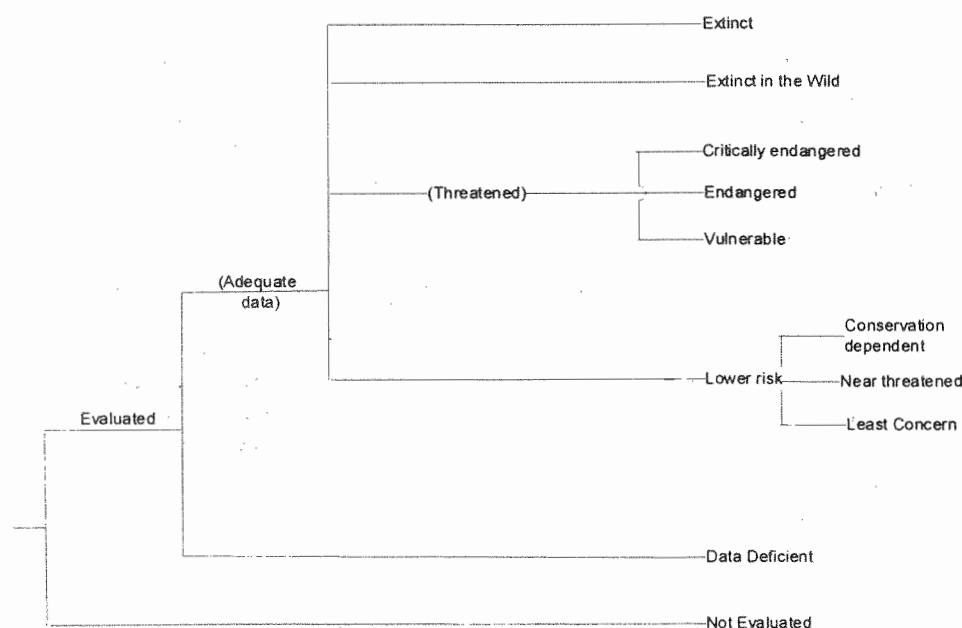
### Methodology

The early Red Data Books contributed significantly to the general knowledge of the status of plants in India. These assessments inspired great concern on the part of Indian botanists and the government of India who utilised the information provided by them in a variety of ways.

The Red Data Books were compiled by officers of the Botanical Survey of India with contributions of information from fellow researchers from all over India as well as from their own research. The collected information was edited at a central office where the decision on the categories was taken and the Report published.

Over the years more information has been gathered by field researchers on these and other plants. Selection of taxa for assessment of perceived status was made by the groups, based on the expertise and experience of possessed by the assembled botanists; therefore a type of pre-prioritisation was done by virtue of the knowledge and concerns of experienced botanists.

Structure of the Categories



The Conservation Assessment and Management Plan process of assessing species works much on the lines of gathering data from different people. In a CAMP, however, an attempt is made to get a representative group of field biologists with direct observational experience of the species and their habitats together in a workshop where information is collected from several sources on the target taxa. In an interactive process of small working groups, a questionnaire with requisite information for making an assessment is provided and a "Taxon Data Sheet" is filled for every taxon. IUCN provides guidelines for each specific data requirement and also for deriving the correct category from the data provided. The Taxon Data Sheets used in CAMP workshops are based on the IUCN

guidelines for deriving status and include additional questions as well.

The present Conservation Assessment and Management Plan Workshop was conducted for 75 taxa of medicinal plants of northwestern Indian Himalaya (including Jammu and Kashmir, Himachal Pradesh and Uttar Pradesh Himalaya), northeastern India (including the Himalaya, North Bengal and Sikkim) and central India (including entire Madhya Pradesh and parts of Maharashtra, Orissa, Uttar Pradesh and Bihar). The participants in an interactive discussion involving the entire workshop selected these areas and the taxa to be assessed. Since southern Indian medicinal plants of concern had been assessed in separate workshops in southern India in an ongoing series by the Foundation for Revitalisation of Local Health Traditions (FRLHT), this workshop focused on plants of other regions.

Before forming working groups, participants decided on the following parameters for the exercise:

1. To identify and assess as many plant taxa, which were "Indian political endemics" as possible, before going on to assess non-endemics
2. To assess only "medicinal plants" and not any other plant even if threatened.

According to the group a plant could be classified as "medicinal" if it came into any of the following groups:

- (a). Any plant used in Ayurveda, Homoeopathy, Unani, Siddha, Allopathy, Tibetan medicine and in other traditional medicines.
- (b). Any plant known to be used as medicinal from old texts (even if no modern publication listed these as medicinal or was not currently being used).
- (c). Any plant traded for reasons of having medicinal value.

### Assessments

Of the total 75 taxa of medicinal plants assessed at the northern and central Indian CAMP only nine taxa are political endemics (6 from northwestern Indian Himalaya and 3 from northeastern India). Assessments for endemic species are described as "Global", even if their range is small, because they occur only in that area in the whole world. The remaining taxa were assessed either "Regionally" because they occur in several areas or "Nationally" because they are assessed for their complete distributional range in India (Table 2). The terms Global, Regional and National assessments are explained in detail in the "Explanations to the Taxon Data Sheet" section.

The four working groups assessed 38 taxa from the northwestern region in India, 19 taxa from northeastern India and 18 from central India. Two taxa were assessed both for their distribution in northeastern and northwestern Himalaya. The taxa selected for assessment belong to 39 families of which Asteraceae, Berberidaceae, Ranunculaceae and Zingiberaceae are the most represented.

Table 1. Taxa assessed in the CAMP listed by different working groups.

Northern India (Northwestern Himalaya)		Northeastern India		Central India	
Group I	Group II	Group III	Group IV	Group I	Group II
<i>Aconitum balfourii</i> (N)	<i>Angelica glauca</i> (R)	<i>Acorus calamus</i> (R)	<i>Baliospermum montanum</i> (R)		
<i>Aconitum deinorrhizum</i> (G)	<i>Arnebia benthamii</i> (N)	<i>Aquilaria malaccensis</i> (N)	<i>Butea monosperma</i> var. <i>lutea</i> (R)		
<i>Aconitum falconeri</i> (G)	<i>Atropa acuminata</i> (N)	<i>Clerodendrum colebrookianum</i> (N)	<i>Celastrus paniculata</i> (R)		
	<i>Bunium persicum</i> (N)	<i>Coptis teeta</i> (G)	<i>Clerodendrum serratum</i> (R)		
<i>Aconitum heterophyllum</i> (N)	<i>Cinnamomum tamala</i> (R)	<i>Costus lacerus</i> (N)	<i>Cordia rothii</i> (R)		
<i>Aconitum violaceum</i> (N)	<i>Dactylorhiza hatagirea</i> (R)	<i>Gastrochilus longiflora</i> (N)	<i>Craterostigma plantagineum</i> (R)		
<i>Berberis aristata</i> (R)	<i>Delphinium denudatum</i> (N)	<i>Hydrocarpus kurzii</i> (N)	<i>Curculigo orchioides</i> (R)		
<i>Berberis chitria</i> (N)	<i>Dioscorea deltoidea</i> (R)	<i>Ilex khasiana</i> (G)	<i>Curcuma angustifolia</i> (R)		
<i>Berberis kashmirana</i> (G)	<i>Fritellaria roylei</i> (N)	<i>Luvunga scandens</i> (N)	<i>Curcuma caesia</i> (R)		
<i>Berberis lycium</i> var. <i>simlensis</i> (G)	<i>Gentiana kurroo</i> (N)	<i>Meconopsis aculeata</i> (R)	<i>Drymia indica</i> (R)		
<i>Berberis petiolaris</i> var. <i>garhwalana</i> (G)	<i>Hedychium spicatum</i> (N)	<i>Nepenthes khasiana</i> (G)	<i>Evolvulus alsinoides</i> (R)		
<i>Bergenia ciliata</i> (N)	<i>Heracleum candicans</i> (R)	<i>Panax pseudoginseng</i> (N)	<i>Gloriosa superba</i> (R)		
<i>Paeonia emodi</i> (N)	<i>Inula racemosa</i> (N)	<i>Picrorhiza kurroo</i> (N)*	<i>Gymnema sylvestre</i> (R)		
<i>Podophyllum hexandrum</i> (N)*	<i>Jurinea dolomiaea</i> (N)	<i>Podophyllum hexandrum</i> (N)*	<i>Hedychium coronarium</i> (R)		
<i>Saussurea costus</i> (N)	<i>Lavatera cashmeriana</i> (G)	<i>Prezowskia tangutica</i> (N)	<i>Ipomea turpethum</i> (R)		
<i>Saussurea gossypiphora</i> (R)	<i>Nardostachys jatamansi</i> (R)	<i>Rheum nobile</i> (N)	<i>Rauvolfia serpentina</i> (R)		
<i>Saussurea obvallata</i> (R)	<i>Picrorhiza kurroo</i> (N)*	<i>Rhododendron anthopogon</i> (N)	<i>Swertia angustifolia</i> var. <i>angustifolia</i> (R)		
<i>Saussurea simpsoniana</i> (R)	<i>Polygonatum verticillatum</i> (R)	<i>Rhus semialata</i> (N)	<i>Tylophora asthmatica</i> (R)		
<i>Thalictrum foliolosum</i> (R)	<i>Rheum australe</i> (R)	<i>Taxus wallichiana</i> (R)			
	<i>Swertia chirayita</i> (R)	<i>Valeriana jatamansi</i> (R)			

The notations in parentheses are the levels of assessment adopted for the taxon (G for Global, N for National and R for Regional). Taxa denoted by (\*) have been assessed by two groups for their respective regions but the assessment is a summation of the two regional assessments.

Table 2. Basis of criteria for assessing selected species at the Lucknow BCPP CAMP

Taxon	IUCN	Assessed for	Threatened due to	Criteria
<i>Aconitum balfourii</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Aconitum deinorrhizum</i>	CR	Endemic to NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Aconitum falconeri</i>	CR	Endemic to NW Indian Himalaya	Restricted distribution	B1, 2a, 2b, 2c
<i>Aconitum ferox</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Aconitum heterophyllum</i>	CR	NW Indian Himalaya	Restricted distribution	B1, 2a, 2b, 2c, 2d, 2e
<i>Aconitum violaceum</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Acorus calamus</i>	VU	NE India	Restricted distribution	B1, 2b, 2c
<i>Angelica glauca</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Aquilaria malaccensis</i>	CR	NE Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Arnebia benthamii</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Atropa acuminata</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Baliospermum montanum</i>	LRnt	Central India	Not applicable	Not applicable
<i>Berberis aristata</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Berberis chitria</i>	EN	NW Indian Himalaya	Restricted distribution	B1, 2c
<i>Berberis kashmirana</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Berberis lycium</i> var. <i>simlensis</i>	EN	NW Indian Himalaya	Restricted distribution	B1, 2c
<i>Berberis petiolaris</i> var. <i>garhwalana</i>	CR	Endemic to NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2a, 2b, 2c
<i>Bergenia ciliata</i>	VU	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Bunium persicum</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Butea monosperma</i> var. <i>lutea</i>	DD	Central India	Not applicable	Not applicable
<i>Celastrus paniculata</i>	LRnt	Central India	Not applicable	Not applicable
<i>Cinnamomum tamala</i>	LRnt	NW Indian Himalaya	Not applicable	Not applicable
<i>Clerodendrum colebrookianum</i>	VU	NE India	Population reduction	A1a, 1c, 1d
<i>Clerodendrum serratum</i>	VU	Central India	Population reduction	A1c
<i>Coptis teeta</i>	CR	Endemic to NE India	Population reduction	A1a, 1c, 1d
<i>Cordia rothii</i>	LRnt	Central India	Not applicable	Not applicable
<i>Costus lacerus</i>	DD	NE India ?	Not applicable	Not applicable
<i>Craterostigma plantagineum</i>	CR	Central India	Restricted distribution	B1, 2c
<i>Curculigo orchioides</i>	VU	Central India	Population reduction	A1a, 1c, 1d
<i>Curcuma angustifolia</i>	LRnt	Central India	Not applicable	Not applicable
<i>Curcuma caesia</i>	CR	Central India	Population reduction	A1a, 1c, 1d
<i>Dactylorhiza hatagirea</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Delphinium demudatum</i>	CR	NW Indian Himalaya	Population reduction	A1c
			Restricted distribution	B1, 2c
<i>Dioscorea deltoidea</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Drymia indica</i>	VU	Central India	Population reduction	A1a, 1c, 1d
<i>Evolvulus alsinoides</i>	LRnt	Central India	Not applicable	Not applicable
<i>Fritillaria roylei</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Gastrochilus longiflora</i>	CR	NE India	Restricted distribution	B1, 2c
<i>Gentiana kurroo</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d

Taxon	IUCN	Assessed for	Threatened due to	Criteria
<i>Gloriosa superba</i>	EN	Central India	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Gymnema sylvestre</i>	VU	Central India	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Hedychium coronarium</i>	EN	Central India	Restricted distribution	B1, 2c
<i>Hedychium spicatum</i>	VU	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Heracleum candicans</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Hydnocarpus kurzii</i>	EN	NE Indian Himalaya	Population reduction	A1c, 1d
<i>Ilex khasiana</i>	CR	Endemic to NE India	Restricted distribution	B1, 2c
			Population number	C2b
			# mature individuals	D
<i>Imula racemosa</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Jurinea dolomiaea</i>	LRnt	NW Indian Himalaya	Not applicable	Not applicable
<i>Lavatera cashmeriana</i>	EN	NW Indian Himalaya	Restricted distribution	B1, 2c
<i>Luvunga scandens</i>	CR	NE India	Restricted distribution	B1, 2c
			Population number	C2b
			# mature individuals	D
<i>Meconopsis aculeata</i>	CR	NE Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Nardostachys jatamansi</i>	CR	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Nepenthes khasiana</i>	CR	Endemic to NE India	Restricted distribution	B1, 2c
<i>Operculina turpethum</i>	VU	Central India	Population reduction	A1a, 1c, 1d
<i>Paeonia emodi</i>	VU	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Panax pseudo ginseng</i>	CR	NE India	Restricted distribution	B1, 2c
<i>Picrorhiza kurroa</i>	EN	Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Podophyllum hexandrum</i>	CR	Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Polygonatum verticillatum</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Prezowskia tangutica</i>	CR	Northern Sikkim	Restricted distribution	B1, 2c
<i>Rauvolfia serpentina</i>	EN	Central India	Population reduction	A1a, 1c, 1d
<i>Rheum australe</i>	VU	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Rheum nobile</i>	EN	NE India	Population reduction	A1c, 1d
			Restricted distribution	B1, 2c
<i>Rhododendron anthopogon</i>	VU	NE India & Darjeeling	Population reduction	A1a, 1c
<i>Rhus semialata</i>	VU	NE India & Darjeeling	Population reduction	A1c, 1d
<i>Saussurea costus</i>	CR	NW Indian Himalaya	Restricted distribution	B1, 2c, 2e
<i>Saussurea gossypiphora</i>	CR	NW Indian Himalaya	Restricted distribution	B1, 2c
<i>Saussurea obvallata</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c
<i>Saussurea simpsoniana</i>	EN	NW Indian Himalaya	Population reduction	A1a, 1c, 1d
			Restricted distribution	B1, 2c
<i>Swertia angustifolia</i> var. <i>angustifolia</i>	EN	Central India	Restricted distribution	B1, 2c
<i>Swertia chirayita</i>	CR	NW Indian Himalaya	Population reduction	A1c, 1d
<i>Taxus wallichiana</i>	CR	NE India	Population reduction	A1c, 1d
<i>Thalictrum foliolosum</i>	VU	NE Indian Himalaya	Population reduction	A1a, 1c, 1d
<i>Tylophora indica</i>	VU	Central India	Population reduction	A1a, 1c, 1d
<i>Valeriana jatamansi</i>	CR	NE Indian Himalaya	Population reduction	A1a, 1c, 1d

## Results

Of the 75 taxa there is a very high proportion of threatened taxa (88%). This is because of the perceived threats that the group participants felt the assessed taxa were facing in the wild. Since participants selected the species, the natural tendency was to select taxa that were known to be highly exploited and or were rare in distribution in the wild. Two taxa were assessed as Data Deficient. Two taxa (*Podophyllum hexandrum* and *Picrorrhiza kurroa*) were assessed for northwestern and northeastern regions separately but the information was combined for a "National assessments.

The list as seen in the Summary Data Table (Executive Summary section of the Report) reveals the habit composition of the taxa to comprise of 8 trees, 54 herbs, 10 shrubs and 3 climbers. However, since the taxa assessed is at random and not representing a substantial proportion of medicinal plants (estimated +/- 7,000), no correlation to the habit and the medicinal properties of the taxa can be made.

## Threats

Most of the taxa assessed at this workshop are under threat (Table 3). The factors that affect their well being in the wild include Overexploitation, Harvest for medicine, food timber, Trade, Loss of habitat due to exotic plants, Human interference, Fragmentation and trampling by herbivores.

Threats can be classified into those affecting the habitat and those affecting the taxon population, though some of the factors affect both habitat and the population. A habitat quality change could be in the form of any small impact human interference has on the habitat that could affect the regeneration capability or habitat structure of the area, or the taxon in question. Therefore threats affecting habitat and threats affecting populations are not independent of each other.

Threats affecting habitat such as logging, cultivation, human

settlements, fragmentation, introduction of exotic plants or monocultures and plantations (and in one case trampling by wild herbivores) are the main contributing factors to the taxa assessed here. All these along with factors that affect population numbers such as human interference, overexploitation, harvesting for various purposes and trade result in many of the taxa assessed to be threatened.

## Trade

Of the very many different kinds of threats, trade plays a considerable part in categorising the taxa as threatened. Trade and a number of factors that work along with those such as harvest, harvest for medicine, harvest for timber and harvest for food comprise a major force of threat to the medicinal plants.

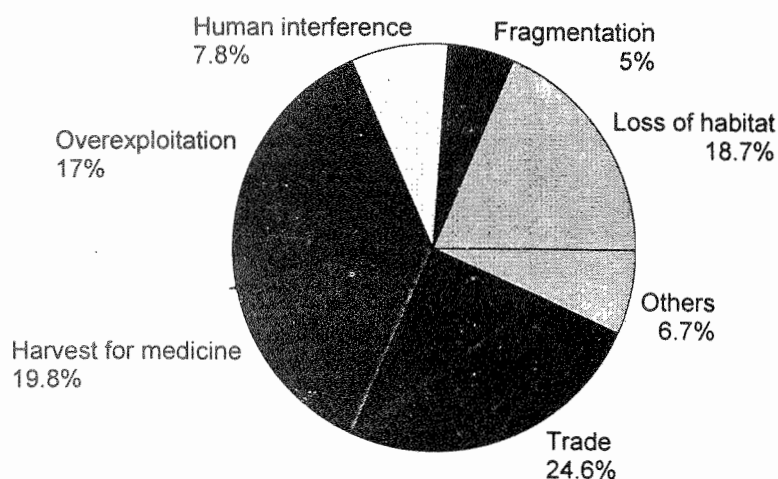
In the present exercise it is seen that 89% of all the assessed taxa and 81% of threatened taxa are in trade (Table 3).

Subsistence living can also take a toll on the survival of some taxa. Recent trends in reduction of wild populations by a variety of threats have resulted in the taxa moving towards extinction. Hence, any unsustainable utilisation, even for subsistence living could tip the scale.

Sixty-seven taxa are assessed to be in trade (Table 3). Depending on the scope and quantity of trade, four levels such as local trade, domestic trade, commercial trade and international trade are listed. While some of the taxa are being traded at one level only, many are being traded at two or more levels. Most of the trade is either at local, commercial or domestic levels while a few taxa are traded internationally (Figure and Table 3).

Sixty-one of the threatened taxa are categorised to be in trade (Table 3). Trade along with other factors is a threat to the survivability of the taxon in the wild. Figure below indicates different levels of trade of threatened and non-threatened taxa.

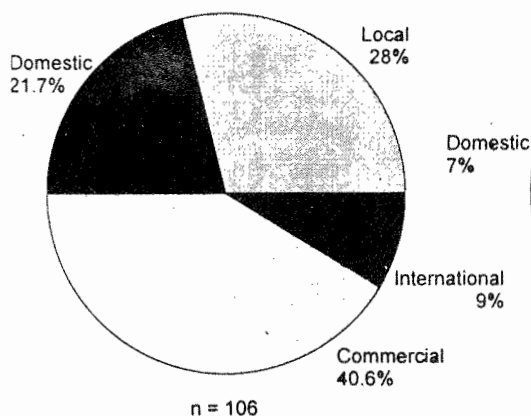
Threats to wild medicinal plant populations



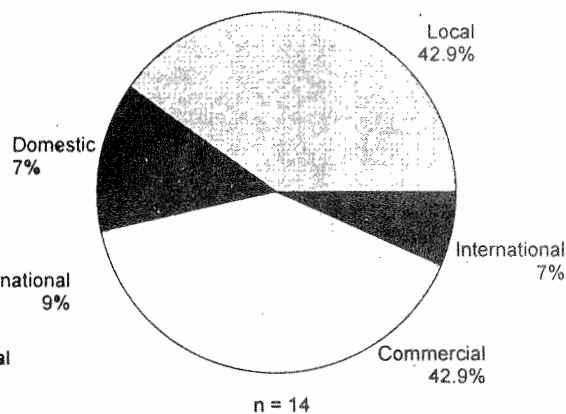
Trade has been a contentious issue for the last many years and has assumed greater importance in recent years due to factors, which compromise the biodiversity convention, indigenous people's rights, and foreign trade. The most recent "scare" is patents, which have aroused much suspicion and frustration among the Indian political, economic, and scientific community towards countries whose actions compromise local community rights in India. A factor of threat to the populations of medicinal plants in the wild has been the basis for the Government of India's policy of a "Negative list of Exports" of plants in trade.

Data quality for all taxa assessed in this workshop is either by or a combination of Reliable census and monitoring (1 taxa), General field studies (67 taxa), Informal field sighting (19 taxa), Indirect information

Trade in threatened taxa



Trade in non-threatened taxa



(26 taxa) and/or through literature studies, herbarium studies and records (17 taxa).

