IDENTIFICATION AND CONSERVATION OF IMPORTANT PLANT AREAS FOR MEDICINAL PLANTS IN THE HIMALAYA

Project and Workshop Report

(organised jointly by Plantlife International and the Ethnobotanical Society of Nepal)

Supported by the Rufford Foundation and the Allachy Trust

ETHNOBOTANICAL SOCIETY OF NEPAL 1997

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Tibetan doctor (Amchi Gurmet Namgyal) reading the pulse, Kanji, Ladakh, India.
PHOTO ALAN HAMILTON.

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COVER IMAGE: COMPLEX HIMALAYAN LANDSCAPE BELOW SANGJENG PEAK, RASUWA – A HOTSPOT FOR MEDICINAL PLANTS. PHOTO KAMAL HUMAGAIN (ESON) DESIGN: RJP DESIGN WWW.RJPDESIGN.CO.UK

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Ethnobotanical Society of Nepal (ESON)
ESON is a government registered, non-political, non-religious, non-profit-making and non-governmental organisation. It is committed to safeguarding traditional knowledge regarding the use, conservation and sustainable utilisation of plants, through coordination, promotion and research activities.

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Plantlife International is the leading conservation organisation working to protect wild plants and their habitats. We act directly to identify and conserve sites of exceptional botanical importance, to rescue wild plants from the brink of extinction and to ensure that common plants don't become rare in the wild. We do this by facilitating conservation work across the globe, influencing policy and legislation and collaborating widely to promote wild plant conservation. Plantlife International is the lead organisation for Target 5 of the Global Strategy for Plant Conservation. We also provide the secretariat for Planta Europa, the pan-European network of over 60 organisations working for plant conservation. HRH The Prince of Wales is our Patron.

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Contents

Dedication

The Chief Guest at the Inaugural Session of a Regional Workshop (part of this project) was Professor Dr Mangal Siddhi Manandhar (Honourable Minister, Ministry of Education and Sports). The Chair was Dr Damodar P. Parajuli (Acting Secretary of the Ministry of Forests and Soil Conservation). Dr Chandra Prasad Gurung (Country Representative, WWF Nepal) was among the many distinguished guests attending. Tragically, Dr Parajuli and Dr Gurung were among 24 people who perished in a helicopter crash at the foot of Mt Kanchenjunga on 23 September 2006, the day after the workshop closed. The loss of these and many other leaders and friends in this terrible accident – among them, many who had dedicated themselves to conservation of the life and culture of the Himalaya – represents a severe blow to the conservation movement and a challenge for those of us who remain.

This report is dedicated to the memory of those that perished. In the words in an obituary for Yeshi Choden Lama, one of those killed in the crash and responsible for the work of WWF-Nepal on the conservation of medicinal plants *"Be in peace on Kangchenjunga, the Five Treasures of the Snows, a sacred mountain you strove so hard to conserve"*.

Kathmandu Recommendation

Medicinal plants of the Himalaya are a major source of income for communities in the region; they provide basic healthcare for millions of citizens and possess immense cultural value. This resource base in terms of the plants themselves and the knowledge of their use is being eroded at an alarming rate. Ensuring a sustainable future for this resource is a regional imperative.

As a group of government and non-government organisations and the herbal industry we are concerned about the disappearance of medicinal plants. We recognise the value of identifying Important Plant Areas (IPAs) for medicinal plants as priority sites for conservation action and we have made a first attempt to identify these sites across the Himalaya and to record the experiences of projects aimed at plant conservation. We believe that the involvement of the community (as a major stakeholder) is essential for effective conservation of medicinal plants at IPAs. Accordingly we recommend that community involvement in the identification and management of IPAs should be adopted as a major conservation approach for the medicinal plants in such areas.

We are committed to promoting the conservation of medicinal plants through the above approach and through sharing experiences on best practise nationally and across the region.