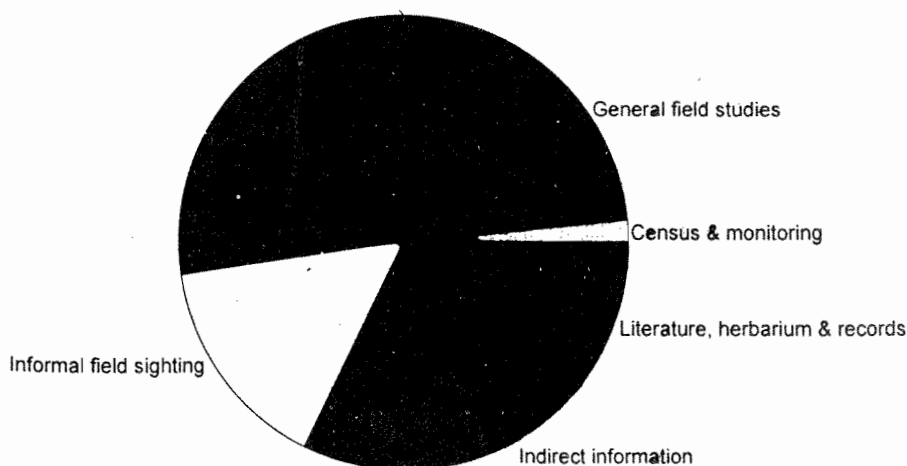
The IUCN guidelines for assessment clearly suggest a "conservative" approach in favour of the taxa, e.g. "... the absence of high quality data should not deter attempts at applying the criteria, as methods involving estimation, inference and projection are emphasized to be acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including dependence on other taxa), so factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonable 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 distribution, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects may be irreversible, or nearly so (pathogens, invasive organisms, hybridization)."

The exercise to determine the status of any taxon should not be hindered by the fact that there is no hard information available. Thorough, all-encompassing hard data is impossible to gather for even a single taxon, and the time required to actually gather such detailed information could delay conservation measures for threatened taxa. The combination of elements which make up a CAMP workshop such as group effort of botanists including field workers, both past and present, museum curators, ecologists, theoreticians, policy makers and related specialists together, good faith and impartial facilitation provide informed advice for conservation action planning. The results of this Workshop are an outcome of such an exercise.

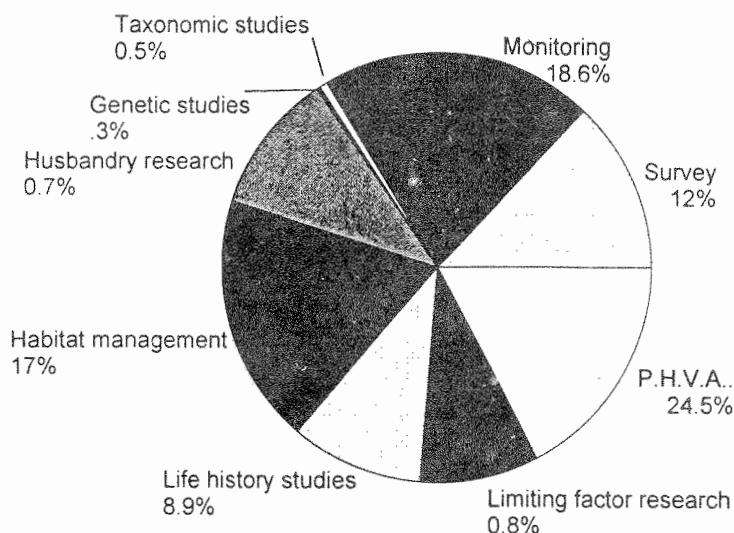
Data Quality



### Conservation action and recommendations

The previous section dealt with the different values for assessing the IUCN categories for the taxa. This section deals with the need for conservation action to be taken to insure that the taxa are conserved in the wild and that their habitat is safe. Conservation action can take many forms. The first action is keeping the habitat inviolate, which may be the best way of insuring survival of taxa. However, habitat protection alone may not be sufficient. Constant pressure on habitat and individual taxa has forced many taxa to become threatened. This creates other complications such as small and isolated or fragmented populations, which may propel the taxon into an "extinction vortex". To overcome these complications and possible extinction, remedial actions need to be taken up

## Research and management recommendations



simultaneously.

An understanding of the basic biology and behaviour of a taxon can also help in identifying individual areas of conservation action and implementation.

Table 5 shows that Monitoring has been recommended for 72 of the 75 taxa followed by Habitat management, Survey, Life history studies, Husbandry research, Limiting factor research, Taxonomic studies, Genetic management and finally other taxon specific recommendations.

Monitoring studies have been carried out for many taxa for population and habitat to determine population trends or effects of harvest and other human-influenced changes in the environment. Monitoring has been strongly recommended for future action plans. For many taxa whose extent of occurrence far exceeds the area of occupancy, the recommendation is for more surveys within the range as to identify other locations. Most of the assessed taxa are not very well understood for their basic biology or husbandry for cultivation. Since they are traded and being exploited in the wild for medicinal and other purposes, cultivation for sustainable utilisation has been recommended as one of the most urgent tasks. However, in many cases propagation techniques are yet to be perfected or no attempt at all has been made to cultivate the taxa. For this reason, husbandry research, limiting factor research and life history studies have been recommended for many taxa.

Recommendations for the assessed taxa include those described above and also Population and Habitat Viability Assessment and Cultivation. All taxa assessed are recommended for cultivation. Population and Habitat Viability Assessment is recommended for 49 of the 68 threatened taxa and 2 of the remaining taxa.

### Cultivation and the level of difficulty

Cultivation recommendations are at four levels, Levels 1, 2, 3 and 4 (see taxon data sheet definitions). Level 1 is for taxa to be interactively managed *in situ* and *ex situ* so as to retain 90% genetic diversity for 100 years. Level 2 is for *ex situ* popula-

tions to be infused with fresh genetic material from the wild so as to retain sufficient diversity. Level 3 is not for conservation but only for education, husbandry and research. Level 4 is for commercial and sustainable utilisation.

In this workshop, a cultivation programme for all of the threatened taxa is recommended (Table 5), although for most of the taxa techniques for cultivation are not in place or still very difficult. Level of difficulty of cultivating the taxa is given in table 6 comparing the categories and level of difficulty is given hereunder.

The concept of sustainable utilisation and the measures towards sustainability has been known and practised for ages, but this concept has lost its place in the present medicinal plant trade in India. There are very few systematic and patient efforts in developing techniques for cultivation of medicinal plants in trade. Of the 75 taxa cultivation

knowledge exists for 47 taxa. Cultivation techniques are in place and propagation is easy for 16 taxa, while techniques are not in place for cultivation or cultivation is very difficult for 20 taxa. The remaining 48% of the plants are only partially understood for cultivation (Table 6).

Medicinal plants are being overexploited from the wild for medicinal trade. Populations have shrunk to the extent that any harvest even for subsistence living could result in the plant going extinct. It is therefore suggested that cultivation be taken up to meet all of the demands of the trade industry or local needs for subsistence. Cultivation is a must for there is no alternative if the taxon is to survive in the wild. Any delay would only mean that a much-depleted wild gene pool would be available to utilise for cultivation programmes.

Cultivation for many medicinal plants is not known as no trials have been conducted. In cases where trials have been made to cultivate medicinal plant taxa, it may not be so difficult as pharmaceutical companies' claim! There are many institutions that have taken up cultivation of some of the threatened taxa. Also much information on cultivation of rare taxa can be obtained from FRLHT's publication "GeneNet" and a host of other regional botanic institutes that have been developing propagation techniques for the threatened or similar taxa.

### Conclusion

Participants at the workshop were strong in their belief that that medicinal plant conservation is much required. Cultivation for sustainable utilisation was recommended unanimously by participants.

The BCPP Conservation Assessment workshop has helped in understanding the urgent need to protect threatened taxa from extinction and manage them in the near future. Some of these taxa may not survive if timely action is not taken, that is if they are not man-managed. Many of them, because of their small population size and restricted distribution, require intensive care and habitat management and may survive only with human support.

**Table 3. Threat and trade information for selected species of northern Indian medicinal plants assessed according to the New IUCN categories.**

Taxon	Threats	Trade	IUCN
<i>Aconitum balfourii</i>	Fragmentation, Human interference, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Aconitum deinorrhizum</i>	Loss of habitat, Fragmentation, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Aconitum falconeri</i>	Fragmentation, Human interference, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Aconitum ferox</i>	Fragmentation, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Aconitum heterophyllum</i>	Loss of habitat, Overexploitation, Human interference, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Aconitum violaceum</i>	Fragmentation, Overexploitation, Human interference, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Acorus calamus</i>	Loss of habitat, Harvest for medicine, Trade	Commercial	VU
<i>Angelica glauca</i>	Overexploitation, Harvest for medicine, Trade	Local	CR
<i>Aquilaria malaccoensis</i>	Loss of habitat, Human interference, Harvest for medicine, Harvest for timber, Trade	Commercial, International	CR
<i>Arnebia benthamii</i>	Overexploitation, Harvest, Harvest for medicine, Trade	Local, Domestic	CR
<i>Atropa acuminata</i>	Loss of habitat, Overexploitation, Harvest, Trade	Domestic, Commercial	CR
<i>Baliospermum montanum</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, Domestic Commercial	LRnt
<i>Berberis aristata</i>	Fragmentation, Human interference, Harvest for medicine, Trade	Commercial	EN
<i>Berberis chitria</i>	Human interference, Overexploitation, Harvest for medicine, Trade	Commercial	EN
<i>Berberis kashmirana</i>	Fragmentation, Overexploitation, Harvest for medicine, Trade	Domestic	CR
<i>Berberis lycium var. simlensis</i>	Fragmentation, Overexploitation, Harvest for medicine, Trade	Commercial	EN
<i>Berberis petiolaris var. garhwalana</i>	Fragmentation, Human interference, Overexploitation, Harvest for medicine, Trade	Commercial	CR
<i>Bergenia ciliata</i>	Human interference, Overexploitation, Harvest for medicine, Trade	Local, Commercial	VU
<i>Bunium persicum</i>	Overexploitation, Harvest for food, Trade of parts	Local, Domestic, Commercial	EN
<i>Butea monosperma var. lutea</i>	Not known	Not known	DD
<i>Celastrus paniculata</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade for parts	Local, Commercial	LRnt
<i>Cinnamomum tamala</i>	Loss of habitat, Overexploitation, Trade	Local, Commercial	LRnt
<i>Clerodendrum colebrookianum</i>	Loss of habitat, Human interference, Harvest for medicine, Trade	Local	VU
<i>Clerodendrum serratum</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, Domestic, Commercial	VU
<i>Coptis teeta</i>	Loss of habitat, Overexploitation, Trade	Commercial, International	CR
<i>Cordia rothii</i>	Loss of habitat, Harvest for timber, Trade	Commercial	LRnt
<i>Costus lacerus</i>	Not known	Not known	DD
<i>Crateriostigma plantagineum</i>	Trampling, Loss of habitat, Harvest for medicine, Trade	Local	CR
<i>Curculigo orchoides</i>	Loss of habitat, Overexploitation, Trade	Local, Domestic, Commercial	VU
<i>Curcuma angustifolia</i>	Loss of habitat, Fragmentation, Overexploitation, Human interference, Harvest, Trade	Local, Commercial, International	LRnt
<i>Curcuma caesia</i>	Overexploitation, Harvest for medicine, Trade for parts	Local	CR
<i>Dactylorhiza hatagirea</i>	Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR

Taxon	Threats	Trade	IUCN
<i>Delphinium denudatum</i>	Loss of habitat	None	CR
<i>Enoscoorea deltoidea</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Commercial	CR
<i>Drymia indica</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, International	VU
<i>Evolvulus alsinoides</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local	LRnt
<i>Fritillaria roylei</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR
<i>Gastrochilus longiflora</i>	Loss of habitat, Harvest for medicine, Trade	Local	CR
<i>Gentiana kurroo</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, Commercial	CR
<i>Gloriosa superba</i>	Loss of habitat, Overexploitation, Human interference, Harvest for medicine, Trade for parts	Local, Commercial, International	EN
<i>Gymnema sylvestre</i>	Loss of habitat, Human interference, Harvest for medicine, Trade for parts	Local, Domestic, Commercial	VU
<i>Hedychium coronarium</i>	Overexploitation, Harvest for medicine, Trade	Local, Domestic, Commercial	EN
<i>Hedychium spicatum</i>	Loss of habitat, Overexploitation, Trade	Local, Commercial	VU
<i>Heracleum candicans</i>	Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	EN
<i>Hydnocarpus kurzii</i>	Human interference, Harvest for medicine, Trade	Local	EN
<i>Ilex khasiana</i>	Loss of habitat	Not known	CR
<i>Inula racemosa</i>	Loss of habitat, Harvest, Trade	Commercial	CR
<i>Jurinea dolomiaea</i>	Loss of habitat, Trampling, Trade	Local, Commercial	LRnt
<i>Lavatera cashmeriana</i>	Overexploitation, Harvest, Trade	Local, Domestic, Commercial	EN
<i>Luvunga scandens</i>	Loss of habitat, Human interference	Not known	CR
<i>Meconopsis aculeata</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Commercial	CR
<i>Nardostachys jatamansi</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, Commercial, International	CR
<i>Nepenthes khasiana</i>	Loss of habitat, Harvest, Trade	Local	CR
<i>Operculina turpethum</i>	Loss of habitat, Human interference, Harvest for medicine, Trade	Commercial, International	VU
<i>Paeonia emodi</i>	Fragmentation, Overexploitation, Harvest for medicine, Trade	Commercial	VU
<i>Panax pseudo ginseng</i>	Loss of habitat, Harvest for medicine, Trade	Local	CR
<i>Picrorhiza kurroo</i>	Loss of habitat, Overexploitation, Trampling, Harvest for medicine, Trade	Domestic, Commercial, International	EN
<i>Podophyllum hexandrum</i>	Loss of habitat, Fragmentation, Over-exploitation, Harvest for medicine, Trade	Commercial, International	CR
<i>Polygonatum verticillatum</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial, International	EN
<i>Prezowskia tangutica</i>	Trampling	Not known	CR
<i>Rauwolfia serpentina</i>	Loss of habitat, Edaphic factors, Human interference, Overexploitation, Harvest for medicine, Trade for parts	Local, Commercial	EN
<i>Rheum australe</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Local, Commercial	VU
<i>Rheum nobile</i>	Loss of habitat, Harvest for medicine, Trade	Local	EN
<i>Rhododendron anthopogon</i>	Loss of habitat, Human interference	Not known	VU
<i>Rhus semialata</i>	Loss of habitat, Harvest for medicine, Trade	Local, Domestic	VU
<i>Saussurea costus</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Commercial	CR
<i>Saussurea gossypiphora</i>	Loss of habitat, Human interference, Harvest	No	CR

Taxon	Threats	Trade	IUCN
<i>Saussurea obvallata</i>	Fragmentation, Overexploitation, Harvest, Harvest for medicine, Trade for parts	Local	EN
<i>Saussurea simpsoniana</i>	Loss of habitat, Human interference, Harvest for medicine, Trade	Local	EN
<i>Swertia angustifolia</i> var. <i>angustifolia</i>	Loss of habitat, Harvest, Trade	Local	EN
<i>Swertia chirayita</i>	Loss of habitat, Overexploitation, Harvest, Trade	Local, Domestic	CR
<i>Taxus wallichiana</i>	Harvest for medicine, Trade for parts	Commercial, International	CR
<i>Thalictrum foliolosum</i>	Loss of habitat, Fragmentation, Overexploitation, Harvest for medicine, Trade	Commercial	VU
<i>Tylophora indica</i>	Loss of habitat, Human interference, Edaphic factors, Harvest for medicine, Trade	Local, Commercial	VU
<i>Valeriana jatamansi</i>	Loss of habitat, Overexploitation, Harvest for medicine, Trade	Domestic, Commercial	CR

Table 4. Research recommendations as suggested for the assessed taxa

	S	M	T	G	H	Hm	Lh	Lr	PH VA
CR	27	35	2	1	19	33	15	19	34
EN	6	16	0	0	7	15	8	8	13
VU	8	15	0	0	6	14	5	3	9
LRnt	4	6	0	0	6	6	5	1	5
DD	2	1	0	0	0	0	2	1	1

Table 5. Cultivation recommendations

	Cultivation recommendation				
	Level 1	Level 2	Level 3	Level 4	Pending
CR	35	2	22	20	0
EN	12	2	7	11	0
VU	9	0	8	8	0
LRnt	5	1	6	2	0
DD	1	0	2	0	0

Table 6. Comparison of categories of assessed plants and cultivation difficulty

	Level of difficulty			
	Least	Moderate	Very	Unknown
CR	5	5	14	11
EN	4	2	5	5
VU	6	3	1	5
LRnt	1	1	0	5
DD	0	1	0	1



# Taxon Data Sheets

**1. *Aconitum balfourii* Stapf** — CR (A1a, 1c, 1d; B1, 2a, 2b, 2c) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Subalpine to alpine Himalaya. **Global Distribution:** Garhwal to Nepal Himalaya. **Current Regional Distribution:** Garhwal and Kumaon Himalaya. - **Elevation:** 3,000 - 4,500 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Many; Fragmented. **Population Trends - % change.** - **% Decline:** 80 %. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in population numbers and very restricted distribution. **Data Quality:** General field studies; Indirect information. **Recent Field Studies:** L. B. Chaudhary and A. Saklani, 1995-96. **Threats:** Harvest for medicine; Loss of habitat due to fragmentation; Human interference; Overexploitation; Trade. **Trade:** Domestic; Commercial. **Other Comments:** . **Status-IUCN:** **CRITICALLY ENDANGERED (Nationally).** **DATA DEFICIENT (Globally).** **Criteria based on:** **A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, fragmented population, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observations/ comments: L. B. Chaudhary, A. Saklani, R. R. Rao, Stapf, O. (1905). *The Aconites of India: A monograph.* Ann. Roy. Bot. Gard. Calcutta 10(2): 115-197. Rau, M. A. (1981-82). An annotated list of the Indian Ranunculaceae, *J. Mysore Univ.* Sec. B. 28:42-80. **Compilers:** R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mangain, L. B. Chaudhary, A. Saklani.

**2. *Aconitum deinorrhizum* Stapf** — CR (A1a, 1c, 1d; B1, 2a, 2b, 2c) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Alpine grassy slopes. **Global Distribution:** ENDEMIC to the northwestern Indian Himalaya. **Current Distribution:** Jammu & Kashmir and Himachal Pradesh Himalaya. - **Elevation:** 3,000 - 3,500 m. - **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change.** - **% Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Continuing rapid decline. **Data Quality:** General field study; Herbarium studies; Indirect information. **Recent Field Studies:** Police scientists, 1995-96 in Himachal Pradesh. **Threats:** Loss of habitat; Loss of habitat due to fragmentation; Overexploitation; Harvest for medicine; Trade. **Trade:** Domestic; Commercial. **Other Comments:** . **Status-IUCN:** **CRITICALLY ENDANGERED.** **Criteria based on:** **A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, few fragmented populations, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES:** Yes. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Taxonomic studies; Habitat management; Limiting factor research; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing**

**Cultivations:** None. - **Names of facilities:** —. **Sources:** Rao (1993). in: *Flora of India*, Vol I. Eds: Sharma, B. D., Balakrishnan, N. P., Rao, R. R. & Hajra, P. K., Botanical Survey of India, Calcutta. **Compilers:** R. R. Rao, T. Husain, B. Datt, A. K. S. Rawat, T. S. Rana, S. K. Mangain, L. B. Chaudhary, A. Saklani.

**3. *Aconitum falconeri* Stapf** — CR (B1, 2a, 2b, 2c) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Erect herb. **Habitat:** . Sub-alpine to alpine meadows. **Global Distribution:** ENDEMIC to Northwestern Indian Himalaya. **Current Distribution:** Garhwal, Uttar Pradesh Himalaya. - **Elevation:** 3,300 - 4,000 m. - **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** < 6; Fragmented. **Population Trends - % change.** - **% Decline:** 60%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Declining rapidly in restricted distribution. **Data Quality:** General field studies; Herbarium studies; Indirect information. **Recent Field Studies:** L. B. Chaudhary and A. Saklani, 1995-96; L. B. Chaudhary, 1996 (herbarium study). **Threats:** Harvest for medicine; Loss of habitat due to fragmentation; Human interference; Trade. **Trade:** Domestic; Commercial. **Other Comments:** —. **Status-IUCN:** **CRITICALLY ENDANGERED.** **Criteria based on:** **B1, 2a, 2b, 2c** (Restricted distribution, fragmented populations, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Monitoring; Limiting factor research; Habitat management; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observations/ comments: L. B. Chaudhary, A. Saklani, R. R. Rao, Stapf, O. (1905). *The Aconites of India: A monograph.* Ann. Roy. Bot. Gard. Calcutta 10(2): 115-197. Rau, M. A. (1981-82). An annotated list of the Indian Ranunculaceae, *J. Mysore Univ.* Sec. B. 28:42-80. **Compilers:** R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, L. B. Chaudhary, A. Saklani

**4. *Aconitum ferox* Wallich ex Ser.** — CR/R (A1a, 1c, 1d; B1, 2a, 2b, 2c) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** . Temperate to sub alpine, moist forests among shrubs. **Global Distribution:** India, Nepal and Bhutan Himalaya. **Current Regional Distribution:** Western Indian Himalaya. - **Elevation:** 2,100 - 3,800 m. - **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change.** - **% Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in severely fragmented areas of occurrence. **Data Quality:** General field studies; Indirect information. **Recent Field Studies:** L. B. Chaudhary, 1995-96. **Threats:** Loss of habitat due to fragmentation; Overexploitation; Harvest for medicine; Trade. **Trade:** Domestic; Commercial. **Other Comments:** . **Status-IUCN:** **CRITICALLY ENDANGERED (Regionally).** **DATA DEFICIENT (Globally).** **Criteria based on:** **A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, few fragmented locations, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Taxonomic studies; Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recom-**

**mendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: L. B. Chaudhary, R. R. Rao, Rau (1993). in *Flora of India*. Eds. Sharma, B. D., Balakrishnan, N. P., Rao, R. R. & Hajra, P. K., Botanical Survey of India, Calcutta. Polunin O. & A. Stainton (1984). *Flowers of the Himalaya*. Oxford Univ. Press. Delhi. **Compilers:** R. R. Rao, T. Hussain, B. Datt, A. K. S. Rawat, T. S. Rana, S. K. Mamgain., L. B. Chaudhary, A. Saklani.

5. *Aconitum heterophyllum* Wall. ex Royle — CR/N (B1, 2a, 2b, 2c, 2d, 2e) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Sub Alpine and Alpine regions in grassy meadows. **Global Distribution:** Kashmir to Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 3,000 - 4,200 m. - **Range (Sq. km):** About 10,000. - **Area Occupied (Sq. km):** < 2. - **Number of locations:** About 30; Fragmented. **Population Trends - % change. - % Decline:** 60%. - **Time / Rate (Yrs or gens):** 40 years. - **No. of Mature Individuals:** Maximum number in any one location — not more than 500 individuals. **Global Population:** Not known. **Regional Population:** Continuing decline in highly restricted area of occupancy. **Data Quality:** General field study; Herbarium study. **Recent Field Studies:** L. B. Chaudhary, 1995-96, A. K. S. Rawat 1996, A. Saklani, 1994-96. **Threats:** Loss of habitat; Overexploitation; Human interference; Harvest for medicine; Trade. **Trade:** Domestic; Commercial. **Other Comments:** Extensively used in medicine. **Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: B1, 2a, 2b, 2c, 2d, 2e** (Restricted distribution, fragmented population, continuing decline observed in area of occupancy, extent of occurrence, quality of habitat, number of locations or subpopulations and number of mature individuals). - **CITES:** No. - **IWPA (1972; 91):**No. - **National Legislation:**First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 2; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Yes. - **Names of facilities:** High Altitude Plant Physiology Research Centre, Srinagar, Garhwal - 1000 plants in cultivation in two areas. **Sources:** Personal observations/comments: L. B. Chaudhary, A. K. S. Rawat, A. Saklani., R. R. Rao, Stapf, O. (1905). *The Aconites of India: A monograph*. Ann. Roy. Bot. Gard. Calcutta 10(2): 115-197. Aswal, B. S. (1993). Rare or threatened medicinal plants of Garhwal Himal-aya and their conservation pp. 99-105. In : Rajwar, G. S. (ed.) *Ecology and Environment*. Ashish Publ. House, New Delhi. **Compilers:** R. R. Rao, T. Hussain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mamgain., L. B. Chaudhary, A. Saklani.

6. *Aconitum violaceum* Jacq. ex Stapf — CR/N (A1a, 1c, 1d; B1, 2a, 2b, 2c) — **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Erect small herbs. **Habitat:** Alpine Himalaya. **Global Distribution:** Kashmir to Nepal. **Current Regional Distribution:** Indian northwestern Himalaya. - **Elevation:** 3,000 - 5,100 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change. - % Decline:** 80%. - **Time / Rate (Yrs or gens):** 10. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Declining very rapidly in its restricted and severely fragmented distribution. **Data Quality:** General field study; Indirect information. **Recent Field Studies:** L. B. Chaudary and A. Saklani, 1995-96. **Threats:** Harvest for medicine; Loss of habitat due to fragmentation. Human interference; Overexploitation; Trade. **Trade:** Domestic; Commercial. **Other Comments:** . **Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/

or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, few fragmented locations, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:**First Negative List of Exports, 1998.

**Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observations/ comments: L. B. Choudhury, A. Saklani, R. R. Rao, Stapf, O. (1905). *The Aconites of India: A monograph*. Ann. Roy. Bot. Gard. Calcutta 10(2): 115-197. Polunin O. & A. Stainton (1984). *Flowers of the Himalaya*. Oxford Univ. Press. Delhi. **Compilers:** R. R. Rao, T. Hussain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mamgain., L. B. Chaudhary, A. Saklani.

7. *Acorus calamus* L. — VU/R (B1, 2b, 2c) — **Family:** Araceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Swampy and marshy open places. Prefer waterlogged conditions. **Global Distribution:** Asia, Europe and N. America. **Current Regional Distribution:** Totapara, Jaldapara (Bengal), Sikkim, Darjeeling, Meghalaya, Manipur. - **Elevation:** 2,000 - 3,000 m. - **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 2,000. - **Number of locations:** > 10; Fragmented. **Population Trends - % change. - % Decline:** 10%. - **Time / Rate (Yrs or gens):** 20 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Gradual continuing decline in northeastern states. **Data Quality:** Direct field studies; Collections (A. R. K. Sastry and P. K. Hajra). **Recent Field Studies:** Rai and Sharma, G. B. Pant Institute, 1994 in Sikkim; B. S. I., December 1995; WWF, India Sikkim Field Unit. **Threats:** Loss of habitat; Harvest for medicine; Trade. **Trade:** Commercial. **Other Comments:** Plant does not tolerate salinity. Habitat specific. Calcium loving plant. Assessed for southern region in FRLHT CAMP, 1996 and assessed as Vulnerable. Included under negative list of exports. In different habitat conditions, different oil content reported; this aspect must be looked into in greater detail. T. S. Rana & B. Dutt, 1995-96 in Tons Valley. Garhwal Himalaya, A. Saklani 1996 in Uttar Kashi. **Status - IUCN: VULNERABLE (Regionally -Northeastern India). DATA DEFICIENT (Globally). Criteria based on: B1, 2b, 2c** (Restricted distribution, fragmented populations, continuing decline observed in area of occupancy, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):**No. **Recommendations- Research management:** Monitoring; Habitat management. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Least difficult - vegetatively propagated through rhizomes. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: A. R. K. Sastry, Molur, S. and S. Walker (1996). *Report of Conservation Assessment and Management Plan (CAMP II) for southern Indian medicinal plants*, ZOO/CBSG, India, FRLHT. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry., J. H. Lalramnghinglova, S. Chatterjee.

8. *Angelica glauca* Edgew. — CR/R (A1a, 1c, 1d) — **Family:** Apiaceae. **Taxonomic Status:** Species. **Habit:** Tall perennial herb. **Habitat:** Shady, moist slopes. **Global Distribution:** Throughout Himalaya. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,500 - 3,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** 90%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline observed. **Data Quality:** General field studies (M. K. Kaul, 1982 -90 in Kashmir). **Recent Field Studies:** B. S. Aswal, 1978 -93 in Uttar Pradesh Himalaya; N. C. Shah, 1978-

93. in Uttar Pradesh Himalaya; P. B. Singh, 1982-96 in Himachal Pradesh; C. P. Kala, 1993-96. **Threats:** Harvest for medicine; Overexploitation; Trade. **Trade:** Local. **Other Comments:** Used locally. **Status - IUCN:** CRITICALLY ENDANGERED (Regionally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: B. S. Aswal, N. C. Shah, M. K. Kaul, P. B. Singh, C. P. Kala, Singh, P. B., and B. S. Aswal, (1992). *Medicinal Plants of Himachal Pradesh used in India Pharmaceutical Industry*, BMEBR, Vol. 13, No. 3 & 4, pp. 172-208; Shah, N. C., R. Mitra and L. D. Kapoor (1974). *Pharmacognostical Studies of Angelica glauca* Edgew. Bobsi, 16(4)40-47. Kaul, M. K., (1997). Medicinal Plants of Kashmir and Ladakh, (Indus Publ.). Aswal, B. S. (1993) Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation. pp. 99-105. In: Rajwar, G. S. (Ed.), *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt., G. P. Sharma, C. P. Kala.

9. *Aquilaria malaccensis* Lam. — CR/N (A1a, 1c, 1d) — (*Aquilaria gallocha* Roxb.). **Family:** Thymelaeaceae. **Taxonomic Status:** Species. **Habit:** Tree. **Habitat:** Along the foothills and river valleys. **Global Distribution:** N. E. India and Malaysia, Myanmar, Sumatra, Borneo, Philippines, Vietnam, S. China, Kampuchea, Lao, Indonesia (T. C. Whitmore, 1972) and New Guinea (I. H. Burkill, 1966). **Current Regional Distribution:** Northeastern India (Assam plains, and foothills of Arunachal Pradesh & Mizoram). - **Elevation:** 200 - 1,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 2,000. - **Number of locations:** Not known. A few trees observed in Namdapha (Mukherjee, pers. comm.). **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 3 generations (apprx. 100 years). - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline observed. **Data Quality:** Direct field studies; Indirect information. **Recent Field Studies:** J. H. Lalramnghinglova, 1993 & 1996 in Mizoram; P. K. Mukherjee, BSI, 1991 in Namdapha. **Threats:** Loss of habitat; Harvest for medicine; Human interference by shifting cultivation and change in land use; Harvest; Harvest for timber; Trade. **Trade:** Commercial; International. **Other Comments:** Common name - Agarwood, Eaglewood. Probably a population is present in Nagaland; extraction of fungal infected part of hardwood. In 1991, 34,33,000 kg. of Agarwood valued at 62.24 lakh was exported from India to other countries. **Status - IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** Appendix II. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Monitoring; Habitat management. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** - **Names of facilities:** BSI Experimental Garden, Barapani; Assam, Arunachal and Mizoram Forest Departments. **Sources:** Personal observation/ comments: P. K. Mukherjee, J. H. Lalramnghinglova, Giri, G. S., U. Chatterjee & M. K. Manna, Botanical Survey of India in *ENVIS Newsletter*, September 1995, No. 2, pp. 8-10. Ashok Kumar (1994). Director, Traffic-India in: Extract - Distribution and Status of Agarwood published as *Trade in*

*Agarwood* by TRAFFIC India, p. 5. Lalramnghinglova, J. H. (1996). *Ethnobotany of Mizoram - A Preliminary Survey in: J. Econ. Taxon. Bot. Additional Series*, 12. Scientific Publishers, Jodhpur (India), p. 457. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry, J. H. Lalramnghinglova, S. Chatterjee.

10. *Arnebia benthamii* (Wall. ex G. Don) Johnston — CR/N (A1a, 1c, 1d) — (*Macrotomia benthamii* (Wall.) A DC.). **Family:** Boraginaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Open slopes, stoney or rocky substrates in alpine region and subalpine forest of birch and rhododendron. **Global Distribution:** Pakistan to West Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 3,500 - 4,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in numbers. **Data Quality:** General field studies; Informal field sightings. **Recent Field Studies:** M. K. Kaul, 1996 in Kashmir; C. P. Kala, 1996 in Valley of Flowers National Park and Nanda Devi Biosphere Reserve; V. P. Bhatt, 1997; A. Saklani, 1996. **Threats:** Overexploitation; Trade; Harvest; Harvest for medicine. **Trade:** Local; Domestic. **Other Comments:** Traditional medicinal herb commonly used in Unani medicine and local use. Used also as food colour. This herb is also used for herb dyeing. **Status-IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: M. K. Kaul, C. P. Kala, V. P. Bhatt, A. Saklani, Kaul, M. K., (1997). *Medicinal Plants of Kashmir and Ladakh*, Indus Publ. House New Delhi. Aswal, B. S. and B. N. Mehantra (1994). *Flora of Lahul-Spiti*, Bishen Singh and Mahendra Pal Singh. Dehra Dun. **Compilers:** M. K. Kaul, P. B. Singh, S. P. Bhatt, C. P. Kala, B. S. Aswal, N. C. Shah, J. Singh.

11. *Atropa acuminata* Royle ex Lindl. — CR (A1a, 1c, 1d) — **Family:** Solanaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** In open places. **Global Distribution:** Pakistan to Himachal Pradesh. **Current Regional Distribution:** Kashmir and Himachal Pradesh. - **Elevation:** 2,000 - 3,500 m. - **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 2,000. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline. **Data Quality:** General Field study. **Recent Field Studies:** B. S. Aswal, 1977-96. **Threats:** Overexploitation; Loss of habitat; Harvest; Trade. **Trade:** Domestic; Commercial. **Other Comments:** . **Status- IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research; Life history studies. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Moderately difficult (Seed germination erratic). **Existing Cultivations:** Yes. - **Names of facilities:** CIMAP, Lucknow; Experimental at CIMAP farm, Kashmir. **Sources:** Singh, P.

B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in India Pharmaceutical Industry*, BMEBR, Vol. XIII, 3 & 4, 172-208. Jain, S. K and A. R. K. Sastry (1980). *Threatened Plants of India - A State of the Art Report*, MAB, Govt. of India. Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Laddakh*, Indus Publication House, New Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, V. Tandon.

**12. *Baliospermum montanum* Muell.-Arg.— LRnt/R —**  
(*Baliospermum axillare* Bl.; *Baliospermum polyandrum* Wt.; *Jatropha montana* Willd.) **Family:** Euphorbiaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb, undershrub. **Habitat:** Forest openings, edges and wastelands - wet areas. **Global distribution:** Throughout India, Burma, Bangladesh, Malay peninsula. **Current Regional Distribution:** Central India. - **Elevation:** Up to 300 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 25 -30 years - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** General field study; Informal field sighting (G. Pandey, 1970 -77). **Recent Field Studies:** J.K. Maheswari, 1982 -91; H.O. Saxena and M. Brahmam, 1995. **Threats:** Overexploitation; Loss of habitat; Harvest for medicine; Trade. **Trade:** Local; Domestic; Commercial. **Other Comments:** Roots and seeds are collected. Sometimes whole plant is also collected. Trade for production of Ayurvedic Medicines. **Status - IUCN:** LOWER RISK - NEAR THREATENED (Regionally-Central India) DATA DEFICIENT (Globally). **Criteria based on:** Not applicable. - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Husbandry research. - **P.H.V.A.:** Pending. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3; Level 4 - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. **Names of facilities:** —. **Sources:** Chatterjee, A. and S.C. Prakash (1994). *The Treaties of Indian Medicinal Plants*, Vol.3, pp.23. Husain, A. et al. (1992). *Dictionary of Indian Medicinal Plants*, pp.65. Saxena, H.O. and M. Brahmam (1995). *Vascular Flora of Gandhamardan Hills, Orissa*, *J. Econ.Tax.Bot.*, Vol. 19(1), pp. 113-132. Haines, H.H. (1921). *The Botany of Bihar & Orissa*, London, Vol.1-2, pp. 114-115. Kiritkar, K.K. and B.D. Basu (1981). *Indian Medicinal Plants*, Vol. 3, pp. 2278-2279. Raghunathan, K. and Roma Mitra (1982). *Pharmacognosy of Indigenous Drug*, Vol.1, pp. 237-249. **Compilers:** P.C. Kotwal, J.K. Maheshwari, G. Pandey, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, K.K. Singh, S.K. Sen.Drs. P. C. Kotwal, J.K. Maheshwari, E. R. Nayar, N. P. Pradhan, A. K. Sahoo, G. Pandey, S. K. Sen.

**13. *Berberis aristata* DC. — EN/R (A1a, 1c, 1d) —** (*Berberis sikkimensis* (Schneid.) Ahrendt; *Berberis chitria* Lindl. var. *sikkimensis* Schneid; *Berberis micrantha* (Hook. f. & Thoms.) Ahrendt; *Berberis ceratophylla* G. Don.) **Family:** Berberidaceae. **Taxonomic Status:** Species. **Habit:** Spiny shrubs. **Habitat:** Open temperate forests in the Himalaya. **Global Distribution:** India, Nepal and Bhutan Himalaya; Nilgiri Hills; Madhya Pradesh. **Current Regional Distribution:** Indian northwestern Himalaya. - **Elevation:** 1,800 -3,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change - % Decline:** 50%. - **Time / Rate** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid decline in population. **Data Quality:** General field study; Herbarium study; Indirect information. **Recent Field Studies:** T. Husain and B. Datt, 1992-94 in UP and HP Himalaya. **Threats:** Harvest for medicine; Loss of habitat due to fragmentation; Human interference; Trade. **Trade:** Commercial. **Other Comments:** Situation likely to be the same all over the country as species is in heavy trade. **Status - IUCN:** ENDANGERED (Regionally). DATA DEFICIENT (Globally).

**Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Limiting factor research. - **PHVA:** No. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes. - **Names of facilities:** Botanic Gardens at Chaubatiya. **Sources:** Personal observations/ comments: T. Husain, B. Datt, R. R. Rao. Ahrendt, I. W. A. (1961). *Berberis and Mahonia - A taxonomic revision*. *J. Linn. Soc. (Bot.)* 57:101. Banerjee, D. C. (1993). *Berberis* In : B. D. Sharma et al., (ed.) *Flora of India*. 1:381. Caius, J. F. (1986). *The Medicinal and Poisonous Plants of India*, Pp. 178-180. Scientific Publishers, Jodhpur. **Compilers:** R. R. Rao, T. Husain, A. K. S. Rawat, B. Datt, L. B. Chaudhary, A. Saklani.

**14. *Berberis chitria* Lindl. — EN/N (B1, 2c) —** (*Berberis aristata* sensu (*auct.non* DC.) Hook. f. & Thoms.) **Family:** Berberidaceae. **Taxonomic Status:** Species. **Habit:** Spiny shrubs. **Habitat:** Sub-tropical to temperate forests. **Global Distribution:** Northwestern Himalaya extending up to Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 1,500 - 3,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Few; Fragmented. **Population Trends - % change - % Decline:** 40%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Declining in its restricted but severely fragmented distribution. **Data Quality:** General field studies; Herbarium study; Indirect information. **Recent Field Studies:** T. Husain, B. Datt and T. S. Rana, 1992-94 in HP and UP Himalaya. **Threats:** Harvest for medicine; Overexploitation; Human interference. **Trade:** Commercial. **Other Comments:** - **Status - IUCN:** ENDANGERED (Nationally). DATA DEFICIENT (Globally). **Criteria based on:** B1, 2c (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Unknown. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observations/ comments: T. Husain, B. Datt, T. S. Rana, R. R. Rao. Ahrendt, I. W. A. (1961). *Berberis and Mahonia - A taxonomic revision*. *J. Linn. Soc. (Bot.)* 57:97. Jafri, S. M. H. (1975). *Berberidaceae* In: E. Nasir & S. I. Ali (ed.) *Flora of West Pakistan* 87:14. Banerjee, D. C. (1993). *Berberis* In : B. D. Sharma et al., (ed.) *Flora of India*. 1:381. **Compilers:** R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mamgain, L. B. Chaudhary, A. Saklani.

**15. *Berberis kashmirana* Ahrendt. — CR (A1a, 1c, 1d; B1, 2a, 2b, 2c) —** **Family:** Berberidaceae. **Taxonomic Status:** Species. **Habit:** Shrubs. **Habitat:** Subalpine. **Global Distribution:** ENDEMIC to Jammu and Kashmir Himalaya. **Current Distribution:** Jammu & Kashmir Himalaya. - **Elevation:** 3,500 - 4,000 m. - **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change - % Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Continuing rapid decline in restricted and fragmented distribution. **Data Quality:** Herbarium study; Indirect information. **Recent Field Studies:** None. **Threats:** Loss of habitat due to fragmentation; Overexploitation; Harvest for medicine; Trade. **Trade:** Domestic. **Other Comments:** Used as an adulterant of *Berberis aristata*; Recent field studies not undertaken due to inaccessibility of type locality. **Status - IUCN:** CRITICALLY ENDANGERED. **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy,

extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, few fragmented locations, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). - **CITES**: No. - **IWPA (1972; 91)**: No. **Recommendations- Research management**: Survey; Monitoring; Habitat management. - **PHVA**: Yes. **Cultivation Program Recommendations- Cultivation**: Level 1; Level 4. - **Level of difficulty**: Least difficult. **Existing Cultivations**: None. - **Names of facilities**: —. **Sources**: Jafri, S. M. H. 1975. *Berberidaceae* In: E. Nasir & S. I. Ali (ed.) *Flora of West Pakistan* 87:16. Rao, R. R. and Kumar, S. 1993. *Berberis* In : B. D. Sharma et al (ed.) *Flora of India* 1:388. **Compilers**: R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**16. *Berberis lycium* Royle var. *simlensis* Ahrendt.** - EN (B1, 2c) — **Family**: Berberidaceae. **Taxonomic Status**: Variety. **Habit**: Shrubs. **Habitat**: In exposed arid places, subtropical to temperate. **Global Distribution**: ENDEMIC to Indian northwestern Himalaya. **Current Regional Distribution**: Jammu and Kashmir, Himachal Pradesh and Uttar Pradesh Himalaya. - **Elevation**: 1,200 - 2,100 m. - **Range (Sq. km)**: < 5,000. - **Area Occupied (Sq. km)**: < 500. - **Number of locations**: Few; Fragmented. **Population Trends - % change. - % Decline**: 70 %. - **Time / Rate (Yrs or gens)**: 3 generations. - **No. of Mature Individuals**: Not known. **Global Population**: Rapid decline in its restricted and fragmented distribution. **Data Quality**: General field studies; Herbarium study; Indirect information. **Recent Field Studies**: B. Datt and Brij Lal, June 1992; T. Husain and T. S. Rana, 1994; B. Datt and T. S. Rana, 1996. **Threats**: Loss of habitat due to fragmentation; overexploitation; Harvest for medicine. **Trade**: Commercial. **Other Comments**: -. **Status- IUCN**: ENDANGERED. **Criteria based on**: B1, 2c (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES**: No. - **IWPA (1972; 91)**: No. **Recommendations- Research management**: Survey; Monitoring; Habitat management. - **PHVA**: Yes. **Cultivation Program Recommendations- Cultivation**: Level 1; Level 4. - **Level of difficulty**: Least difficult. **Existing Cultivations**: No. - **Names of facilities**: —. **Sources**: Personal observation/ comments: B. Datt, Brij Lal, T. Husain, T. S. Rana, B. Datt. Ahrendt, L. W. A. 1961. *Berberis* and *Mahonia* - A taxonomic revision. *J. Linn. Soc. (Bot.)* 57:88. Uniyal, B. P. and Rao, R. R. 1993. In : B. D. Sharma et al (ed.) *Flora of India*. 1:373. **Compilers**: R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**17. *Berberis petiolaris* Wall. ex G. Don var. *garhwalana* Ahrendt.** — CR (A1a, 1c, 1d; B1, 2a, 2b, 2c) — **Family**: Berberidaceae. **Taxonomic Status**: Variety. **Habit**: Large shrubs. **Habitat**: Exposed slopes in temperate zones. **Global Distribution**: ENDEMIC to Yamuna Valley, Tehri Garhwal Himalaya in Uttar Pradesh. **Current Distribution**: Yamuna Valley, Tehri Garhwal Himalaya. - **Elevation**: 2,400 - 3,000 m. - **Range (Sq. km)**: < 100. - **Area Occupied (Sq. km)**: < 10. - **Number of locations**: 1. **Population Trends - % change. - % Decline**: 80%. - **Time / Rate (Yrs or gens)**: 10. - **No. of Mature Individuals**: Not known. **Global Population**: Restricted area and declining fast. **Regional Population**: . **Data Quality**: General field study; Herbarium study; Indirect information. **Recent Field Studies**: B. Datt and B. Lal, June 1992. **Threats**: Harvest for Medicine; Loss of habitat due to fragmentation; Human interference; Overexploitation; Trade. **Trade**: Commercial. **Other Comments**: . **Status- IUCN**: CRITICALLY ENDANGERED. **Criteria based on**: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2a, 2b, 2c** (Restricted distribution, single location, continuing decline observed in area of occupancy, extent of occurrence and quality of habitat). -