Since joint collaborative efforts will contribute more effectively to the implementation of targets for plant conservation in the internationally agreed *Global Strategy for Plant Conservation* (Convention on Biological Diversity), we, the workshop participants, strongly urge NGOs, local and national governments, and industry within the Himalayan region to join hands in our efforts to conserve these resources.

This Recommendation was developed at a Regional Workshop on the Identification and Conservation of Important Plant Areas for Medicinal Plants in the Himalaya held at Kathmandu, Nepal, September 19–22 2006.

Signed: Participants at the Regional Workshop (Annex 3)

Executive summary

This is the report of the project and Regional Workshop *"Identification and Conservation of Important Plant Areas for Medicinal Plants in the Himalaya"* held in Kathmandu, Nepal on September 19–22 2006. The project brings together two of Plantlife International's programmes, on 'Important Plant Areas' (IPAs) and 'Plant Conservation and Livelihoods'. The project is the first time that IPAs have been identified in the Himalaya.

The project is collaborative between Plantlife International and National Partners in five Himalayan countries – Bhutan, China, India, Nepal and Pakistan. The National Partners prepared reports for their respective countries, with baseline information on medicinal plants, overviews of current conservation initiatives and assessments of the contribution of existing information on medicinal plants to the identification of IPAs. These National Reports were presented at the Regional Workshop, at which some additional organisations from Nepal also gave presentations.

Medicinal plants are of great importance in the Himalaya, supporting people's healthcare, income and cultures. All the National Reports confirmed that some medicinal plants are under threat, especially through habitat loss (including deforestation) and commercial over-harvesting.

Important Plant Areas (IPAs) are sites of international significance for the conservation of global plant diversity that are recognised at a national level. Their recognition is based on three standard criteria (presence of threatened species, species richness, and presence of threatened habitats).

Fifty-three IPAs for medicinal plants were provisionally recognised in the Himalaya, with a significant number of smaller sites at a more local level. Many of these smaller sites are nested within the IPAs. However all countries reported a shortage of the information required for the recognition of IPAs, and so the IPAs identified in the National Reports are regarded as provisional. Information on both medicinal and non-medicinal species of plants can be used for the further development of national IPA networks.

IPAs will be useful for monitoring progress towards Target 5 of the *Global Strategy for Plant Conservation, part of the Convention* on Biological Diversity, to which all Himalayan states are signatories. They will also be useful for landscape-level planning, including for the siting of protected areas. Based on the gross geography of the IPAs (as currently recognised), protected area networks in the Himalaya should be reviewed to ensure that they have good coverage along the west-east and altitudinal axes. A good distribution of protected areas along these dimensions will help to ensure survival of the species in the face of climatic change (expected to be on a major scale at higher altitudes in the Himalaya). It will also help to ensure that the genetic diversity of medicinal species is conserved (important with useful plants).

Progress in finding ways to involve local communities is fundamental to achieving conservation of Himalayan medicinal plants. This will involve identifying places important

for medicinal plants at the very local level – the level of direct management. Decisions about the management of these areas should involve all relevant local stakeholders. Issues to be addressed include – which species require special attention, who will be the managers, how can management be improved? Traditional doctors, cultural leaders and industry can play useful roles to encourage community-based conservation of medicinal plants and provide guidance. Religious beliefs, strongly associated with traditional medicine, are major forces that have underpinned traditional conservation in the Himalaya. They surely can continue to be a foundation in the future, especially if their worth is recognised by other stakeholders.

Regional collaboration is very helpful for conservation of Himalayan medicinal plants. The countries vary in their policy environments and conservation experiences with respect to medicinal plants. They have much to gain from the sharing of case-studies and ideas about best practice. There are aspects of conservation that require direct collaboration, especially to combat unsustainable cross-border trade.

After the rains – flowering of the high altitude trans-Himalayan desert Ladakh, India.
PHOTO ALAN HAMILTON

Naxi traditional physician Mr Li Siqui drying plants at his home in Sue Song Village near Lijiang, Yunnan, China. With Dr Huai Huyin.
PHOTO ALAN HAMILTON.