**CITES**: No. - **IWPA (1972; 91)**: No. **Recommendations- Research management**: Survey; Monitoring; Habitat management. - **PHVA**: Yes. **Cultivation Program Recommendations- Cultivation**: Level 1; Level 4. - **Level of difficulty**: Least difficult. **Existing Cultivations**: None. - **Names of facilities**: —. **Sources**: Personal observation/ comments: B. Datt, R. R. Rao. Ahrendt, L. W. A. 1961. *Berberis* and *Mahonia* - A taxonomic revision. *J. Linn. Soc. (Bot.)* 57:88. Chatterjee, R. 1953. Studies on Indian Berberidaceae from botanical, chemical and pharmacological aspects. *Rec. Bot. Surv. India* 16 (2): 15. **Compilers**: R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**18. *Bergenia ciliata* (Haw.) Sternb.** — VU/N (A1a, 1c, 1d; B1, 2c) — **Family**: Saxifragaceae. **Taxonomic Status**: Species. **Habit**: Herb. **Habitat**: Shady and moist rocks. **Global Distribution**: Northwestern Himalaya. **Current Regional Distribution**: Kashmir to Kumaon Himalaya. - **Elevation**: 1,200 - 2,500 m. - **Range (Sq. km)**: > 20,000. - **Area Occupied (Sq. km)**: < 2,000. - **Number of locations**: Many; Fragmented. **Population Trends - % change. - % Decline**: 40%. - **Time / Rate (Yrs or gens)**: 10 years. - **No. of Mature Individuals**: Not known. **Global Population**: Not known. **Regional Population**: Continuing decline observed. **Data Quality**: General field study; Indirect information. **Recent Field Studies**: A. K. S. Rawat, T. S. Rana and B. Datt, 1995-96, A. Saklani, 1994-96. **Threats**: Harvest for medicine; Human interference; Overexploitation; Trade. **Trade**: Local; Commercial. **Other Comments**: . **Status- IUCN**: VULNERABLE (Nationally). **DATA DEFICIENT (Globally)**. **Criteria based on**: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2c** (Restricted distribution, fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES**: No. - **IWPA (1972; 91)**: No. **Recommendations- Research management**: Monitoring; Habitat management; Husbandry research. - **PHVA**: No. **Cultivation Program Recommendations- Cultivation**: Level 1; Level 3; Level 4. - **Level of difficulty**: Moderately difficult. **Existing Cultivations**: Yes. - **Names of facilities**: Chaubatia Garden. **Sources**: Personal observation/ comments: A. K. S. Rawat, T. S. Rana, B. Datt, A. Saklani. Badoni, A. K. (1995). *Garhwal Himalay Main aushdhiya pandon ki jeevic vividhata aivum samrakshan*, Sher, Dehradun. Aswal, B. S. (1993). Rare or threatened medicinal plants of Garhwal Himal-aya and their conservation pp. 99-105. In : Rajwar, G. S. (ed.) *Ecology and Environment*. Ashish Publ. House, New Delhi. **Compilers**: R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**19. *Bunium persicum* Boiss Fedtseb.** — EN/N (A1a, 1c, 1d) — (*Carum bulbocastanum* auct. non Koch.). **Family**: Apiaceae. **Taxonomic Status**: Species. **Habit**: Erect perennial herb. **Habitat**: Common on moist, open slopes. **Global Distribution**: USSR, Afganistan, Pakistan, Kashmir to Garhwal Himalaya. **Current Regional Distribution**: Kashmir to Garhwal Himalaya. - **Elevation**: 2,000 - 3,500 m. - **Range (Sq. km)**: < 20,000. - **Area Occupied (Sq. km)**: < 2,000. - **Number of locations**: Many; Fragmented. **Population Trends - % change. - % Decline**: > 50%. - **Time / Rate (Yrs or gens)**: within 10 years. - **No. of Mature Individuals**: Not known. **Global Population**: Not known. **Regional Population**: Declining steadily. **Data Quality**: General field study; Literature. **Recent Field Studies**: B. S. Aswal and Mehrotra, 1990-91; B. S. Aswal, 1977-96; M. K. Kaul, 1985-93. **Threats**: Overexploitation; Harvest for food; Trade of parts (seeds). **Trade**: Local; Domestic; Commercial. **Other Comments**: Used locally as condiments. Corm rot a serious constraint in cultivation. **Status - IUCN**: ENDANGERED (Nationally). **DATA DEFICIENT (Globally)**. **Criteria based on**: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to

actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91): No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Limiting factor research; Husbandry research. - PHVA: Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Yes. - **Names of facilities:** RRL, Jammu; In some forest areas of Guresh Valley, Kashmir. **Sources:** Personal observation/ comments: B. S. Aswal, M. K. Kaul, Aswal, B. S. and B. N. Mehrotra (1994). *Flora of Lahul-Spiti*, Bishen Singh and Mahendra Pal Singh. Dehra Dun. Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladakh*, Inds Publishing Co., New Delhi. Sarin, Y. K. (1985). *Medicinal and Aromatic Plant Resources in H. P. A present Status and Future Prospects*, First Himachal Science and Technology held at Shimla, Oct. 28 - 31. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala. **20. *Butea monosperma* var. *lutea* (Witt.) Maheshwari — DD/R (*Butea frondosa* Koenig ex Roxb. var. *lutea*.) Family:** Papilionaceae. **Taxonomic Status:** Variety. **Habit:** Small tree. **Habitat:** Dry deciduous forest. **Global distribution:** Central India and Orissa, Gujarat and Maharashtra. **Current Regional Distribution:** Central India. - **Elevation:** 300 m.- **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 100. - **Number of locations:** About 20; Fragmented. **Population Trends - % change- % Decline:** Not known. - **Time / Rate (Yrs or gens):** Not known. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Not known. **Data quality:** General field studies. **Recent Field Studies:** H.O. Saxena and M. Brahmam, 1995. **Threats:** Not known. **Trade:** Not known. **Other Comments:** This variety is mentioned in classical texts. Seed germination slow. **Status - IUCN:** DATA DEFICIENT (Regionally- Central India) DATA DEFICIENT (Globally). **Criteria based on:** Not applicable. - CITES: No. - IWPA (1972; 91): No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Limiting factor research- P.H.V.A.: No. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3- **Level of difficulty:** Moderately difficult. **Existing Cultivations:** Yes- **Names of facilities:** Cultivated in gardens in Delhi and Bombay. **Sources:** Saxena, H.O. and M. Brahmam (1995). *Vascular Flora of Gandhamardan Hills, Orissa, J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. Pandey, G. (1973). *JRINH*, Delhi. Maheshwari, J.K. (1961). *Bull. Bot. Surv. India*, Vol. 3, 91-94. Santapau, H. (1964-65). *Flora of Khandala* Bennet, S.S.R. (1987). *Name changes in Flowering Plants of India and Adjacent Regions*, pp.85. **Compilers:** J.K. Maheshwari, G. Pandey, E.R. Nayar, A.K. Sahoo, Pathak

**21. *Celastrus paniculata* Willd. — LRnt/R (*Celastrus montana* Wight & Arn.) Family:** Celastraceae. **Taxonomic Status:** Species. **Habit:** Straggling woody liana. **Habitat:** Sub-montane forests up to terai region, undergrowths of forests; moist and dry areas of tropical deciduous forests. **Global distribution:** Throughout India. **Current Regional Distribution:** Central India. - **Elevation:** 300 -500 m.- **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Not known. **Population Trends - % change- % Decline:** 50 %. - **Time / Rate (Yrs or gens):** 30 -40 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** Informal field sightings (G. Pandey, 1970-77 in Madhya Pradesh). **Recent Field Studies:** J.K. Maheshwari, 1986-92 in Madhya Pradesh; Saxena and Brahmam, 1995, B. Datt, 1981 -84. **Threats:** Overexploitation; Loss of habitat; Harvest for medicine; Trade of parts (seeds). **Trade:** Local; Commercial. **Other Comments:** Seeds used for oil extraction for medicinal purposes. **Status - IUCN:** LOWER RISK - NEAR THREATENED (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - CITES: No. - IWPA (1972; 91): No. **Recommendations- Research**

**management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research- . P.H.V.A.: Pending. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3- **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** — **Sources:** Saxena, H.O. and M. Brahmam (1995). *Vascular Flora of Gandhamardan Hills, Orissa, J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, pp.142. Chatterjee, A. and S.C. Prakash (1994). *The Treatise of Indian Medicinal Plants*, Vol.3, pp. 160. **Compilers:** P.C. Kotwal, J.K. Maheshwari, G. Pandey, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, K.K. Singh, S.K. Sen.

**22. *Cinnamomum tamala* (Ham.) Nees & Eberm. — LRnt/R — Family:** Lauraceae. **Taxonomic Status:** Species. **Habit:** Small tree. **Habitat:** Subtropical region. **Global Distribution:** Throughout Himalaya. **Current Regional Distribution:** Indian northwestern Himalaya. - **Elevation:** 1,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 20%. - **Time / Rate (Yrs or gens):** 20 yrs. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Gradual continuing decline in population. **Data Quality:** General field study; Literature study. **Recent Field Studies:** P. B. Singh, 1990-96 in HP Himalaya; V. P. Bhatt, 1992-95 in UP Himalaya; N. C. Shah, 1990 -93 in UP Himalaya; C. P. Kala, 1995 in UP Himalaya; B. S. Aswal, 1996 in UP Himalaya. **Threats:** Loss of habitat; Overexploitation; Trade. **Trade:** Local; Commercial. **Other Comments:** *Ex situ* and *in situ* conservation urgently needed. Reforestation recommended to be carried out by Forest Department. Lopping of trees for leaf extraction needs to be stopped. **Status - IUCN:** LOWER RISK-NEAR THREATENED (Regionally -northern India). **DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - CITES: No. - IWPA (1972; 91): No. **Recommendations- Research management:** Habitat management; Monitoring; Life history studies; Husbandry research. - PHVA: Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/comments: P. B. Singh, V. P. Bhatt, N. C. Shah, C. P. Kala, B. S. Aswal, Singh, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. III, No. 3 & 4, p. 172 - 208. Singh, P. B. (1993). *Medicinal Plants of Ayurvedic importance from Mandi dist., of Himachal Pradesh*. BMEBR, Vol. 14(3-4):126-136. **Compilers:** P. B. Singh, J. Singh, B. S. Aswal, N. C. Shah, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala, G. Pandey, V. Tandon.

**23. *Clerodendrum colebrookianum* — VU/N (A1a, 1c, 1d) — Family:** Verbenaceae. **Taxonomic Status:** Species. **Habit:** Shrub. **Habitat:** Subtropical forest undergrowth along forest margins. **Global Distribution:** Northeastern India and Myanmar. **Current Regional Distribution:** Northeastern India. - **Elevation:** 800 - 1,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Many. **Population Trends - % change. - % Decline:** 30%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data Quality:** General field study. **Recent Field Studies:** J. H. Lalramnghinglova, 1996 in Mizoram. **Threats:** Loss of habitat; Human interference; Harvest for medicine; Trade. **Trade:** Local. **Other Comments:** Locally consumed for medicine as well as vegetables. **Status - IUCN:** VULNERABLE (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91): No. **Recommendations- Research management:** Monitoring; Habitat management. - P. H. V. A.: No. **Cultiva-**

**tion Program Recommendations- Cultivation:** Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes. - **Names of facilities:** In home gardens. **Sources:** Personal observation/ comments: J. H. Lalramghinglova. Shah, S. C. *et al* (1991). RAL Jorhat: Current report. Brandis, D. (1906). *Indian Trees*, p. 507. Nath, S. C. & Bordoloi, D. N. (1991). *Clerodendrum colebrookianum*, a Folk Remedy for the Treatment of Hypertension in North-eastern India. In: *Int. J. of. Ethnophy.* 29(2), pp. 127-129. Lalramghinglova, J. H. (1996). Ethnobotany of Mizoram - A Preliminary Survey in: *J. Econ. Taxon. Bot. Additional Series*, 12. p. 458. Scientific Publishers, Jodhpur (India), p. 457. Saklani, A. & S. K. Jain (1994). *Cross-cultural Ethnobotany of Northeast India*, p. 240. Deep Publication, New Delhi. Kanjilal, U. N. A. Das & P. C. Kanjilal (1939). *Flora of Assam*. Vol. III, p. 448. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry, J. H. Lalramghinglova, S. Chatterjee.

**24. *Clerodendrum serratum* (L.) Moon — VU/R (A1c) — Family:** Verbenaceae (Clerodendraceae). **Taxonomic Status:** Species. **Habit:** Woody shrub. **Habitat:** Forest species in tropical moist deciduous forests in moist forests in fertile soil. **Global distribution:** Throughout northern, central, and forested parts of peninsular India and Assam and Bengal upto 1000m. altitude. **Current Regional Distribution:** Central India. - **Elevation:** 400 -500 m.- **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change - % Decline:** 40 -50. % - **Time / Rate (Yrs or gens):** 20 -30 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** Informal field sighting (G. Pandey, 1970 -77). **Recent Field Studies:** J.K. Maheswari, 1982-91; H.O. Saxena and M. Brahmam, 1995. **Threats:** Loss of habitat; Overexploitation; Harvest for medicine; Trade. **Trade:** Local; Domestic; Commercial. **Other Comments:** Widespread collection of whole plant, including roots for medicine. **Status - IUCN:** VULNERABLE (Regionally -Central India) DATA DEFICIENT (Globally). **Criteria based on:** A1c (Population reduction due to decline in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Habitat management; Monitoring; Limiting factor research- P.H.V.A.: Pending. **Cultivation Program Recommendations - Cultivation:** Level 1- **Level of difficulty:** Moderately difficult (Regeneration, germination and seed setting capabilities are poor). **Existing Cultivations:** Yes. - **Names of facilities:** Only in some nurseries. **Sources:** Personal observation/ comments: J.K. Maheswari, G. Pandey Husain, A. *et al* (1992). *Dictionary of Indian Medicinal Plants*, pp.142. Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 132 Saxena, H.O. and M. Brahmam (1995). *Vascular Flora of Gandhamardan Hills, Orissa*, *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. **Compilers:** P.C. Kotwal, J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, K.K. Singh, S.K. Sen.

**25. *Coptis teeta* Wall. — CR (A1a, 1c, 1d) — Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Moist, tropical, shady forest slopes, particularly with humus rich soil. **Global Distribution:** ENDEMIC to Mishmi Hills. **Current Regional Distribution:** Mishmi Hills. - **Elevation:** 2,500 -3,000 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** 8 -10; Fragmented. **Population Trends - % change. - % Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Rapid continuing decline observed in population size. **Data Quality:** General field studies (Mudgal and Jain, 1980; Bhatti and Benniwal, 1988; J. Lal, 1990). **Recent Field Studies:** Forest Deptt. of Arunachal Pradesh, WWF, India, Sikkim. **Threats:** Overexploitation; Loss of habitat; Trade. **Trade:** Commercial; International. **Other Comments:** Prof. C. R. Babu of Delhi University has identified a new subspecies *Coptis teeta*; *lohitisensis* in 1994. Legal trade from

cultivated stock; illegal trade, quantity unknown. **Status- IUCN:** CRITICALLY ENDANGERED. **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Monitoring; Habitat management; Others (agrotechnique should be developed). - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Easy through rhizome. **Existing Cultivations:** Yes. - **Names of facilities:** Cultivated in some parts of Arunachal Pradesh. **Sources:** Jain, S. K. and A. R. K. Sastry (1980). *Threatened Plants of India; a State of the Art Report*. Nayar, M. P. and ARK Sastry, *Red Data Book of Indian Plants*. Jain, S. K. and R. R. Rao (1983). *An Assessment of Threatened Plants of India*. Babu, C. R. (1994). *Botanical J. Linn. Soc.* III 371-378. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, S. Chatterjee, J. H. Lalramghinglova, A. R. K. Sastry.

**26. *Cordia rothii* Roem & Schultz. — LRnt/R — Family:** Ehretiaceae. **Taxonomic Status:** Species. **Habit:** Medium tree. **Habitat:** Mixed dry deciduous forests and scrub forests. **Global distribution:** Throughout India. **Current Regional Distribution:** Throughout central India. - **Elevation:** 300 m.- **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change - % Decline:** 30%. - **Time / Rate (Yrs or gens):** 30 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** Informal field sighting (G. Pandey, 1972); Indirect information. **Recent Field Studies:** None. **Threats:** Harvest for timber; Loss of habitat; Trade. **Trade:** Commercial. **Other Comments:** In crude drug trade. **Status - IUCN:** LOWER RISK - NEAR THREATENED (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research- P.H.V.A.: No. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3- **Level of difficulty:** Moderately difficult. **Existing Cultivations:** Yes. - **Names of facilities:** Avenue trees in New Delhi. **Sources:** Personal observation/ comments: G. Pandey, Maheswari, J.K. (1961). *Flora of Delhi*. CSIR, Delhi Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 141 **Compilers:** J.K. Maheshwari, G. Pandey, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, S.K. Sen.

**27. *Costus lacerus* — DD/N — Family:** Zingiberaceae. **Taxonomic Status:** Species. **Habit:** Shrub (perennial). **Habitat:** Moist and marshy locations. Undergrowth of moist tropical and subtropical forest. **Global Distribution:** Not known. **Current Regional Distribution:** Presumably northeastern India. - **Elevation:** 500 -1,000 m. - **Range (Sq. km):** Not known. - **Area Occupied (Sq. km):** Not known. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** Not known. - **Time / Rate (Yrs or gens):** Not known. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Not known. **Data Quality:** Indirect information. **Recent Field Studies:** BSI field surveys. **Threats:** Not known. **Trade:** Not known. **Other Comments:** Described by Gagnepain. J. H. Ramnghinglova has noted differences in plant size, structure and flower colour in a collection of specimen that he is yet to study critically. **Status- IUCN:** DATA DEFICIENT (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Life history studies. - **P. H. V. A.:** Pending. **Cultivation Program Recommendations- Cultivation:** Pending. - **Level of difficulty:** Not known. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Verma D. M. and A. S. Rao (1971). BSI Bulletin. Books by Holtum.

*Zingiberaceae of Malay Peninsula. Compilers:* P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana. Group Members. Dr. M. S. Mondol, Facilitator. Sudipto Chatterjee. Recorder. Dr. A. R. K. Shastri. Dr. B. C. Pal. Dr. P. K. Mukherjee. Dr. R. R. Rao. Dr. G. S. Giri. Dr. J. H. Lalramnghinglova. Dr. Ved Prakash. *Nepenthes khasiana. Coptis teeta.*

**28. *Craterostigma plantagineum* Hochst. — CR/R (B1, 2c) —**  
**Family:** Scrophulariaceae. **Taxonomic Status:** Species. **Habit:** Small perennial herb. **Habitat:** Exposed, gravelly and shallow soils. **Global distribution:** Tropical Africa, Arabia and continuing upto India. **Current Regional Distribution:** Western parts of Madhya Pradesh, Shivpuri. - **Elevation:** 100 -200 m.- **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** 1. **Population Trends - % change- % Decline:** 80%. - **Time / Rate (Yrs or gens):** 30 years- **No. of Mature Individuals:** not known. **Global Population:** Not known. **Regional Population:** Rapid decline observed and restricted to a single population. **Data quality:** General field studies (J.K. Maheshwari and V. Singh, 1971; G. Pandey, 1971); Informal field sighting. **Recent Field Studies:** R.M. Paimuri, 1990s. **Threats:** Trampling by wild animals; Loss of habitat; Harvest for medicine; Trade. **Trade:** Local. **Other Comments:** Ethnomedicinal. **Status - IUCN:** **CRITICALLY ENDANGERED (Regionally -Central India). DATA DEFICIENT (Globally).** **Criteria based on:** B1, 2c (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No-. **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research- **P.H.V.A.:** Pending. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3- **Level of difficulty:** Not known. **Existing Cultivations:** Not known- **Names of facilities:** —. **Sources:** Personal observation/ comments: J.K. Maheshwari, G. Pandey, G. (1972). *JRNH*, Delhi. Maheshwari, J.K. and V. Singh (1971). *Bull. Bot. Surv. India*, Vol. 13(1): 11-12. **Compilers:** J.K. Maheshwari, G. Pandey, A.K. Sahoo, E.R. Nayar, N.B. Pradhan, S.K. Sen

**29. *Curculigo orchoides* Gaertn. — VU/R (A1a, 1c, 1d) —**  
(*Curculigo malabarica* Wt.). **Family:** Amaryllidaceae. **Taxonomic Status:** Species. **Habit:** Small herb with tuberous roots. **Habitat:** Dry deciduous forest undergrowth in moist shady areas. **Global distribution:** Central, penninsular and western India. **Current Regional Distribution:** Central India. - **Elevation:** 500 -700 m.- **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented Population Trends - % change - % Decline: > 60%. - **Time / Rate (Yrs or gens):** 20 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Gradual continuing decline observed. **Data quality:** General field studies (G. Pandey in Madhya Pradesh, 1970 -78; B.Datt, 1981-84); Informal field sightings. **Recent Field Studies:** J.K. Maheshwari, 1982-91 in tribal tracts of Madhya Pradesh; H.O. Saxena and M. Brahmam, 1995 in Gandhamardan hills. **Threats:** Loss of habitat; Overexploitation; Trade. **Trade:** Commercial; Domestic; Local. **Other Comments:** No cultivation taken up so far; this needs to be done. Used in pharmaceutical industry and in traditional medicines. **Status - IUCN:** **VULNERABLE (Regionally -Central India). DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No-. **IWPA (1972; 91):** No. **Recommendations - Research management:** Monitoring; Habitat management; Life history studies; Husbandry research- **P.H.V.A.:** Yes. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3- **Level of difficulty:** No cultivation done; therefore not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments:

J.K. Maheshwari, G. Pandey, G. A.K., A.K. Sahoo and V. Mdgal (1984). BSI, Howrah. Husain, A. *et al.*, (1992). *Dictionary of Indian Medicinal Plants*, pp.161. Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 151. Saxena, H.O. and M. Brahmam (1995). *Vascular Flora of Gandhamardan Hills, Orissa*, *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. **Compilers:** J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, G. Pandey, S.K. Sen.

**30. *Curcuma angustifolia* Roxb. — LRnt/R' — Family:**  
**Zingiberaceae. Taxonomic Status:** Species. **Habit:** Rhizomatous herb with short stem. **Habitat:** Undergrowth in dry deciduous forests. **Global distribution:** Foothills of Himalaya extending into central and southern India. **Current Regional Distribution:** Central India. - **Elevation:** 500 -800 m.- **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Many. **Population Trends - % change- % Decline:** < 20%. - **Time / Rate (Yrs or gens):** 10 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Declining because of restricted areas and fragmentation, decreasing forest cover and increasing cultivation. **Data quality:** General field studies (G. Pandey, 1970-77); Informal field sightings. **Recent Field Studies:** J.K. Maheshwari, 1982 -91. **Threats:** Overexploitation; Loss of habitat; Loss of habitat due to fragmentation; Human interference; Trade. **Trade:** Local; Commercial; International. **Other Comments:** Collected by locals as coolant, rhizomes exported for good quality starch; no seed set, only propagated by rhizomes. **Status - IUCN:** **LOWER RISK - NEAR THREATENED (Regionally - Central India). DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - **CITES:** No-. **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management- **P.H.V.A.:** Pending. **Cultivation Program Recommendations- Cultivation:** Level 2; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes - **Names of facilities:** Raised at Forest Research Garden, Godbhaga in Bargarh dist., Orissa. **Sources:** Personal observation/ comments: J.K. Maheshwari, G. Pandey, Husain, A. *et al.*, (1992). *Dictionary of Indian Medicinal Plants*, pp.162. Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 151. Haines, H.H. (1921). *The Botany of Bihar & Orissa*, London, Vol. 3-4, pp. 1131-1132 (Re Eds. 1978, M/s BSMPS, Dehradun). Kirtikar, K.K. and B.D. Basu (1981). *Indian Medicinal Plants*, Vol. I, pp. 2418. **Compilers:** P.C. Kotwal, J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, G. Pandey, S.K. Sen.

**31. *Curcuma caesia* Roxb. — CR/R (A1a, 1c, 1d) — Family:**  
**Zingiberaceae. Taxonomic Status:** Species. **Habit:** Rhizomatous herb. **Habitat:** Undergrowth in moist deciduous forest, along edges, opening in marshy areas. **Global distribution:** Central and north-eastern India (North of Bengal). **Current Regional Distribution:** Central India, in pockets around Amarkantak, and Lamni Forest Range, MP. - **Elevation:** 300 -500 m.- **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** About 5. **Population Trends - % change- % Decline:** 90 %. - **Time / Rate (Yrs or gens):** 10 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Very scanty distribution and declining rapidly. **Data quality:** Informal field sightings (G. Pandey, 1970-77; P.C. Kotwal, 1986 in Kanha). **Recent Field Studies:** J.K. Maheshwari, 1991. **Threats:** Harvest for medicine; Overexploitation; Trade of parts. **Trade:** Local. **Other Comments:** . **Status - IUCN:** **CRITICALLY ENDANGERED (Regionally -Central India). DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No-. **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management- **P.H.V.A.:** Pending. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes. - **Names of facilities:** Private individuals and research nurseries

in Jabalpur; Herbal Garden at Narasinghnath and Berhaguda in Bargarh District, Orissa. **Sources:** Personal observation/ comments: P.C. Kotwal, G. Pandey, J.K. Maheswari, Husain, A. *et al.* (1992). *Dictionary of Indian Medicinal Plants*, pp.162. Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 151. Haines, H.H. (1921). *The Botany of Bihar & Orissa*, London, Vol. 3-4, pp. 1131-1132 (Re Eds. 1978, M/S BSMPS, Dehradun). **Compilers:** G. Pandey, P.C. Kotwal, J.K. Maheswari, S.K. Sen, E.R. Nayyar

**32. *Dactylorhiza hatagirea* D. Don — CR/R (A1a, 1c, 1d) —** (*Orchis latifolia* auct non Linn.) **Family:** Orchidaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Subalpine and Alpine Meadows. **Global Distribution:** Western Pakistan, Kashmir, Sikkim, Bhutan, southeastern Tibet. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,500-4,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing rapid decline. **Data Quality:** General field study. **Recent Field Studies:** N. C. Shah, 1993 in Uttar Pradesh hills; B. S. Aswal, 1980-92 in Uttar Pradesh hills and Himachal Pradesh; V. P. Bhatt in Uttar Pradesh hills; A. Saklani, 1994-96; C. P. Kala, 1993-95 in Uttar Pradesh hills; P. B. Singh, 1986-96 in Himachal Pradesh. **Threats:** Overexploitation; Harvest for medicine; Trade. **Trade:** Domestic; Commercial. **Other Comments:** Tissue culture studies under progress at CIMAP, Palampur and Research station at Bhowali. Ban on wild collection recommended urgently. **Status - IUCN:** CRITICALLY ENDANGERED (Regionally - northern India). **DATA DEFICIENT (Globally).** **Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Moderately difficult (seed germination is erratic). **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: P. B. Singh, V. P. Bhatt, N. C. Shah, C. P. Kala, B. S. Aswal, Shah, N. C. (1983). Endangered Medicinal and Aromatic Taxa of UP Himalaya In: *An Assessment of Indian Threatened Plants* (Editors: S. K. Jain and R. R. Rao) B. S. I., Calcutta, pp. 40-49. Singh, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, B. M. B. E. R., Vol. 13 (3-4), 172-208. Aswal, B. S. (1993), Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation. pp. 99-105. In Rajwar, G. S. (Ed.), *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. Aswal, B. S. and B. N. Mehantra, (1994). *Flora of Lahul-Spiti*, Bishen Singh and Mahendra Pal Singh. Dehra Dun. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, V. P. Bhatt, G. P. Sharma, C. P. Kala.

**33. *Delphinium denudatum* Wall. ex Hook. f. & Thoms. — CR/N (A1a, 1c; B1, 2c) —** **Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Open grasslands and margins of fields. **Global Distribution:** Pakistan to Central Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,500 - 3,000 m. - **Range (Sq. km):** < 500. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Extremely rare in occurrence (No established population existing). **Data Quality:** General field survey. **Recent Field Studies:** M. K. Kaul, 1985-93; C. P. Kala, 1993-96; V. P. Bhatt, 1997; T. S. Rana & B. Datt., 1995-96 in

Garhwal Himalaya (Tons Valley); B. S. Aswal, 1990. **Threats:** Loss of habitat. **Trade:** Not in trade because of its rarity. **Other Comments:** Since this is a rarely occurring plant, it is not possible to collect it for experimental purpose. *Ex situ* cultivation urgently required. **Status- IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on: A1a, 1c** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat); **B1, 2c** (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat Management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: M. K. Kaul, C. P. Kala, T. S. Rana, B. Datt., V. P. Bhatt, B. S. Aswal, Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladhak*, Indus Publishing Co., New Delhi. Aswal, B. S. (1993). Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation. pp. 99-105. In Rajwar, G. S. (Ed.), *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. **Compilers:** M. K. Kaul, N. C. Shah, C. P. Kala, V. P. Bhatt, P. B. Singh, B. S. Aswal, J. Singh.

**34. *Dioscorea deltoidea* Wall. ex Kunth. — CR/R (A1a, 1c, 1d) —** **Family:** Dioscoreaceae. **Taxonomic Status:** Species. **Habit:** Perennial twining herb. **Habitat:** Open places. **Global Distribution:** Kashmir to Assam, Indo China, West China. **Current Regional Distribution:** Indian northwestern Himalaya. - **Elevation:** 1,500 - 2,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in population. **Data Quality:** General field study; Literature study (N. C. Shah, 1983). **Recent Field Studies:** M. K. Kaul, 1985-93; B. S. Aswal, 1988-91; T. S. Rana and D. Bhatt, 1995-96; P. B. Singh, 1986-96 in Himachal Pradesh. **Threats:** Loss of habitat; Overexploitation; Harvest for medicine; Trade. **Trade:** Commercial. **Other Comments:** *In situ* and *ex situ* conservation both urgently needed. Agrotechnology has been developed by CIMAP, Lucknow and RRL, Jammu. **Status- IUCN:** CRITICALLY ENDANGERED (Regionally - northern India). **DATA DEFICIENT (Globally).** **Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Habitat management; Monitoring; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1. - **Level of difficulty:** Moderately difficult because propagation is erratic. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: M. K. Kaul, C. P. Kala, T. S. Rana, B. Datt., B. S. Aswal, Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladakh*. Indus Publishing Co., New Delhi. Shah, N. C. (1983). Endangered Medicinal and Aromatic Taxa of Himalaya. In: *An Assessment of Threatened Plants of India*, Eds. S. K. Jain and R. R. Rao. Aswal, B. S. (1994) *Flora of Lahul-Spiti*, Bishen Singh, Mahendra Pal Singh., Dehra Dun. Singh, P. B. and B. S. Aswal (1992). *Medicinal plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, 13: 172-208. Singh, P. B. (1995). Studies on Dioscoreacea of Himachal Pradesh: Systematic, Ethnobotanical and Conservation aspects. *Seminar on Research in Ayurvedic. & Siddha*, March 20-22, 1995. CLRHS, New Delhi, Abstract 75-76. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, V. P. Bhatt., G. P. Sharma, C. P. Kala, V. Tandon.

35. *Drymia indica* (Roxb.) Jessop. — VU/R (A1a, 1c, 1d) — (*Urginea indica* (Kunth.) Roxb.; *Scilla indica* Roxb. non (Wt.) Baker). **Family:** Liliaceae. **Taxonomic Status:** Species. **Habit:** Bulbous herbs. **Habitat:** Rocky places along streams. **Global distribution:** Throughout India. in sandy soils near sea, in dryer hills of lower Himalaya, on salt range at 600 m. Bihar, Penninsular India, Tropical Africa. **Current Regional Distribution:** Central India. - **Elevation:** 500 - 700 m. - **Range (Sq. km):** < 5,000 - **Area Occupied (Sq. km):** < 500 - **Number of locations:** About 100. **Population Trends - % change - % Decline:** 60%. - **Time / Rate (Yrs or gens):** 20 years - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** General field studies (G. Pandey, 1970-77 in Gwalior and western MP). **Recent Field Studies:** J.K. Maheshwari, 1982-91 in western MP and eastern Rajasthan; B.M. Singh of NBPGR, 1994 in parts of Rajasthan and UP; B.Datt, 1981-84. **Threats:** Overexploitation; Loss of habitat; Harvest for medicine; Trade. **Trade:** Local; International. **Other Comments:** Exported as Indian squall; loss of general variability. Useful in asthma and cough (bulbs). Used in traditional and tribal medicines and has been recently accepted in modern medicine. Agrotechnique needs to be standardised. Material preserved at NBPGR, Pusa Campus, New Delhi. **Status - IUCN:** VULNERABLE (Regionally - Central India) DATA DEFICIENT (Globally). **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Habitat management; Life history studies; Monitoring; Husbandry research. - **P.H.V.A.:** Yes. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Haines, H.H. (1924). *The Botany of Bihar & Orissa*. London, Vol. 5-6, pp. 1096 (Re Eds. 1978, M/S MSBPS, Dehradun). Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, pp. 479-480. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, pp. 66. Kirtikar & Basu (1981). *The Indian Medicinal Plants*, pp. 2518. Saxena, H.O. and M. Brahmam (1995). Vascular Flora of Gandhamardan Hills, Orissa, *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. **Compilers:** J.K. Maheshwari, G. Pandey, N.B. Pradhan, S.K. Sen, A.K. Sahoo, E.R. Nayar, P.C. Kotwal

36. *Evolvulus alsinoides* L. — LRnt/R — (*Evolvulus hirtus* Lam.; *Evolvulus angustifolia* Roxb.; *Convolvulus alsinoides* L.). **Family:** Convolvulaceae. **Taxonomic Status:** Species. **Habit:** Prostrate herb. **Habitat:** Moist open fields. **Global distribution:** Throughout India and adjacent regions. **Current Regional Distribution:** Central India. - **Elevation:** About 2,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many. **Population Trends - % change - % Decline:** < 10%. - **Time / Rate (Yrs or gens):** 30 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing gradual decline observed. **Data quality:** General field study; Informal field sightings. **Recent Field Studies:** H.O. Saxena and M. Brahmam, 1995; B. Datt, 1981-84. **Threats:** Loss of habitat; Overexploitation; Harvest for medicine; Trade. **Trade:** Local. **Other Comments:** Trade for local pharmaceutical purposes. Used as fodder. **Status - IUCN:** LOWER RISK - NEAR THREATENED (Regionally - Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** Not applicable. - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations - Research management:** Monitoring; Life history studies; Husbandry research; Habitat management. - **P.H.V.A.:** No. **Cultivation Program Recommendations - Cultivation:** Level 3 - **Level of difficulty:** Not known. **Existing Cultivations:** None - **Names of facilities:** —. **Sources:** Warrier, P.K. et al., (1995). *Indian Medicinal Plants - A Compendium of 500 Species*, pp. 11. Saxena, H.O. and M. Brahmam (1995). Vascular Flora of Gandhamardan Hills, Orissa, *J. Econ. Tax. Bot.*, Vol.

19(1), pp. 113-132. Pandey, G. (1973). *JRINH*. Delhi Goel, A.K., A.K. Sahoo and V. Mudgal (1984). BSI, Howrah. **Compilers:** J.K. Maheshwari, G. Pandey, G.K. Sahoo, N.B. Pradhan, S.K. Sen

37. *Fritillaria roylei* Hook. — CR/N (A1a, 1c, 1d) — **Family:** Ariaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Open alpine meadows. **Global Distribution:** Temperate Himalaya to Western Tibet. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 3,000 - 3,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in population numbers. **Data Quality:** Field studies. **Recent Field Studies:** M. K. Kaul, 1980-93; P. B. Singh & B. S. Aswal, 1987-92; C. P. Kala, 1996 in Valley of Flowers National Park; V. P. Bhatt, 1996; N. C. Shah, 1990-94. **Threats:** Overexploitation; Habitat destruction; Harvest for medicine; Trade. **Trade:** Domestic; Commercial. **Other Comments:** Important component of Ashtwarga (a combination of 8 rejuvenating drugs. in preparation of the famous Ayurvedic tonic 'Chyavanprash'). **Status - IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments : M. K. Kaul, P. B. Singh, B. S. Aswal, C. P. Kala., V. P. Bhatt, N. C. Shah, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Pharmaceutical Industry*, BMEBR 13(3-4): 172-208. Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladakh*. Indus Publishing Co., New Delhi. **Compilers:** B. S. Aswal, P. B. Singh, M. K. Kaul, G. P. Sharma, V. P. Bhatt, C. P. Kala, N. C. Shah.

38. *Gastrochilus longiflora* — CR/N (B1, 2c) — **Family:** Zingiberaceae. **Taxonomic Status:** Species. **Habit:** Perennial stemless herb. **Habitat:** Epiphyte on tree trunks in moist, broad-leaved subtropical forests. **Global Distribution:** Sikkim Himalaya, Northeast India, Myanmar and Malacca. **Current Regional Distribution:** Meghalaya, Mizoram, Arunachal Pradesh. - **Elevation:** 1,000 - 1,500 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** 1-2; Fragmented. **Population Trends - % change - % Decline:** 20%. - **Time / Rate (Yrs or gens):** 20 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing gradual decline observed. **Data Quality:** Direct and indirect field studies. **Recent Field Studies:** J. H. Lalramnghinglova, 1995 & 1996 in Mizoram; Ketaki, Jain and Sastry, 1994. **Threats:** Harvest for medicine; Loss of habitat; Trade. **Trade:** Local. **Other Comments:** Low density species. **Status - IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** B1, 2c (Restricted distribution, fragmented populations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Tissue culture; Limiting factor research; Habitat management. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Very Difficult. Slow in proliferation. **Existing Cultivations:** Yes. - **Names of facilities:** Domestication only. **Sources:** Personal observation/ comments: J. H. Lalramnghinglova, A. R. K. Sastry, Ketaki, Jain, and Sastry (1984). *Endemic Orchids of Northeast India*. S. N. Hegde, SFRL, Arunachal Pradesh. Hooker, J. D. (1890).

*Flora of British India*, p. 217. Rao, A. S. & D. M. Verma (1972). Materials towards a Monocot Flora of Assam II (Zingiberaceae & Marantaceae) in: *Bull. Bot. Surv. India*. Vol. 14. Nos. 1-4, p. 123. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry, J. H. Lalramghinglova, S. Chatterjee.

**39. *Gentiana kurroo* Royle — CR/N (A1a, 1c, 1d) — Family:** Gentianaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** In Quercus forests, on bare hills and edges of rocks. **Global Distribution:** Pakistan to Uttar Pradesh hills. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,000 -4,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing rapid decline in population. **Data Quality:** General field study; Literature study (Shah, 1975). **Recent Field Studies:** P. B. Singh, 1986-96 in Himachal Pradesh; M. K. Kaul, 1980-93 in Kashmir. **Threats:** Loss of habitat; Overexploitation; Trade; Harvest for medicine. **Trade:** Local; Commerical. **Other Comments:** *In situ* as well as *ex situ* is urgently needed. **Status- IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: P. B. Singh, M. K. Kaul, Singh, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13, Nos. 3-4, p. 172-208. Shah, N. C. (1983). Endangered Medicinal and Aromatic Taxa of U. P. Himalaya In: *An Assessment of Threatened Plants of India*, Eds. S. K. Jain and R. R. Rao, pp. 40-49. Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladakh*, Indus Publishing Co., New Delhi. Singh, P. B. (1993). *Medicinal Plants of Ayurvedic Importance from Mandi. district of Himachal Pradesh*, BMEBR 14(3-4):126-136. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala, V. Tandon.

**40. *Gloriosa superba* L. — EN/R (A1a, 1c, 1d; B1, 2c) — Family:** Liliaceae. **Taxonomic Status:** Species. **Habit:** Straggling herb with tuberous roots. **Habitat:** Along edges of moist tropical forest. **Global distribution:** Throughout tropical India from the North West Himalaya to Assam extending to Burma, Malacca and Sri Lanka. **Current Regional Distribution:** Tropical hills of Central India. - **Elevation:** Upto 2,350 m. - **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Many; Fragmented. **Population Trends - % change - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid decline in population with introduction of soybean cultivation. **Data quality:** General field studies (B. Datt, 1981-84 in Chhatarpur, Madhya Pradesh); Informal field studies; Indirect information. **Recent Field Studies:** H. O. Saxena and M. Brahman, 1995; . **Threats:** Overexploitation; Loss of habitat; Human interference; Harvest for medicine; Trade of parts (roots). **Trade:** Local; International; Commercial. **Other Comments:** Exported for alkaloids, Slow growth of plants; no seed setting observed; propagation only by tuberous roots which is the main source of raw material. Plants available with Althea Chemicals (M.P. Shiva). Traded for medicinal and ornamental purposes. **Status - IUCN:** ENDANGERED (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c,

1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2c** (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Habitat management; Limiting factor research. - **P.H.V.A.:** Yes. **Cultivation Program Recommendations - Cultivation:** Level 2. - **Level of difficulty:** Moderately difficult. **Existing Cultivations:** Yes. - **Names of facilities:** Plants commonly introduced into gardens as ornamental all over the region. Practice of agrotechnologies documented by K. Raghunathan and Roma Mitra. **Sources:** Personal observation/ comments: M.P. Shiva Haines, H.H. (1924). *The Botany of Bihar & Orissa*, London, Vol. 5-6, pp. 1093-1094 (Re Eds, 1978, M/S MSBPS, Dehradun). Saxena, H.O. and M. Brahman (1995). Vascular Flora of Gandhamardan Hills, Orissa, *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, pp. 224. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, pp. 238. Atal, C.K. and B.M. Kapur (Ed) (1982). *Cultivation and Utilisation of Medicinal Plants*, pp. 270-278. RRL, Jammu-Tawi. Raghunathan, K. and Roma Mitra (1982). *Pharmacognosy of Indigenous Drugs*, Vol. 2, pp. 595-606. Anon. (1989). *Institute of Deciduous Forests Technical Bulletin*, Vol. 1. S.S. Bisen and G.N. Kharkwal. Minor forest product (Medicinal Plants). **Compilers:** P.C. Kotwal, J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, G. Pandey, S.K. Sen.

**41. *Gymnema sylvestre* (Retz) R. Br. — VU/R (A1a, 1c, 1d; B1, 2c) — (*Asclepias germinata* Roxb.). Family:** Asclepiadaceae. **Taxonomic Status:** Species. **Habit:** Climber. **Habitat:** Deciduous forests. **Global distribution:** Throughout India in dry forests upto 600 m. **Current Regional Distribution:** Central India. - **Elevation:** 200 -300 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Many; Fragmented. **Population Trends - % change - % Decline:** 25%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing declining observed. **Data quality:** General field studies; Informal field sightings (G. Pandey, 1970-77). **Recent Field Studies:** J.K. Maheshwari, 1982-91; H.O. Saxena and M. Brahman, 1990-95; B. Datt, 1981-84. **Threats:** Loss of habitat; Harvest for medicine; Human interference (forest fire); Trade of parts (roots). **Trade:** Local; Commerical; Domestic. **Other Comments:** Leaves are used in drahetis to induce glycosuria. Dried leaf powder improves efficiency of pancreas. Roots are emetic and expectorant. Being traded for herbal crude drug. **Status - IUCN:** VULNERABLE (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); **B1, 2c** (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Habitat management; Monitoring. - **P.H.V.A.:** No. **Cultivation Program Recommendations - Cultivation:** Level 1; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** - **Names of facilities:** Seedlings being raised at Barhaguda & Narasinghnath Herbal Garden of Social Forestry Project, Barghar Division, Orissa for distribution under farmforestry to local Vaidyas. **Sources:** Saxena, H.O. and M. Brahman (1995). Vascular Flora of Gandhamardan Hills, Orissa, *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. Anon. (1989). *Minor Forest Produce Technical Bulletin* No. 1, Jabalpur. Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, pp. 231. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, pp. 251-252. Warrier, P.K. et al., (1995). *Indian Medicinal Plants - A Compendium of 500 Species*, pp. 107. **Compilers:** J.K. Maheshwari, G. Pandey, S.K. Sen, N.B. Pradhan, A.K. Sahoo, P.C. Kotwal, E.R. Nayar

**42. *Hedychium coronarium* Koering — EN/R (B1, 2c) — Family:**

Zingiberaceae. **Taxonomic Status:** Species. **Habit:** Herb (perennial and rhizomatous). **Habitat:** Moist tropical forest near streams and canals. **Global distribution:** Sal forests throughout central India, Santal Pragnas, Chhota Nagpur, Mayurbhanj Dist. (Orissa), Jalpaiguri dist. **Current Regional Distribution:** Amarkantak in Madhya Pradesh and Chota Nagpur area. - **Elevation:** 700 -1,000 m.- **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 100. - **Number of locations:** 2. **Population Trends - % change- % Decline:** 80 - 90%. - **Time / Rate (Yrs or gens):** 50 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline in restricted distribution. **Data quality:** Informal field sightings. **Recent Field Studies:** J.K. Maheshwari in Amarkantak, 1991 & 1993; P.C. Kotwal, 1993. **Threats:** Overexploitation; Harvest for medicine; Trade. **Trade:** Domestic; Commercial; Local. **Other Comments:** Cultivated in restricted scale by individuals; flowers collected by private pharmacies and used to make eye medicine. It is a cottage industry. **Status - IUCN:** ENDANGERED (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** B1, 2c (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management. - **P.H.V.A.:** Yes. **Cultivation Program Recommendations - Cultivation:** Level 2; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Experimental trials for cultivation in progress- **Names of facilities:** TFRI, Jabalpur; SFRI, Jabalpur. **Sources:** Haines, H.H. (1924). *The Botany of Bihar & Orissa*, London, Vol. 5-6, pp. 1138.(Re Eds, 1978, M/S MSBPS, Dehradun). Saxena, H.O. and M. Brahmam (1995). Vascular Flora of Gandhamardan Hills, Orissa, *J. Econ.Tax.Bot.*, Vol. 19(1), pp. 113-132. Husain, A. et al. (1992). *Dictionary of Indian Medicinal Plants*, pp.234. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, pp. 257-258 **Compilers:** P.C. Kotwal, J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, G. Pandey, S.K. Sen.