Introduction

In 2005, Plantlife International launched a new *Plant Conservation and Livelihoods Programme* with an initial emphasis on medicinal plants (the *Medicinal Plants Conservation Initiative*). With geographical areas of focus in the Himalaya and East Africa, the programme is seeking ways to conserve plant diversity within the context of people's livelihood needs. Six community-based projects to conserve medicinal plants in the Himalaya have so far been supported, thanks to a generous grant to Plantlife from the Allachy Trust – one project in each of China, Nepal and Pakistan and three in India. These projects are being used to develop and test approaches and methodologies to the conservation of Himalayan medicinal plants. The intention is to later identify lessons learnt and promulgate more effective methodologies. Descriptions of these projects and some initial analyses can be viewed on Plantlife's website (**www.plantlife.org.uk**).

The project reported here marries Plantlife's livelihoods programme with its more established programme on Important Plant Areas (IPAs). It provides a first test of the applicability of the IPA concept in this large and geographically complex region. The selection of medicinal plants as a floristic sub-group for this purpose was considered intuitively reasonable. This is because of the large number of Himalayan species that are regarded as medicinal and the likelihood that, being useful plants, their distribution and conservation status are probably relatively well known.

The objectives of the project are to:

- Collate baseline information on medicinal plants, their habitats and their threats across the Himalaya.
- Overview information on existing initiatives on the conservation of Himalayan medicinal plants.
- Assess the contribution of existing information on medicinal plants to the identification of IPAs in the Himalaya.
- Assess recommendations for future progress in medicinal plant conservation at IPAs in the Himalaya, including through regional collaboration.
- Contribute to the development of a new Plantlife regional project on the conservation of Himalayan medicinal plants.

This is a collaborative project between Plantlife International and National Partners in five countries, all respected experts in this field. They are:

- Bhutan – Yeshey Dorji and Mr A Karma Rinzin (Ministry of Agriculture).
- China – Professor Pei Shengji and Mrs Yang Lixin (Chinese Academy of Sciences) and Dr Huai Huying (Yangzhou University).
- India – Pragya, with presentations at the Regional Workshop by Dr Visvarup Chakravarti and Ms Manali Baruah.
- Nepal – Ethnobotanical Society of Nepal (ESON), involving Dr K.K. Shrestha, Ms S. Rajbhandary, Mr R.C. Poudel and Dr N.B. Tiwari.
- Pakistan – Mr Ashiq Ahmad Khan (WWF-Pakistan) and Dr Hassan Sher (Government Postgraduate Jahanzeb College).

Each National Partner prepared a report with information on their countries. These reports were then presented and discussed at a Regional Workshop, convened at Kathmandu (Nepal) on 19-22 September 2006 and organised jointly by the Ethnobotanical Society of Nepal (ESON) and Plantlife International. 35 participants attended (Annex 3), with additional presentations from various individuals and organisations working on medicinal plants in Nepal. Two staff from Plantlife International participated, Elizabeth Radford (IPA Programme Manager) and Alan Hamilton (Manager, Plant Conservation and Livelihoods Programme). They gave presentations on technical matters relating to the recognition of IPAs and on possible next steps in regional collaboration.

Debarked yew tree (*Taxus wallichiana* Zucc.), in Ayubia National Park, Pakistan. This species is on CITES Appendix II.
PHOTO ALAN HAMILTON.

2. The context

2.1. The concept of Important Plant Areas

Important Plant Areas (IPAs) are defined as the most important places in the world for wild plant diversity that can be managed as specific sites [1,2]. Their identification and conservation have been promoted as a contribution to Target 5 of the *Global Strategy for Plant Conservation* (GSPC, part of the Convention on Biological Diversity) – *Protection of 50 per cent of the most important areas for plant diversity assured* (to be met by 2010). All Himalayan countries are signatories to the CBD and hence should be trying to achieve this target. It is recommended that the process of recognising IPAs be undertaken through a collaborative process involving as many experts as possible of the country concerned. Plantlife is recognised internationally as a facilitating organisation for Target 5 of the GSPC.