43. *Hedychium spicatum* Ham. ex Sm. — VU/N (A1a, 1c, 1d) — **Family:** Zingiberaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Moist and shady places. **Global Distribution:** Himachal Pradesh to Kumaon, Nepal. **Current Regional Distribution:** Uttar Pradesh and Himachal Pradesh Himalaya. - **Elevation:** 1,500 -2,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 20%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline in population. **Data Quality:** General field study; Literature study. **Recent Field Studies:** V. P. Bhatt; 1996; N. C. Shah, 1990 - 96 in Uttar Pradesh; P. B. Singh, 1986 -96 in Himachal Pradesh; B. S. Aswal, 1985 -95. **Threats:** Overexploitation; Trade; Loss of habitat. **Trade:** Local; Commercial. **Other Comments:** *In situ* and *ex situ* conservation is needed. **Status - IUCN:** VULNERABLE (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):**No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: V. P. Bhatt, N. C. Shah, P. B. Singh, B. S. Aswal, Singh, P. B. and B. S. Aswal. (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13, Nos. 3 & 4, pp. 172 -208. Singh, P. B. (1993). *Medicinal Plants of Ayurvedic Importance from Mandi district of Himachal Pradesh*, BMEBR 14(3-4):126-136. Aswal, B. S.

(1993). Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation pp. 99-105. In Rajwar, G. S. (Ed. ), *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala, V. Tandon.

44. *Heracleum candicans* Wall. ex DC. — EN/R (A1a, 1c, 1d) — (*Heracleum lanatum* Mictux). **Family:** Apiaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Along water courses, amongst stones and open slopes. **Global Distribution:** Kashmir to Bhutan, Tibet, Yuman. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 1,500 -2,600 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 50%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Decline in population. **Data Quality:** General field study (N. C. Shah, B. S. Aswal, G. Pandey, J. Singh and B. P. Bhatt in Uttar Pradesh Hills, 1985 -90). **Recent Field Studies:** M. K. Kaul and V. Singh, 1980-93 in Kashmir, P. B. Singh and B. S. Aswal, 1986-96 in Himachal Pradesh. **Threats:** Overexploitation; Trade; Harvest for medicine. **Trade:** Domestic; Commercial. **Other Comments:** Ban on extraction on wild sources should be imposed and cultivation is required for commercial use. In Kashmir Himalaya, the plant population declined by 90% during 1980 -90 and after 1990, the plant population has replenished. In UP and HP the population is stable. Agrotechnology developed at Regional Research Laboratory, Jammu. **Status - IUCN:** ENDANGERED (Regionally -northern India). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 4. - **Level of difficulty:** Moderately difficult as seed germination is erratic. **Existing Cultivations:** Yes. - **Names of facilities:** R. R. L. Jammu. **Sources:** Personal observation/ comments: N. C. Shah, B. S. Aswal, G. Pandey, J. Singh, B. P. Bhatt, M. K. Kaul, V. Singh, P. B. Singh, Kaul, M. K. and V. Singh. (1985). Conserve Himalayan Hogweed, *Himalayan Plant Journal*, 3(6), 42-49. Kaul, M. K. (1989). *Himalayan Heracleum Linn. (Hogweed)- A Review*, Regional Research Laboratory, CSIR, Aswal, B. S. and B. N. Mehrotra (1994). *Flora of Lahul-Spiti*, Bishen Singh and Mahendra Pal Singh. Dehra Dun. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala.

45. *Hydnocarpus kurzii* — EN/N (A1c, 1d) — **Family:** Flacourtiaceae. **Taxonomic Status:** Species. **Habit:** Tree. **Habitat:** Tropical evergreen forests. **Global Distribution:** Northeastern India and Myanmar. **Current Regional Distribution:** Northeastern India. - **Elevation:** 200 -800 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** < 20. **Population Trends - % change. - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 10. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing rapid decline. **Data Quality:** General field studies; Indirect information. **Recent Field Studies:** J. H. Lalramghinglova, 1996 in Mizoram. **Threats:** Harvest for medicine; Human interference; Trade. **Trade:** Local. **Other Comments:** Oil extracted from fruits is used for skin diseases. sent to states outside Mizoram a few decades back. **Status-IUCN:** ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1c, 1d (Population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):**No. **Recommendations- Research manage-**

**ment:** Monitoring; Habitat management; Silviculture techniques to be developed; Life history studies; Husbandry research. - P. H. V. A.: Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Unknown. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: J. H. Lalramnghinglova, Mitra, R. L. (1993). *Flora of India*, Vol. 1. BSI, Brandis, D. (1906). *Indian Trees*, p. 42. Kanjilal, U. N., A. Das & P. C. Kanjilal (1934). *Flora of Assam*. Vol. I, p. 87-88. Lalramnghinglova, J. H. (1996). Ethnobotany of Mizoram - A Preliminary Survey in: *J. Econ. Taxon. Bot. Additional Series*, 12, p. 449. Scientific Publishers, Jodhpur (India), p. 457. Saklani, A. & S. K. Jain (1994). *Cross-cultural Ethnobotany of Northeast India*, p. 128. Deep Publication, New Delhi. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana.

**46. *Ilex khasiana* — CR (B1, 2c; C2b; D) — Family:** Aquifoliaceae. **Taxonomic Status:** Species. **Habit:** Tree. **Habitat:** Sub-tropical mixed evergreen forests. **Global Distribution:** ENDEMIC to Khasi Hills. **Current Regional Distribution:** Khasi Hills. - **Elevation:** 1,000 - 1,500 m. - **Range (Sq. km):** < 100. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** 1 (Shillong peak). **Population Trends - % change, - % Decline:** > 30%. - **Time / Rate (Yrs or gens):** 3 generations. - **No. of Mature Individuals:** 3 - 4. **Global Population:** 3 to 4 individuals extant. **Data Quality:** General field study. **Recent Field Studies:** R. R. Rao, 1991 in Shillong Peak; BSI between 1985-1995, Floristic surveys. **Threats:** Loss of habitat. **Trade:** Not known. **Other Comments:** Studies done mostly by visual observations. **Status - IUCN: CRITICALLY ENDANGERED- Criteria based on:** B1, 2c (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat); C2b (Continuing decline observed in mature individuals and all individuals are in a single population); D (population number less than 50 mature individuals). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Life history studies; Limiting factor research (regeneration studies); Husbandry research (trials for multiplication and research on reproductive biology). - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** No existing cultivations. - **Names of facilities:** —. **Sources:** Personal observation/ comments: R. R. Rao, G. S. Giri, Kanjilal et al, (1938-40). *Flora of Assam*. Rao, R. R. and Haridasan (1985). *Forest Flora of Meghalaya*. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry, J. H. Lalramnghinglova, S. Chatterjee.

**47. *Inula racemosa* Hook. f. — CR/N (A1a, 1c, 1d) — Family:** Asteraceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Cultivated areas, forest clearings and shrubberies. **Global Distribution:** Afghanistan to Central Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,000 - 3,200 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change, - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in population. **Data Quality:** General field study. **Recent Field Studies:** M. K. Kaul, 1980 -93; B. S. Aswal, 1985 -94; C. P. Kala, 1995. **Threats:** Loss of habitat; Harvest; Trade. **Trade:** Commercial. **Other Comments:** Roots used as an adulterant for *Saussurea costus*. Information regarding planting material can be got from CDRI and RRC from CCRAS in Mandi. **Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research**

**management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Not known. **Existing Cultivations:** Yes. - **Names of facilities:** Experimental and commercial cultivation in HP. **Sources:** Personal observation/ comments: M. K. Kaul, B. S. Aswal, C. P. Kala, Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladhak*, Indus Publishing Co., New Delhi; Aswal, B. S. and B. N. Mehrotra (1994). *Flora of Lahaul-Spiti*. Bishen Singh Mahendra Pal Singh, Dehra Dun. Singh, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13, Nos. 3 & 4, pp. 172 -208. **Compilers:** M. K. Kaul, P. B. Singh, V. P. Bhatt, C. P. Kala, B. S. Aswal, N. C. Shah, J. Singh.

**48. *Jurinea dolomiæa* Boiss. — LRnt — (*Jurinea macrocephala* (Royle) Clark). **Family:** Asteraceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Grassland and open meadows in sub alpine and alpine area. **Global Distribution:** Western Himalaya, Pakistan to Central Nepal. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 3,000 - 4,200 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change, - % Decline:** > 50%. - **Time / Rate (Yrs or gens):** 50 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Gradual decline. **Data Quality:** General field study; Informal field sighting. **Recent Field Studies:** M. K. Kaul, 1995; V. P. Bhatt, 1997; C. P. Kala, 1995; A. Saklani, 1995-96; B. S. Aswal, 1990-93. **Threats:** Trade; Trampling; Loss of habitat. **Trade:** Local; Commercial. **Other Comments:** Used as an incense. **Status - IUCN: LOWER RISK — NEAR THREATENED (Nationally). DATA DEFICIENT (Globally). Criteria based on:** Not applicable. - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: M. K. Kaul, B. S. Aswal, A. Saklani, V. P. Bhatt, C. P. Kala, Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladhak*. Indus Publishing Co., New Delhi. Aswal, B. S. (1993). Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation. pp. 99-105. In Rajwar, G. S. (Ed.), *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. **Compilers:** M. K. Kaul, P. B. Singh, N. C. Shah, C. P. Kala, J. Singh, B. S. Aswal, V. P. Bhatt.**

**49. *Lavatera cashmeriana* Cambess — EN (B1, 2c) — Family:** Malvaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Open grasslands, stony substrates. **Original Global Distribution:** ENDEMIC to Kashmir Himalaya. **Current Distribution:** Kashmir Himalaya. - **Elevation:** 2,000 - 2,500 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Very few; Fragmented. **Population Trends - % change, - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 30 years. - **No. of Mature Individuals:** Not known. **Global Population:** Rapid decline in restricted and severely fragmented distribution. **Data Quality:** General field study (M. K. Kaul, 1990). **Recent Field Studies:** None. **Threats:** Overexploitation; Harvest; Trade. **Trade:** Local; Domestic; Commercial. **Other Comments:** Stray plants in small populations. **Status - IUCN: ENDANGERED. Criteria based on:** B1, 2c (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Husbandry research; Habitat management. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments:

M. K. Kaul, Kaul, M. K., (1997). *Medicinal Plants of Kashmir and Ladhak*, Inds Publishing Co., New Delhi. Polunin O. & A. Stainton (1984). *Flowers of the Himalaya*. Oxford Univ. Press. Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, V. Tandon, G. Pandey, V. P. Bhatt.

**50. *Luvunga scandens* — CR/N (B1, 2c; C2b; D) — Family:** Rutaceae. **Taxonomic Status:** Species. **Habit:** Scandent shrub. **Habitat:** Temperate, sacred forests. **Global Distribution:** Mausmai forests in Meghalaya and in Myanmar. **Current Regional Distribution:** Meghalaya. - **Elevation:** 1,500 m. - **Range (Sq. km):** < 10. - **Area Occupied (Sq. km):** < 1. - **Number of locations:** 1 (Mausmai forest). **Population Trends - % change. - % Decline:** 90%. - **Time / Rate (Yrs or gens):** 40 years. - **No. of Mature Individuals:** 3-4. **Global Population:** Continuing decline observed. **Regional Population:** 3 to 4 individuals extant in India. **Data Quality:** General field studies (Chauhan, 1983). **Recent Field Studies:** Not known. **Threats:** Loss of habitat; Human interference. **Trade:** Not known. **Other Comments:** Reported in Myanmar also. Need for further studies. **Status-IUCN:** CRITICALLY ENDANGERED (Nationally). **DATA DEFICIENT (Globally).** **Criteria based on:** B1, 2c (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat); C2b (Continuing decline observed in mature individuals and all individuals are in a single population); D (population number less than 50 mature individuals). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Habitat management; Monitoring; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Chauhan, Jain, R. R. Rao (1983). *An Assessment of Threatened Plants of India*. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, S. Chatterjee, J. H. Lalramnghinglova, A. R. K. Sastry.

**51. *Meconopsis aculeata* — EN/R (A1a, 1c, 1d; B1, 2c) Family:** Papaveraceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Rocky alpine areas in between boulders. **Global Distribution:** Himalaya. **Current Regional Distribution:** Indian northeastern Himalaya. - **Elevation:** 3,000-3,500 m. - **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Few; Fragmented. **Population Trends - % change. - % Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in restricted and fragmented distribution. **Data Quality:** General field study. **Recent Field Studies:** BSI, 1985-95. **Threats:** Overexploitation; Loss of habitat; Harvest for medicine; Trade. **Trade:** Commercial. **Other Comments:** Common name 'blue poppy'. Included in Tibetan medicine. **Status-IUCN:** CRITICALLY ENDANGERED (Regionally). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); B1, 2c (Restricted distribution, fragmented populations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Debnath and Nayar (1986). *Poppies of Indian region*, BSI. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana.

**52. *Nardostachys jatamansi* DC. — CR/R (A1a, 1c, 1d) — (*Nardostachys grandiflora* DC.) Family:** Valerianaceae. **Taxonomic**

**Status:** Species. **Habit:** Perennial herb. **Habitat:** In rock crevices and moist shady places. **Global Distribution:** Afganistan to southern West China, Myanmar. **Current Regional Distribution:** Uttar Pradesh hills. - **Elevation:** 2,500-4,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 yrs. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline. **Data Quality:** General field study; Literature study (N. C. Shah, 1983). **Recent Field Studies:** B. S. Aswal, 1990-94; V. P. Bhatt, 1996; C. P. Kala, 1996; N. C. Shah 1990-93. **Threats:** Loss of habitat; Overexploitation; Harvest for medicine; Trade. **Trade:** Local; Commercial; International. **Other Comments:** *In situ* and *ex situ* conservation is urgently needed. **Status-IUCN:** CRITICALLY ENDANGERED (Regionally - northern India). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: B. S. Aswal, V. P. Bhatt, C. P. Kala, N. C. Shah, Aswal, B. S. (1994). *Flora of Lahaul-Spiti*, Bishen Singh Mahendra Pal Singh, Dehra Dun. Shah, N. C. (1993). *Endangered Medicinal and Aromatic Taxa of U. P. Himalaya*, In: *An Assessment of Threatened Plants of India*, S. K. Jain and R. R. Rao, p. 41-47. Aswal, B. S. (1993). *Rare or threatened Medicinal Plants of Garhwal Himalaya and their conservation*, pp. 99-105. In Rajwar, G. S. (Ed.) *Garhwal Himalaya: Ecology and Environment*. Ashish Publ. House. New Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt., G. P. Sharma, C. P. Kala, V. Tandon.

**53. *Nepenthes khasiana* — CR (B1, 2c) — Family:** Nepenthaceae. **Taxonomic Status:** Species. **Habit:** Herb (straggling). **Habitat:** Along road cuttings and streams, undisturbed subtropical zone. **Global Distribution:** ENDEMIC to northeastern India. **Current Regional Distribution:** Meghalaya (Khassia, Jaintiar, Garo Hills). - **Elevation:** 500 m. - **Range (Sq. km):** < 1,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** 6 (Jarain, Bagmara, Tura, Balpakrana); Fragmented. **Population Trends - % change. - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 40 years. - **No. of Mature Individuals:** Not known (60-100 individuals in each cluster). **Global Population:** Continuing decline observed. **Data Quality:** Census and monitoring. **Recent Field Studies:** Continuous monitoring by BSI. **Threats:** Harvest (Botanical curiosity); Loss of habitat; Trade. **Trade:** Local. **Other Comments:** Wildlife sanctuary established in Jaring (whole habitat). Wildlife sanctuary in Tura Peak (close to 2 ha.), Balpakran National Park. **Status - IUCN:** CRITICALLY ENDANGERED. **Criteria based on:** B1, 2c (Restricted distribution, fragmented populations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** Appendix I. - **IWPA (1972; 91):** Schedule VI. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Levels 1; Level 2; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Yes. - **Names of facilities:** In Henagar, Guwahati University, TBGRI, BSI Shillong, Barapani. **Sources:** BSI, 1994, Joseph and Bosak (1st issue of ENVIS Newsletter, No. 1, 94 or 95). BSI Jain & Sastry, 1950.. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry., J. H.

**54. *Operculina turpethum* (L.) Silva Manso — VU/R (A1a, 1c, 1d) — (*Ipomea turpethum* R. Br.; *Convolvulus turpethum* L.). Family: Convolvulaceae. Taxonomic Status: Species. Habit: Large twining herb. Habitat: Dry deciduous forest and fallow lands, wastelands, etc. Global distribution: Common in waste places and thickets throughout India. Current Regional Distribution: Central India. - Elevation: Up to 1,000 m. - Range (Sq. km): > 20,000. - Area Occupied (Sq. km): > 2,000. - Number of locations: Many. Population Trends - % change - % Decline: 40%. - Time / Rate (Yrs or gens): 10 years. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Continuing decline observed. Data quality: General field study (B. Datt, 1981 - 84); Informal field sightings (G. Pandey, 1970-77). Recent Field Studies: J.K. Maheshwari, 1982-91. Threats: Harvest for medicine; Loss of habitat; Human interference; Trade. Trade: Commercial; International. Other Comments: Heavy demand for crude drug. Trade name for main drug Indian Jalap. Recommended to be included in CITES Appendix II. Agrotechnique should be standardised. Need to cultivate commercially. Only cultivated material should go out and not the wild plant. Status - IUCN: VULNERABLE (Regionally - Central India). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91): No. Recommendations- Research management: Survey; Habitat management; Monitoring. - P.H.V.A.: No. Cultivation Program Recommendations - Cultivation: Level 3; Level 4. - Level of difficulty: Least Difficult. Existing Cultivations: - Names of facilities: Seedlings being produced by Social Forest Project, Bargarh Division, Orissaat Narasinghnath and Barhaguda herbal garden for distribution to the local Vaidyas. Sources: Personal observation/ comments: N.B. Pradhan, S.K. Sen, G. Pandey, J.K. Maheshwari, Haines, H.H. (1924). *The Botany of Bihar & Orissa*, London, Vol. 3-4, pp. 600. (Re Eds, 1978, M/S MSBPS, Dehradun). Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, pp.325. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, p. 409. Satyavati, G.V. et al., (1987). *Medicinal Plants of India*, Vol.2, pp. 374-377, ICMR, New Delhi. Chatterjee, A and S.C. Prakash (1995). *The Treatise of Indian Medicinal Plants*, Vol.4, pp. 166-167, CSIR, New Delhi. Raghunathan, K. and Roma Mitra (1982). *Pharmacognosy of Indigenous Drugs*, Vol.2, pp. 960-981. Compilers: N.B. Pradhan, S.K. Sen, J.K. Maheshwari and G. Pandey**

**55. *Paeonia emodi* Wall. ex Royle — VU/N (A1a, 1c, 1d; B1, 2c) — Family: Paeoniaceae. Taxonomic Status: Species. Habit: Robust perennial herb. Habitat: Fringes of temperate forests, often gregarious. Global Distribution: Afghanistan to Nepal Himalaya. Current Regional Distribution: Garhwal and Kumaon Himalaya. - Elevation: 1,800 - 2,500 m. - Range (Sq. km): > 20,000. - Area Occupied (Sq. km): < 1,000. - Number of locations: Many; Fragmented. Population Trends - % change. - % Decline: 20%. - Time / Rate (Yrs or gens): 10 years. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Continuing decline observed. Data Quality: General field study; Indirect information. Recent Field Studies: T. S. Rana, B. Datt, A. Saklani, A. K. S. Rawat, 1995 -96. Threats: Harvest for medicine; Loss of habitat due to fragmentation; Overexploitation; Trade. Trade: Commercial. Other Comments: —. Status- IUCN: VULNERABLE (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); B1, 2c (Restricted distribution, fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - CITES: No. - IWPA (1972; 91): No. Recommendations- Research management: Survey; Monitoring; Habitat management; Limiting factor research. -**

PHVA: Yes. Cultivation Program Recommendations- Cultivation: Level 4. - Level of difficulty: Moderately difficult. Existing Cultivations: None. - Names of facilities: —. Sources: Personal observation/ comments: T. S. Rana, B. Datt, A. Saklani, A. K. S. Rawat, Rana, T. S., B. Datt & R. R. Rao (1996). *Ethnobotany*, Vol 8, pp. 96-104. Badoni, A. K. (1995) *Biodiversity and conservation of medicinal plants of Himalaya*. Compilers: R. R. Rao, T. Husain, B. Datt, A. K. S. Rawat, T. S. Rana, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**56. *Panax pseudo ginseng* — CR/N (B1, 2c) — Family: Araliaceae. Taxonomic Status: Species. Habit: Perennial herb. Habitat: Temperate/ shady areas with an undergrowth of rhododendron forests along streams, sub-Alpine zone. Global Distribution: Eastern Himalaya (East of Sikkim to Arunachal Pradesh including Bhutan). Current Regional Distribution: Sikkim, Assam and Arunachal Pradesh. - Elevation: 2,000 - 4,000 m. - Range (Sq. km): < 20,000. - Area Occupied (Sq. km): < 10. - Number of locations: Few; Fragmented. Population Trends - % change. - % Decline: 50%. - Time / Rate (Yrs or gens): 10 years. - No. of Mature Individuals: Not known. Global Population: Possible decline. Regional Population: Rapid continuing decline observed. Data Quality: General field study; Informal field sightings. Recent Field Studies: R. K. Avasthe, WWF, India, Sikkim Field Office, 1995-96; ARK Sastry, BSI, Gangtok Circle, 1979-1994 in Yuntong River, Sikkim; Yogendra Kumar, NEHU; Haridasan, SFRI, Itanagar. Threats: Harvest for medicine; Loss of habitat; Trade. Trade: Local. Other Comments: Used as an adulterant to the ginseng of China. Active principle is same in both species. Sold in bazars of Sikkim. Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: B1, 2c (Restricted distribution, fragmented populations, continuing decline observed in area, extent and/ or quality of habitat). - CITES: No. - IWPA (1972; 91): No. Recommendations- Research management: Survey; Monitoring; Habitat management; Limiting factor research; Husbandry research. - PHVA: Yes. Cultivation Program Recommendations- Cultivation: Level 1; Level 3. - Level of difficulty: Very difficult. Existing Cultivations: Not known. - Names of facilities: —. Sources: Sarnam Singh and Raju D. C. S., *Red Data Book of Indian plants* Vol 3. Compilers: P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry., J. H. Lalramnghinglova, S. Chatterjee.**

**57. *Picrorhiza kurroa* Royle ex Benth. — EN/N (A1a, 1c, 1d) — Family: Scrophulariaceae. Taxonomic Status: Species. Habit: Herb. Habitat: Alpine Himalaya (slopes and meadows). Global Distribution: Throughout Himalaya. Current Regional Distribution: Indian Himalaya. - Elevation: 2,500 - 4,000 m. - Range (Sq. km): > 20,000. - Area Occupied (Sq. km): > 2,000. - Number of locations: Many. Population Trends - % change. - % Decline: > 50%. - Time / Rate (Yrs or gens): 10 years. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Continuing rapid decline observed. Data Quality: General field study; Indirect information. Recent Field Studies: BSI, 1987 onwards in northeastern India; B. S. Aswal, 1982 -94 in Himachal Pradesh, Uttar Pradesh and Kashmir; M. K. Kaul, 1990 in Kashmir; N. C. Shah & J. Singh, 1990 -93 in Uttar Pradesh; P. B. Singh, 1992 -96 in Himachal Pradesh; G. Pandey, 1985 -96 in Uttar Pradesh; C. P. Kala, 1996 in Uttar Pradesh hills. Threats: Overexploitation; Loss of habitat; Harvest for medicine; Trampling by cattle; Trade. Trade: Domestic; Commercial; International. Other Comments: Rhizomes are gathered. Population in wild is at great risk due to collection of rhizomes. Highly traded; in negative list of exports. Ban on extraction from the wild, commercial cultivation should be implemented. Areas of rich biodiversity should be protected. Status- IUCN: ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential**

levels of exploitation). - CITES: Appendix II. - IWPA (1972; 91):No. - National Legislation: First Negative List of Exports, 1998. Recommendations. - Research management: Monitoring; Habitat management; Limiting factor research. - PHVA: Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3; Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes. - **Names of facilities:** R. R. L., Srinagar and High Altitude Plant Physiological Research Centre, Tungnath, Chamoli, U. P. **Sources:** Personal observation/ comments: B. S. Aswal, M. K. Kaul, N. C. Shah, J. Singh, P. B. Singh, G. Pandey, C. P. Kala, Kaul, M. K. (1996). Studies on medico-ethno botany, diversity, domestication and utilisation of *Picrorhiza kurroa*. In: *Supplement to Cultivation of medicinal Plants* (Editors: S. S. Handa and M. K. Kaul), R. R. L., Jammu, CSIR, Shah, N. C. (1989). *Endangered Medicinal and Aromatic Taxa of U. P. Himalaya*. In: *An Assessment of Threatened Plants of India*, S. K. Jain and R. R. Rao, p. 41-47. Singh P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13(3-4): 172-203. Rai and Sharma. *Medicinal Plants of Sikkim Himalaya*. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana, N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, G. Pandey, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala.