The greatest experience in identifying IPAs has so far been in Eastern Europe, where the IPA process has proved valuable for uniting botanical communities to jointly assess their national priorities in plant conservation. Plant conservationists in Eastern Europe have generally found the IPA concept intuitively understandable and useful. The present study, based in a different part of the world, has helped to further advance the IPA concept (see Sections 3.2.6 and 5). This is particularly so regarding the 'conservation' (contrasted with the 'identification') element of the IPA process. Particularly because medicinal plants are resources, their choice as a floristic sub-group for identifying IPAs has drawn attention to the positive side of peoples relationships with plants – how people can be seen as opportunities for conservation, not just as causes of threat.

A site has the potential to be recognised as an IPA if it meets one or more of these criteria: (1) presence of threatened species of global or regional concern; (2) exceptional botanical richness for its biogeographic zone; or (3) presence of threatened habitats. IPAs are internationally important sites that are recognised formally (but not legally) at national-level. The numbers and sizes of sites selected are matters for national decision. The criteria require some modification when IPAs are recognised with reference only to medicinal plants (as here), namely a site should be marked by the: (1) presence of threatened species of medicinal plants of global or regional concern; (2) exceptional richness in medicinal plants for its biogeographic zone; or (3) presence of threatened habitats for medicinal plants.

2.2. Himalayan medicinal plants

The Himalaya form the highest mountain range on Earth. Extending for 2500 km along the northern border of the Indian subcontinent, the range forms a barrier to moisture-laden winds moving up from the south. The high altitude trans-Himalayan region of the Tibetan (Qinghai-Xizang) Plateau lies in the rain-shadow of this range. Following the common practice in China, the Himalaya are considered here as additionally covering the Hengduan Mountains of China and the Qinghai-Tibetan Plateau.

A large proportion of the Himalayan flora is medicinal resulting in the Himalaya being a globally significant centre for medicinal plants. The two countries globally with the highest numbers of medicinal plants are both partly Himalayan – China with 10,027 species (41% of its angiosperm flora) and India with 7500 species (44% of its vascular flora) [3,4].

Lancang county town market in Yunnan, China. An ethnic Yi man from a mountain village sells about 80 herbal plants, mostly collected by himself from mountain vegetation. PHOTO PEI SHENGJI, KUNMING INSITUTE OF BOTANY, CAS.

***Dactylorhiza hatagirea* (D. Don) Soo. used across the Himalaya as a tonic for vitality and strength and for healing wounds. This species is a high conservation priority in India and Nepal.** PHOTO TSEWANG GONBO, LADAKH SOCIETY FOR TRADITIONAL MEDICINES (LSTM).

Landscape within the Sapi-Penzila IPA complex, Indian Himalaya. PHOTO TSEWANG GONBO, LADAKH SOCIETY FOR TRADITIONAL MEDICINES (LFTM).

Species of medicinal plants grow at all altitudes in the Himalayas, up to the permanent snowline. However, as reported for India and Nepal [5,6], the majority of **traded** medicinal plants (whether measured in terms of number of species, total volume, or total value) originate from lower altitudes. Eighty-two percent of species of medicinal plants traded from the Indian Himalaya come from the subtropical zone [5]. On the other hand, the great diversity of herbs and shrubs found in Alpine meadows is of great importance in Tibetan medicine, though Tibetan doctors insist that **all** altitudes and **all** vegetation types provide plants useful to them [7].