58. *Podophyllum hexandrum* Royle — CR/N (A1a, 1c, 1d) — (*Podophyllum emodi* Wall ex Royle). **Family:** Podophyllaceae. **Taxonomic Status:** Species. **Habit:** Erect small herb. **Habitat:** Subalpine and alpine meadows. **Global Distribution:** Himalaya, East Asia and North America. **Current Regional Distribution:** Indian Himalaya. - **Elevation:** 3,000-4,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline observed. **Data Quality:** General field study; Indirect information. **Recent Field Studies:** BSI, 1980 to present in eastern Himalaya; B. Datt & T. Hussain, 1994 in northwestern Himalaya; L. B. Chaudhary, 1995-96 in northwestern Himalaya; A. K. S. Rawat, 1995 in northwestern Himalaya; A. Saklani, 1996 in northwestern Himalaya. **Threats:** Human interference; Overexploitation; Loss of habitat; Harvest for medicine; Loss of habitat due to fragmentation; Trade. **Trade:** Commercial; International. **Other Comments:** Under negative list of exports. Few recordings in recent past. **Status - IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: Appendix I. - IWPA (1972; 91): No. - National Legislation: First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/comments: L. B. Chaudhary, A. K. S. Rawat, B. Datt, T. Hussain, A. Saklani, R. R. Rao, R. R. & Hajra, P. K. 1993. Podophyllaceae. In Sharma, B. D. *et al. Flora of India*, BSI, Calcutta, Aswal, B. S. (1993). Rare or threatened medicinal plants of Garhwal Himalaya and their conservation pp. 99-105. In: Rajwar, G. S. (ed.) *Ecology and Environment*. Ashish Publ. House, New Delhi, Aswal, B. S. & B. N. Mehantra (1994). *Flora of Lahaul-Spiti*. Bishen Singh, Mahendrapal Singh, Dehradun, Nayar, M. P. and A. R. K. Sastry. *Red Data Book of Indian plants* Fillipe D. *Medicinal plants of India*. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana, A. Saklani, T. Hussain, A. K. S. Rawat, B. Datt, S. K. Mangain, L. B.

Chaudhary, T. S. Rana & B. Dutt, 1995-96 in Tons Valley, Garhwal Himalaya, A. Saklani 1996 in Uttar Kashi.

59. *Polygonatum verticillatum* (L.) All. — EN/R (A1a, 1c, 1d) — **Family:** Liliaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Stony substrates, open places. **Global Distribution:** Europe, Asia minor, Central Asia, Himalaya, Tibet. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 2,500 - 3,500 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** > 50%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline. **Data Quality:** General field studies. **Recent Field Studies:** B. S. Aswal & Mehrotra, 1988-92; C. P. Kala, 1995; V. P. Bhatt 1995; B. Datt & T. S. Rana, 1995-96 in Tons Valley, Garhwal; N. C. Shah, 1990-94; B. Datt & Brij Lal, 1992 in Gangotri, Garhwal; P. B. Singh, 1986-96 in Himachal Pradesh. **Threats:** Overexploitation; Trade; Habitat destruction; Harvest for medicine. **Trade:** Domestic; Commercial; International. **Other Comments:** Important component of "Ashtawarg"; used in the preparation of Chavanprash. **Status - IUCN: ENDANGERED (Regionally -northern India). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91):No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation/ comments: B. Datt, T. S. Rana, N. C. Shah, B. S. Aswal, C. P. Kala, V. P. Bhatt, P. B. Singh, Aswal, B. S. and B. N. Mehrotra (1994). *Flora of Lahaul-Spiti*. Bishen Singh Mahendra Pal Singh, Dehra Dun, Singh P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13(3-4): 172-203. Polunin O. & A. Stainton (1984). *Flowers of the Himalaya*. Oxford Univ. Press, Delhi. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, G. Pandey, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala, V. Tandon, P. B. Singh.

60. *Prezalskia tangutica* — CR/N (B1, 2c) — **Family:** Solanaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Alpine moraine areas. **Global Distribution:** Tibet and northern Sikkim. **Current Regional Distribution:** Northern Sikkim. - **Elevation:** About 5,000 m. - **Range (Sq. km):** <100. - **Area Occupied (Sq. km):** <10. - **Number of locations:** 1. **Population Trends - % change. - % Decline:** Not known. - **Time / Rate (Yrs or gens):** Not known. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Restricted to one location in India. **Data Quality:** General field study. **Recent Field Studies:** Sanjappa, 1992. **Threats:** Trampling by mountain goats. **Trade:** Not known. **Other Comments:** In use in Tibetan medicine. Recorded by Dr. Sanjappa, as a new distribution record for India. **Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: B1, 2c** (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - CITES: No. - IWPA (1972; 91):No. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Pending. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Sanjappa (1992-93). **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana.

**61. *Rauvolfia serpentina* Benth. ex. Kurz. — EN/R (A1a, 1c, 1d) — (*Ophioxylon serpentina* L.) Family: Apocynaceae. Taxonomic Status: Species. Habit: Herb (Perennial). Habitat: Moist to dry deciduous forest, undergrowth in shaded conditions. Global distribution: Throughout tropical parts of India. Current Regional Distribution: Bastar, Koraput, Phulwani, Terai, Santal Parganas. - Elevation: 100 -300 m. - Range (Sq. km): < 5,000. - Area Occupied (Sq. km): < 500. - Number of locations: About 100; Fragmented. Population Trends - % change - % Decline: > 50 %. - Time / Rate (Yrs or gens): 10 years- No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Rapid continuing decline observed. Data quality: General field studies (J.K. Maheshwari, 1970 -77 in MP; BSI, 1983 -85). Recent Field Studies: J.K. Maheshwari, 1982-91 in MP; Saxena and Brahman, 1990 -95. Threats: Loss of habitat; Overexploitation; Human interference; Edaphic factors (fire); Harvest for medicine; Trade of parts (roots). Trade: Commercial; Local. Other Comments: Used by Government Agencies, various private and commercial pharmaceuticals. Botanical Gardens and voluntary agencies should be involved in commercial cultivation of this species. It is recommended that genetic diversity of wild types, particularly from Bastar area may be conserved in gene banks. Status - IUCN: ENDANGERED (Regionally -Central India). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91): No- National legislation: First Negative List of Exports, 1998. Recommendations- Research management: Survey; Others (tissue culture; vegetative micropropagation); Husbandry research; Monitoring; Limiting factor research. - P.H.V.A.: Yes. Cultivation Program Recommendations - Cultivation: Level 4- Level of difficulty: Very difficult (Slow seed germination and low percent germination). Existing Cultivations: Yes- Names of facilities: Amarkantak Research Nursery, MP; Jabalpur TFR; Bilsapur, M.P.; Near Bhopal - recent medicinal plants garden; Narasinghanath Nursery in Bargarh Distt., Orissa; Tissue cultured material at NBPGR. Sources: Personal observation/ comments: J.K. Maheshwari. Saxena, H.O. and M. Brahman (1995). Vascular Flora of Gandhamardan Hills, Orissa. *J. Econ. Tax. Bot.*, Vol. 19(1), pp. 113-132. Sahoo (1984). *A contribution to ethnobotany of the Santal parganas*, BSI. Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, p. 387. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, p. 516. Chatterjee, A and S.C. Prakash (1995). *The Treatise of Indian Medicinal Plants*, Vol.4, pp. 166-167, CSIR, New Delhi. Atal, C.K. and B.M. Kapur (1992). *Cultivation & Utilisation of Medicinal Plants*, RRL, Jammu-Tawi, pp. 288-294. Husain, A. (1992). *Status Report on Cultivation of Medicinal Plants in NAM*, pp. 91-97. Compilers: P.C. Kotwal, J.K. Maheshwari, E.R. Nayar, N.B. Pradhan, A.K. Sahoo, K.K. Singh, S.K. Sen.**

**62. *Rheum australe* D. Don — VU/R (A1a, 1c, 1d) — (*Rheum emodi* Wall. ex Meissn.) Family: Polygonaceae. Taxonomic Status: Species. Habit: Stout perennial herb. Habitat: Moist open grassy slopes and meadows. Global Distribution: Western and Central Himalaya. Current Regional Distribution: Kashmir to Kumaon. - Elevation: 3,000 -4,000 m. - Range (Sq. km): > 20,000. - Area Occupied (Sq. km): > 2,000. - Number of locations: Many; Fragmented. Population Trends - % change. - % Decline: > 20 %. - Time / Rate (Yrs or gens): 10 -15 years. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Continuing decline. Data Quality: General field study; Literature (N. C. Shah, 1975). Recent Field Studies: P. B. Singh, 1992-96; B. S. Aswal, 1992-94; M. K. Kaul, 1990; C. P. Kala, 1996; V. P. Bhatt, 1992-94; N. C. Shah, 1990-94. Threats: Loss of Habitat; Overexploitation; Harvest for medicine; Trade. Trade: Local; Commercial. Other Comments: *In situ* and *ex situ* conservation is**

urgently required. Other allied species of *Rheum* viz. *R. nobile*, HK. Ft; *R. moorcroftianum* Royle and *R. spiciforme* Royle also need attention because they are collected from wild sources. Status- IUCN- VULNERABLE (Regionally -northern India). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - CITES: No. - IWPA (1972; 91): No. Recommendations- Research management: Survey; Habitat management; Monitoring; Life history studies; Husbandry research. - PHVA: Yes. Cultivation Program Recommendations- Cultivation: Level 1; Level 3. - Level of difficulty: Not known. Existing Cultivations: Not known. - Names of facilities: —. Sources: Personal observation/ comments: P. B. Singh, B. S. Aswal, M. K. Kaul, C. P. Kala, V. P. Bhatt, N. C. Shah, Aswal, B. S. and B. N. Mehrotra (1994). *Flora of Lahaul-Spiti*, Bishen Singh & Mahendra Pal Singh, Dehra Dun. Shah, N. C. (1983). Endangered Medicinal and Aromatic Taxa of U. P. Himalaya, In: *An Assessment of Threatened Plants of U. P. Himalaya*, Eds. S. K. Jain and R. R. Rao, pp. 40 -49. Kaul, M. K. (1997). *Medicinal Plants of Kashmir and Ladakh*, Indus Publishing Co., New Delhi. Singh, P. B. and B. S. Aswal (1992). *Medicinal Plants of Himachal Pradesh used in Indian Pharmaceutical Industry*, BMEBR, Vol. 13, No. 3 & 4, Pp. 172 -208. Compilers: N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, V. P. Bhatt, G. P. Sharma, C. P. Kala, G. Pandey, V. Tandon.

**63. *Rheum nobile* — EN/N (A1c, 1d; B1, 2c) — Family: Polygonaceae. Taxonomic Status: Species. Habit: Herb. Habitat: Subalpine open hill slopes and screes. Global Distribution: Nepal eastwards up to Arunachal Pradesh. Current Regional Distribution: Sikkim, Assam, Arunachal Pradesh. - Elevation: 3,500 -4,500 m. - Range (Sq. km): < 5,000. - Area Occupied (Sq. km): < 100. - Number of locations: Few; Fragmented. Population Trends - % change. - % Decline: 60%. - Time / Rate (Yrs or gens): 10. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Rapid continuing decline in area of occupancy. Data Quality: General field study. Recent Field Studies: B. S. I., Gangtok Circle, Arunachal Field Station, Shillong Regional Circle. Threats: Loss of habitat; harvest for medicine; Trade. Trade: Local. Other Comments: Consumed locally. Status- IUCN: ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1c, 1d (Population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); B1, 2c (Restricted distribution, single location, continuing decline observed in area, extent and/ or quality of habitat). - CITES: No. - IWPA (1972; 91): No. Recommendations- Research management: Monitoring; Habitat management; Life history studies; Husbandry research. - PHVA: Yes. Cultivation Program Recommendations- Cultivation: Level 1; Level 3. - Level of difficulty: Not known. Existing Cultivations: Not known. - Names of facilities: —. Sources: Flora of Sikkim; Flora of British India; Flora of Arunachal Pradesh. Compilers: P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah., J. H. Lalramnghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana.**

**64. *Rhododendron anthopogon* — VU/N (A1a, 1c) — Family: Ericaceae. Taxonomic Status: Species. Habit: Shrub. Habitat: Temperate and sub Alpine regions. Global Distribution: East Nepal to Arunachal Pradesh. Current Regional Distribution: Sikkim, Darjeeling, Assam and Arunachal Pradesh. - Elevation: 3,000 -4,500 m. - Range (Sq. km): > 20,000. - Area Occupied (Sq. km): < 500. - Number of locations: Not known. Population Trends - % change. - % Decline: 30 %. - Time / Rate (Yrs or gens): 3 generations. - No. of Mature Individuals: Not known. Global Population: Not known. Regional Population: Gradual decline in population. Data Quality: General field research. Recent Field Studies: BSI in**

Sikkim and Arunachal Pradesh, 1990 - 94; Avasthe and Haridasan, WWF, India in 1995-96. **Threats:** Loss of habitat; Human interference. **Trade:** Not known. **Other Comments:** Probably occurs in China. Specimen grown in Kew, Edinburgh Botanical Gardens since climate is congenial for its growth. **Status - IUCN: VULNERABLE (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 3. - **Level of difficulty:** Very difficult; cannot be cultivated other than its natural habitat. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Hooker, J. D. (1849). *Rhododendrons of Sikkim, Himalaya*; Cullen, 1976 in *Notes of Royal Botanic Gardens, Edinburgh*, 36; Hutchinson, 1930. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry, J. H. Lalramghinglova, S. Chatterjee.

65. *Rhus semialata* — VU/N (A1c, 1d) — Family: Anacardiaceae. **Taxonomic Status:** Species. **Habit:** Tree. **Habitat:** Subtropical semievergreen forests. **Global Distribution:** Northeastern India, Japan, China. **Current Regional Distribution:** Northeastern India and foothills of Darjeeling. - **Elevation:** 800 -1,500 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** 30. - **Time / Rate (Yrs or gens):** 10 year. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline. **Data Quality:** General field studies. **Recent Field Studies:** J. H. Lalramghinglova, in Mizoram, 1996. BSI, Shillong Circle and Arunachal field station. **Threats:** Loss of habitat; Harvest for medicine; Trade. **Trade:** Local; Domestic. **Other Comments:** Fruits edible and sold. **Status- IUCN: VULNERABLE (Nationally). DATA DEFICIENT (Globally). Criteria based on: A1c, 1d** (Population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management. - **PHVA:** No. **Cultivation Program Recommendations- Cultivation:** Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Domesticated. - **Names of facilities:** —. **Sources:** Rana, T. S. (1996). Mukherjee and Channa (1985). Brandis, D. (1906). *Indian Trees*, p. 197. Kanjilal, U. N., A. Das & P. C. Kanjilal (1934). *Flora of Assam*. Vol. I, p. 331. Lalramghinglova, J. H., (1996). *Ethnobotany of Mizoram - A Preliminary Survey, J. Econ. Taxon. Bot. Additional Series*, 12. p. 441. Scientific Publishers, Jodhpur (India). Saklani, A. & S. K. Jain (1994). *Cross-cultural Ethnobotany of Northeast India*, p. 178. Deep Publication, New Delhi. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, M. Ahamedullah, J. H. Lalramghinglova, A. R. K. Sastry, S. Chatterjee, R. S. Rana.

66. *Saussurea costus* (Falc.) Lipsch. — CR/N (B1, 2c, 2e) — (*Saussurea lappa* (Decne.) Sch. -Bip.). Family: Asteraceae. **Taxonomic Status:** Species. **Habit:** Herb, perennial. **Habitat:** Open temperate to sub alpine meadows. **Global Distribution:** Pakistan to Garhwal. **Current Regional Distribution:** Kashmir to Garhwal. - **Elevation:** 2,000 -3,000 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** About 1. - **Number of locations:** 10 -20; Fragmented. **Population Trends - % change. - % Decline:** 70 %. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. Few population in Pakistan also. **Regional Population:** Continuing rapid decline in restricted and severely fragmented distribution. **Data Quality:** General Field studies; Indirect information. **Recent Field Studies:** A. Saklani, 1995 -96. **Threats:** Harvest for medicine; Loss of habitat; Overexploitation; Trade. **Trade:** Commercial. **Other Comments:**

Roots were exported from India up to almost 1970's. It was cultivated earlier in HP but now other commercial crops have replaced it. In Garhwal, farmers are trying its cultivation. Extensively used in medicines. **Status- IUCN: CRITICALLY ENDANGERED (Nationally). DATA DEFICIENT (Globally). Criteria based on: B1, 2c, 2e** (Restricted distribution, few fragmented locations, continuing decline observed in area, extent, quality of habitat and number of mature individuals). - **CITES:** No. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Habitat evaluation and management; Monitoring; Genetic management; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Moderately difficult. **Existing Cultivations:** Yes. - **Names of facilities:** Herbal demonstration farm in Barsu, Uttar Kashi, UP Himalaya. **Sources:** Personal observation/ comments: A. Saklani, R. R. Rao, Hajra, P. K. 1988. *Brahmkamal and its allies*, Jugal Kishore & Co., Dehradun. Hajra, P. K., R. R. Rao, D. K. Singh and B. P. Uniyal 1995. *Flora of India: Asteraceae*. Vol. 12: 186-216, BSI, Calcutta. Aswal, B. S. & B. N. Mehantra (1994). *Flora of Lahaul-Spiti*, Bishen Singh, Mahendrapal Singh, Dehradun. Polunin O. & A. Stainton (1984). *Flowers of the Himalaya*. Oxford Univ. Press. Delhi. **Compilers:** R. R. Rao, A. Saklani, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mamgain, L. B. Chaudhary.

67. *Saussurea gossypiphora* D. Don — CR/R (B1, 2c) — Family: Asteraceae. **Taxonomic Status:** Species. **Habit:** Woolly herb. **Habitat:** Alpine Himalaya in open places amongst boulders. **Global Distribution:** Indian northwestern Himalaya, Sikkim, Nepal, Bhutan, Tibet and southwestern China. **Current Regional Distribution:** Kashmir to Kumaon. - **Elevation:** 3,500 - 5,700 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 100. - **Number of locations:** Few; Fragmented. **Population Trends - % change. - % Decline:** 30%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid decline observed. **Data Quality:** General field study; Indirect information. **Recent Field Studies:** A. Saklani, 1994 -96. **Threats:** Harvest; Loss of habitat; Human interference. **Trade:** No. **Other Comments:** Very attractive herb; picked up by local people and tourists. **Status- IUCN: CRITICALLY ENDANGERED (Regionally -Northwestern Himalaya). DATA DEFICIENT (Globally). Criteria based on: B1, 2c** (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Life history studies; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: A. Saklani, R. R. Rao, Saklani, A. and R. R. Rao, (1997). *Saussurea*, D. C. in Garhwal Himalaya: Distribution, Diversity and Conservation; In: Y. P. S. Pangtey (ed.) *High. Attitude Plants of Himalaya, Nainital* (in press). Hajra, P. K. 1988, *Brahmkamals and its Allies*, Jugal Kishore & Co., Dehradun. **Compilers:** R. R. Rao, A. Saklani, T. Husain, B. Datt, A. K. S. Rawat, T. S. Rana, S. K. Mamgain, L. B. Chaudhary.

68. *Saussurea obvallata* (DC.) Edgew. — EN/R (A1a, 1c) — Family: Asteraceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Alpine Zone — near glacial zone, amongst the boulders. **Global Distribution:** Himalaya in India, Nepal and southwestern China. **Current Regional Distribution:** Indian northwestern Himalaya. - **Elevation:** 3,000 - 5,100 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 100. - **Number of locations:** Many. **Population Trends - % change. - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known.