Himalayan medicinal plants are found in diverse habitats according to their ecology. There is considerable variation in types of species along the west-east axis of the range, associated with a major gradient of increasing climatic moistness towards the east. The eastern end, including Arunachal Pradesh and the Hengduan Mountains, is recognized as one of the world's great centres of botanical diversity [8,9]; there is an exceptional number of medicinal species [10-12]. The trans-Himalayan region of the Tibetan Plateau is a rain-shadow area with a distinctive flora. Altitudinally, the natural vegetation of the Himalaya varies from tropical or sub-tropical types at lower altitudes (up to roughly 1000 m), broad-leaved and coniferous forest in a temperate zone (up to roughly 3000-3800 m) and sub-alpine and alpine communities at higher altitudes. Lowland vegetation ranges from xeric thorn scrub forest in the west to moist evergreen forest in the wetter east. Medicinal plants are not confined just to more natural habitats in the Himalayas. There are many species of Himalayan medicinal plants favouring habitats strongly disturbed by man [13,14].

Collecting medicinal plants Lomangthan Mustang Central Nepal.
PHOTO ARIANA WAGNER (ESON)

The medicinal plants of the Himalaya contribute immensely to the healthcare of its inhabitants, with the great majority of people in the Himalaya relying primarily on herbal medicine (as contrasted with western medicine) [15-19] for their healthcare. Medicinal plants also provide many with a source of income through their sale. There are hundreds of millions of people living outside the Himalaya who benefit from medicines made from Himalayan plants.

The number of plant species used in folk medicine at particular localities in the Himalaya is said to be often about 45 to 60 [14,20], with more species recorded at some localities, for instance 110 species at Humla (Nepal) [21], 100 species at Darjeeling Himalaya [22] and an extraordinary 450 species at Dolpa (Nepal) (according to a presentation of Suresh Ghimire at the Regional Workshop). However, not all communities use medicinal plants extensively. The Shuhi people of the Hengduan Mountains know of only 27 species of medicinal plants, with no evidence that their knowledge has ever been greater [14].

The Himalaya are home to four of the world's great medical traditions – Ayurveda, Chinese, Tibetan and Unani. All of these, except perhaps Tibetan medicine, are very extensively used also outside the Himalayas, which is one reason why so much collection pressure is placed on some types of Himalayan plants. About 100 of the 750 native

species in all-India trade are sourced from the Himalaya [23]. The numbers of medicinal plant species (not all Himalayan) used by these major medical traditions are reported to be: Ayurveda 1250-1400, Chinese 1200-1600 (commonly), Tibetan 1100-3600 and Unani 342 [3, 24, 25]. Apart from the major medical traditions, the Himalaya are home to several other notable medical traditions more limited in their extent, such as those associated with the Bai, Dai, Lahu, Naxi, Qiang and Yi minorities in China [26]. Yunnan and Sichuan are recognised as places of outstanding botanical and cultural diversity.

Millions of Himalayan residents depend on the harvesting of wild medicinal plants for an income. There is generally very little cultivation. An estimated 323,000-470,000 households (2.6 million people) are engaged in the collection of wild medicinal plants for sale in Nepal [27]. Medicinal plants are economically so important in Uttarachal that this Indian state now calls itself the *Herbal State*. Estimates of the percentage of income received from the sale of non-timber forest products (NTFPs) in the Tibetan Autonomous Prefecture of northwest Yunnan (China) range between 25-80%, the most lucrative commodity being *mastutake* (*Tricholoma*), a medicinal/culinary mushroom [28]. Medicinal plant collection for the market is especially significant as an economic activity for the very poor, particularly those living at high altitude [29]. Much of the income of such people can come from the sale of wild medicinal plants.

2.3. Threats to Himalayan medicinal plants

Medicinal plants in the Himalaya are virtually all wild-collected; there is hardly any cultivation. Unfortunately, there are numerous reports from all parts of the Himalaya that some species of medicinal plants are in decline [5, 15, 30, 31]. It can be predicted that significant genetic erosion is occurring – a serious matter with economic species.