**Global Population:** Not known. **Regional Population:** Continuing population decline and restricted area of occurrence. **Data Quality:** General field study and indirect information. **Recent Field Studies:** A. Saklani, 1994-96. **Threats:** Overexploitation; Loss of habitat due to fragmentation; Harvest; Harvest for medicine; Trade of parts. **Trade:** Local. **Other Comments:** This is over exploited by the local people for their festivals offering the shrines at Badrinath, Kedarnath, Gangotri, etc. In florescence, attractive and plucked by tourists. 1g. of powder is prescribed for curing insanity by the locals. **Status-IUCN:** ENDANGERED (Regionally -Northwestern Himalaya). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Life history studies; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: A. Saklani, Hajra, P. K., (1988). *Brahmkamal and its Allies*, Jugal Kishore & Co., Dehradun. Saklani, A. and R. R. Rao, (1996). Role of Brahmkamal (*Saussurea obvallata* (DC.) Edgew.) in the life and culture of Garhwalis, *Ethnobotany* 8: 75-78. **Compilers:** R. R. Rao, A. Saklani, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt., S. K. Mamgain, L. B. Chaudhary.

**69. Saussurea simpsoniana (Field & Gard.) — EN/R (A1a, 1c, 1d; B1, 2c) —** (Lipsch. *Saussurea sacra* Edgew.). **Family:** Asteraceae. **Taxonomic Status:** Species. **Habit:** Small woolly herb. **Habitat:** Glacial zone (Alpine Himalaya). **Global Distribution:** Indian northwestern, Nepal, Sikkim and Tibet Himalaya. **Current Regional Distribution:** Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh Himalaya. - **Elevation:** 4,300 -5,000 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 100. - **Number of locations:** Few; Fragmented. **Population Trends - % change. - % Decline:** 50%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing rapid decline in population. **Data Quality:** General field study; Indirect information. **Recent Field Studies:** A. Saklani, 1994-96. **Threats:** Harvest for medicine; Loss of habitat; Trade; Human interference. **Trade:** Local. **Other Comments:** The plant is also very attractive and uprooted by the local people and tourists, shepherds, etc. It is a biologically curious plant. **Status-IUCN:** ENDANGERED (Regionally -Northwestern Himalaya). **DATA DEFICIENT (Globally).** **Criteria based on:** A1a, 1c, 1d (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation); B1, 2c (Restricted distribution, few fragmented locations, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Life history studies; Limiting factor research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** None. - **Names of facilities:** —. **Sources:** Personal observation/ comments: A. Saklani, R. R. Rao, Hajra, P. K., (1988). *Brahmakamals and its allies*, Jugal Kishore & Co Dehradun. Saklani, A. and R. R. Rao, (1997). *Saussurea, D. C.* in Garhwal Himalaya: Distribution, Diversity and Conservation; In: Y. P. S. Pangtey (ed.) *High. Attitude Plants of Himalaya. Nainital*, U. P. (in press). **Compilers:** R. R. Rao, T. Husain, A. K. S. Rawat, T. S. Rana, B. Datt, S. K. Mamgain., L. B. Chaudhary, A. Saklani.

**70. Swertia angustifolia Buch.-Ham. ex D. Don var. Angustifolia — EN/R (B1, 2c) —** (*Swertia angustifolia* Buch.-Ham. ex D. Don var. *hamiltoniana* Burkill; *Ophelia angustifolia* (Buch.-Ham. ex D. Don) G. Don). **Family:** Gentianaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Marshy areas frequently occurring in moist forests;

appearing later in rainy seasons. Occurs in specific localities in gregarious populations. **Global distribution:** Sub-tropical Himalaya from Kashmir to Bhutan. **Current Regional Distribution:** Raipur, Chattisgarh, Bastar, Shahdol (Amarkantak). - **Elevation:** 400 -700 m. - **Range (Sq. km):** < 5,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Few; Fragmented. **Population Trends - % change- % Decline:** 50%. - **Time / Rate (Yrs or gens):** 25 years. **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** General field studies (G. Pandey, 1970 -77). **Recent Field Studies:** J.K. Maheshwari, 1982 -91. **Threats:** Loss of habitat; Harvest; Trade. **Trade:** Local. **Other Comments:** No success in germination. Plants could not be raised from seeds. Micropropagation recommended. In Khana National Park, not present where available earlier. **Status - IUCN:** ENDANGERED (Regionally -Central India). **DATA DEFICIENT (Globally).** **Criteria based on:** B1, 2c (Restricted distribution, fragmented population, continuing decline observed in area, extent and/ or quality of habitat). - **CITES:** No. **IWPA (1972; 91):** No. **Recommendations — Research management:** Habitat management of marshy areas; Limiting factor research; Monitoring. **P.H.V.A.:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Very difficult. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Haines, H.H. (1921). *The Botany of Bihar & Orissa*, London, Vol. 3-4, pp. 568(M/S MSBPS, Dehradun) Husain, A. et al., (1992). *Dictionary of Indian Medicinal Plants*, p. 441. Ambasta, S.P. et al., (1992). *The Useful Plants of India*, p. 608. **Compilers:** P.C. Kotwal, J.K. Maheshwari, S.K. Sen, A.K. Sahoo, N.B. Pradhan, E.R. Nayar

**71. Swertia chirayita (Roxb. ex Flem.) — CR/R (A1c, 1d) —** **Family:** Gentianaceae. **Taxonomic Status:** Species. **Habit:** Annual herb. **Habitat:** Moist shady places. **Global Distribution:** Himachal to northeastern Himalaya. **Current Regional Distribution:** Himachal and Uttar Pradesh Hills. - **Elevation:** 1,500 -3,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** > 2,000. - **Number of locations:** Many; Fragmented. **Population Trends - % change. - % Decline:** > 90%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline. **Data Quality:** General field study; Literature study (N. C. Shah, 1975; H. J. Chowdhery and B. M. Wadhwa, 1984). **Recent Field Studies:** N. C. Shah, 1994; V. P. Bhatt, 1994. **Threats:** Overexploitation; Trade; Habitat destruction; Harvest. **Trade:** Local; Domestic. **Other Comments:** Also used locally and in liquor industry. **Status- IUCN:** CRITICALLY ENDANGERED (Regionally -northern India). **DATA DEFICIENT (Globally).** **Criteria based on:** A1c, 1d (Population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. - National Legislation: First Negative List of Exports, 1998. **Recommendations- Research management:** Survey; Monitoring; Habitat management; Life history studies; Husbandry research. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Darjeeling, Kalimpong. - **Names of facilities:** Not known. **Sources:** Personal observation/ comments: P. B. Singh, B. S. Aswal, M. K. Kaul, C. P. Kala, V. P. Bhatt, N. C. Shah, Chauhan, N. S. (1988). Endangered Ayurvedic and Pharmacological Plant Resources of Himachal Pradesh, In: *Indigenous Medicinal Plant Populations 199 -205*. Chowdhery, H. J. and B. M. Wadhwa (1984). *Flora of Himachal Pradesh Analysis*, Howrah. **Compilers:** N. C. Shah, J. Singh, B. S. Aswal, P. B. Singh, M. K. Kaul, G. P. Sharma, V. Tandon, G. Pandey, V. P. Bhatt.

**72. Taxus wallichiana Zucc. — CR/R (A1c, 1d) —** **Family:** Taxaceae. **Taxonomic Status:** Species. **Habit:** Tree. **Habitat:** In temperate mixed forests; occurs along with rhododendron, betula, and

other associates. **Global Distribution:** Himalayan range from Afganistan to Arunachal Pradesh. **Current Regional Distribution:** Sikkim, Assam and Arunachal Pradesh. - **Elevation:** 1,500 -3,000 m. - **Range (Sq. km):** < 2,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Scattered. **Population Trends - % change. - % Decline:** > 90 %. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Rapid continuing decline in population. **Data Quality:** General field study; Informal sightings; Indirect information. **Recent Field Studies:** None. **Threats:** Harvest for medicine; Trade of parts. **Trade:** Commercial; International. **Other Comments:** This species is discontinuous throughout Himalayas but concentrated from Sikkim eastwards, Sumita and Timianjha, Dept. of Botany, Calcutta University have a project on *Taxus wallichiana*. 1,70,710 kg of dried leaves was exported from Arunachal Pradesh in one month - data collected from Chardwargate checkpost, Arunachal Pradesh (BSI, 1995). **Status - IUCN: CRITICALLY ENDANGERED (Regionally). DATA DEFICIENT (Globally). Criteria based on: A1c, 1d** (Population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** Appendix II. - **IWPA (1972; 91):** No. - **National Legislation:** First Negative List of Exports, 1998. **Recommendations- Research management:** Monitoring; Habitat management; Limiting factor research. - **P. H. V. A.:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 4. - **Level of difficulty:** Moderately difficult in natural conditions. **Existing Cultivations:** Yes. - **Names of facilities:** Nursery in SFRI, Itanagar. **Sources:** ENVIS Newsletter, 1995, BSI Newsletter; Haridasan, K. Arunachal Forest News. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry., J. H. Lalramnghinglova, S. Chatterjee.

**73. *Thalictrum foliolosum* DC. — VU/R (A1a, 1c, 1d) — Family:** Ranunculaceae. **Taxonomic Status:** Species. **Habit:** Perennial herb. **Habitat:** Open hill slopes and forests. **Global Distribution:** Kashmir to southwestern Tibet, Nepal and Myanmar. **Current Regional Distribution:** Garhwal and Kumaon Himalaya. - **Elevation:** 1,300 - 3,400 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 500. - **Number of locations:** Many. **Population Trends - % change. - % Decline:** 20%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Gradual continuing decline in population in restricted area of occupancy. **Data Quality:** General field studies; Indirect information. **Recent Field Studies:** T. S. Rana, B. Datt, A. K. S. Rawat, A. Saklani 1995 -96. **Threats:** Harvest for medicine; Loss of habitat; Loss of habitat due to fragmentation; Overexploitation; Trade. **Trade:** Commercial. **Other Comments:** Sold as Mamira (trade name). **Status - IUCN: VULNERABLE (Regionally). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Habitat management. - **PHVA:** Yes. **Cultivation Program Recommendations- Cultivation:** Level 4. - **Level of difficulty:** Least difficult. **Existing Cultivations:** Yes. - **Names of facilities:** High Altitude Plant Physiology Research Centre, Tunganath, Srinagar, Garhwal for research purpose. **Sources:** Personal observation/ comments: T. S. Rana, B. Datt, A. K. S. Rawat, A. Saklani, Badoni, A. K., (1995). *Garhwal Himalay main aushadhiya paudon ki jeevic vividhata aivum sanrrakshan, aivum satar vikas hetic jarhi - booti udyog*, Sher, Dehradun. **Compilers:** R. R. Rao, T. Husain, B. Datt, A. K. S. Rawat, T. S. Rana, S. K. Mangain., L. B. Chaudhary, A. Saklani.

**74. *Tylophora indica* (Burm.f.) Merriell — VU/R (A1a, 1c, 1d) — (*Tylophora asthmatica* (L. f.) Wight and Arn.; *Cynanchum indicum***

*Burm. f.). Family:* Asclepiadaceae. **Taxonomic Status:** Species. **Habit:** Twining climber. **Habitat:** Dry deciduous forest in the hills. **Global distribution:** Assam, West Bengal, Orissa, Bihar, Penninsular India. **Current Regional Dis-tribution:** Central India. - **Elevation:** Up to 1,000 m. - **Range (Sq. km):** > 20,000. - **Area Occupied (Sq. km):** < 5,000. - **Number of locations:** Approximately 300. **Population Trends - % change- % Decline:** 30% . - **Time / Rate (Yrs or gens):** 10 years- **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Continuing decline observed. **Data quality:** General field studies and informal field sightings (G. Pandey, 1970 -77). **Recent Field Studies:** J.K. Maheshwari, 1982-91; N.B. Pradhan and S.K. Sen, 1993. **Threats:** Loss of habitat; Harvest for medicine; Human interference; Edaphic factors (forest fire); Trade. **Trade:** Local; Commercial. **Other Comments:** Recommended to be in Appendix II of CITES. Agrotechnique should be standardised. Roots used to cure dysentary. Infusion of roots given for asthma and bronchitis causes vomiting and therefore providing relief. **Status - IUCN: VULNERABLE (Regionally -Central India). DATA DEFICIENT (Globally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Survey; Monitoring; Life history studies; Husbandry research. - **P.H.V.A.:** Pending. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Yes. - **Names of facilities:** In government ayurveda colleges and gardens; also in Tibetan and Unani gardens for demonstration. Herbal Garden at Narasinghnath and Barhagudain Bargarh District.. **Sources:** Personal observation/ comments: J.K. Maheshwari, N.B. Pradhan, S.K. Sen, G. PandeyHaines, H.H. (1924). *The Botany of Bihar & Orissa*, London, Vol. 3-4, pp. 560 (Re Eds, 1978, M/S MSBPS, Dehradun)Husain, A. *et al.*, (1992). *Dictionary of Indian Medicinal Plants*, pp. 476. Ambasta, S.P. *et al.*, (1992). *The Useful Plants of India*, pp. 657-658Kirtikar & Basu (1981). *The Indian Medicinal Plants*, pp. 1631-1632Bennet, S.S.R. (1987). *Name changes in Flowering Plants of India and Adjacent Regions*, pp. 577. Chatterjee, A. & S.C. Prakash (1995). *The Treatise of Indian Medicinal Plants*, Vol. 4, pp. 143. CSIR, New Delhi. **Compilers:** G. Pandey, J.K. Maheshwari, S.K. Sen, N.B. Pradhan, A.K. Sahoo

**75. *Valeriana jatamansi* — CR/R (A1a, 1c, 1d) — (*Valeriana wallichii*). **Family:** Valerianaceae. **Taxonomic Status:** Species. **Habit:** Herb. **Habitat:** Temperate Himalaya. **Global Distribution:** Himalaya (Himachal Pradesh eastwards). **Current Regional Distribution:** Indian northeastern Himalaya. - **Elevation:** 1,200 - 1,800 m. - **Range (Sq. km):** < 20,000. - **Area Occupied (Sq. km):** < 10. - **Number of locations:** Not known. **Population Trends - % change. - % Decline:** 80%. - **Time / Rate (Yrs or gens):** 10 years. - **No. of Mature Individuals:** Not known. **Global Population:** Not known. **Regional Population:** Declining rapidly. **Data Quality:** General field study; Indirect information. **Recent Field Studies:** BSI field survey 1985 -95. **Threats:** Loss of habitat; Harvest for medicine; Overexploitation; Trade. **Trade:** Domestic; Commercial. **Other Comments:** Heavily traded. **Status - IUCN: CRITICALLY ENDANGERED (Regionally). DATA DEFICIENT (Gobally). Criteria based on: A1a, 1c, 1d** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/ or quality of habitat and due to actual or potential levels of exploitation). - **CITES:** No. - **IWPA (1972; 91):** No. **Recommendations- Research management:** Monitoring; Habitat management; Life history studies; Husbandry research. - **P. H. V. A.:** Pending. **Cultivation Program Recommendations- Cultivation:** Level 1; Level 3. - **Level of difficulty:** Not known. **Existing Cultivations:** Not known. - **Names of facilities:** —. **Sources:** Personal observation: Haridasan. Ved Prakash in *J. of Ethnobotany*. **Compilers:** P. K. Mukherjee, D. C. Pal, R. R. Rao, M. S. Mondal, G. S. Giri, A. R. K. Sastry., J. H. Lalramnghinglova, S. Chatterjee.**

# ZOO NEWS' PRINT

ZOOS' PRINT recently sent a form to all small, medium and large zoos, soliciting up to date news which would be of interest to other zoo directors and anyone on the wildlife scene. This column will be used for publishing the contributions from this form.

## News of Itanagar Zoo

### **Births and Hatchings :** (Since January 1998)

One male mithun on 3.1.98

One male tiger on 18.2.98 (died after two hours)

One female Himalayan bear born 29.2.98 (died after two days)

### **Acquisitions --** from other zoos, confiscations, rescues, etc.

Rescued one male red panda from Towang

Rescued two pythons from jungle

### **Surplus animals -- available for exchange**

Mithun - 4male, 5 female, 3 calf

Nilgai - 5 male, 5 female, 4 calf

### **Single animals -- require mates**

Peacock -- require two females

Clouded leopard - require two females

Tiger - require one female

### **Transfers, new zoo officers .. vets, curators, etc. and new Posts**

Sri D. N. Roy, Forest Ranger, transferred from Zoo to Itanagar silviculture Division (A.P.)

### **New exhibits, enclosures, centres, etc.**

Constructed tiger land area 2.5 hectares

### **New Educational activities initiated, brochures, guides, etc.**

2000 nos. Zoo brochures printed during the year

Conducted essay writing and drawing competition held in Zoo during Wildlife week.

### **Other news and notes, short reports . . .**

Proposed Itanagar Zoo with Botanical Garden because Itanagar Zoo has a large area of 2.56 sq km.

## Appointments

### **School of Studies in Zoology Jiwaji University Gwalior**

Applications are invited for the following positions to work in the research project "Studies on Evaluation of Wildlife habitats in the proposed Amarkantak Biosphere Reserve, M.P. with special reference to Biodiversity conservation" sponsored by Ministry of Environment & Forests, Govt. of India for a period of three years. The candidates have to be prepared to work long hours both in the field (Bilaspur, Shadol and Mandla Districts, M.P.) and in the Laboratory.

#### **Junior Research Fellow:**

Rs. 2500-2500-2800/- plus other allowances as per University rules.

#### **Qualification :**

M.Sc. in Zoology/ Bio-Science/ Environmental Science/ Wildlife with atleast 55% marks.

#### **Field Assistant :**

Fixed salary of Rs. 2,000/-

#### **Minimum Qualification :**

Graduate with atleast 55% marks. Typing/Computer knowledge is essential.

Applications should reach the Principal Investigator on or before 20th May 1998. NET qualified candidates shall be preferred.

Dr. R.J. Rao  
Principal Investigator  
School of Studies in Zoology  
Jiwaji University, Gwalior

### **Pintung Rescue Centre for Endangered Animals Taiwan**

Applications are invited for a one year contract position of Wildlife Veterinarian at the Pingtung Rescue Centre for Endangered Wild Animals. Taiwan ROC. The applicant must have a degree in Veterinary Science (B.V.Sc.) and 2 or 3 years of professional zoo/ wildlife veterinary experience. The selected candidate will be responsible for all aspects of the veterinary care for about 300 animals including tigers, bears, orangutans, gibbons, macaques, civets, raptors, snakes, and monitor lizards kept at the rescue center. Responsibilities include implementing and monitoring preventive health care program vaccinations, clinical rounds, interactions with animal keepers, disease diagnosis, routine laboratory tests, treatments, surgery, quarantine procedures, treatment and care of hospitalized animals and necropsy. Additional responsibilities include overseeing veterinary records using computer software, nutrition, diet evaluation pest control assessment and the management of the rescue center's hospital. Applicant must be a team player with excellent management skills. Salary depends on the qualification and experience (US\$ 10,000-12,000).

Send letter, biodata, one letter of recommendation and salary history to

Dr. G. Agoramooty  
Deputy Director  
Pingtung Rescue Center for Endangered Wild Animals  
National Pingtung University of Science & Technology  
P.O. Box 37-32. Pingtung 91207, Taiwan, ROC  
(Fax: 886-8-7740388; email: moorthy@mail.npust.edu.tw).



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interest in improving the environment . . . .

## **Some environmental achievements of British Airways in 1995-96**

Overall fuel efficiency per ATK improved by 2% over the previous year

Consumption of CFC 11 and 12 has decreased by 4% and CFC113 by 95% compared to the previous year. Reductions were also achieved in the use of 1,1,1 trichloroethane, HFC 134a and other chlorocarbons

British Airways Avionics Engineering (BAAE) is the first part of British Airways to achieve the British Standard for Environmental Management, BS7750

More than 750 children from some 80 countries attended the International Children's Conference on the Environment sponsored by British Airways in partnership with the United National Environment Programme and the local organisers in Eastbourne, UK

Over fifty new or restated targets and objectives. Of those set last year, progress has been made in 21 out of 24

First three of fifteen Boeing 777 aircraft delivered and in service. The 85dB(A) noise footprint is approximately 1/3 of that of the Boeing 747-400 and about the sum as that of a smaller Boeing 767

Water consumption at Heathrow Catering Center South per longhaul passenger out of Heathrow reduced by 14%. This is a new performance measure to monitor the efficiency of water usage at the facility using the most water

For the first year, all waste from British Airways Heathrow operations has been measured through introduction of weighing of non-special wastes

Two new awards (Special Europe and Special Longhaul) introduced, for projects in the mass tourism market, as part of the British Airways Tourism for Tomorrow Awards

The Number of British Airways Environmental Champions worldwide increased to 438, 54% more than 1994-95

Total ground energy consumption per ATK, at Heathrow and Gatwick, improved by 7%

British Airways Assisting Conservation provided travel assistance to 276 individuals, an increase of 6% from 1994-95

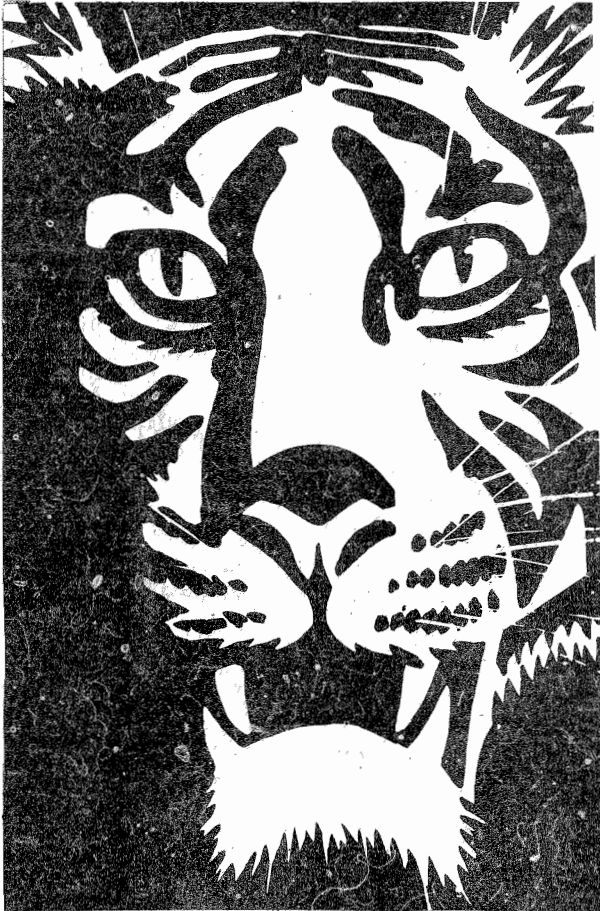


## *If you are flying, Zoo Outreach Organisation recommends :*

◆ before selecting your airline, find out if they have an environment department and ask for their Report.

◆ if you are convinced by their Report and make your choice on that basis, write the airline a letter informing them they get your business because of their approach to environmental protection

◆ suggest environmental projects in your country which the airline may like to support.



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