The percentage of species of medicinal plants regarded as threatened has been calculated at a very similar level (13%) for three different parts of the Indian Himalaya [17, 22, 30]. Higher altitude plants are considered to be particularly at risk because of their often sparse occurrence, slow growth, large number of households involved in commercial collection, the tendency of these households to be strongly reliant on the income so received and the relatively high number of local endemics sought by collectors [6, 30, 32]. Generally, it is the roots or other underground organs of these mainly herbaceous species that are sought for collection, contributing to its destructiveness [20, 30, 33].

The major direct threats to medicinal plants across the Himalaya are generally agreed to be habitat loss (including deforestation), habitat fragmentation, overgrazing by domestic stock, burning, and unsustainable harvesting. More local direct threats include pressures from tourism, mining and construction. Threats are reported to have mounted over recent decades, for example in Tibet [26]. Not all these general threats are necessarily inimical to all species. There are many medicinal plants favored by human presence, at least to a certain degree [13, 14]. The reactions of species to environmental change can be complex. For instance, *Nardostachys grandiflora* is unpalatable to livestock and so this species is favored by higher numbers of livestock, but, on the other hand, it is easily damaged by trampling [15].

Collection for local village use is not generally a problem. Such collection tends to be on a small scale and collectors can be careful to avoid undue damage. In contrast, people collecting for sale often collect destructively. The reasons include: an urge to collect large quantities to compensate for low prices; ignorance of 'proper' methods of

***Aconitum spicatum* Stapf in Sagarmatha National Park. This species is threatened by commercial collection in Nepal.**
PHOTO KK SHRESTHA (ESON)

***Ephedra geriandiana* Wall. ex Stapf at Langbushe Solukhumbe.** PHOTO KK SHRESTHA (ESON)

collection; and open access tenure regimes which mitigate against taking much care for the future. It has been calculated that 36% by volume and 51% by value of the total commercial harvest of medicinal plants in Nepal is undertaken destructively [6].

Collection pressure is not uniform across the Himalaya. It is very high in Nepal and Uttaranchal, but reportedly less intense in Ladakh, Spiti and the eastern Himalaya of India [32, 34]. Inaccessibility has saved some places. There was little commercial trade in medicinal plants from the remote Dolpa area of Nepal prior to the building of an airport at Juphal in the early 1990s, an event that triggered its expansion [18].

There are substantial political and socio-economic contrasts between the Himalayan countries, often with major socio-economic changes in recent years. These have major implications for medicinal plants, which are only briefly discussed here. Both China and India have shifted towards more open market economies since 1990, which has greatly magnified the commercial pressures on wild medicinal plants, just as was the case with the demise of centrally planned economies in eastern Europe [35]. The one-child policy in China has likely had a significant impact on reducing demands on natural resources, compared with what would otherwise have been the case. This is unparalleled elsewhere in the region (though minorities in China, including most of the indigenous inhabitants of the Himalayas, are not subject to this policy). Bhutan is unique for its environmentally friendly policies and has escaped the high degree of deforestation apparent in some neighbouring Himalayan states. Nepal and parts of the Eastern Himalaya of India have suffered serious insurgencies in recent years, limiting the authority and ability of the state to manage natural resources in some regions.

Governments in the Himalayan region have found it difficult to enforce rules and regulations relating to medicinal plants. It is estimated that less than 5 per cent of the large quantities of medicinal plants exported from Nepal to India is officially recorded [6]. The ruggedness of the Himalaya and the low levels of staffing of line agencies make forest reserves and protected areas very difficult to police. Reportedly, 80% of the 75 protected areas in the Indian Himalaya suffer from encroachment [32].

There have been substantial declines in traditional knowledge about Himalayan medicinal plants over the last 50 years [15, 34, 36]. This is a serious matter for conservation, as traditional knowledge forms an obvious basis from which to develop modern conservation strategies. In China, a factor contributing to cultural loss has been efforts to 'modernize' Traditional Chinese Medicine, Tibetan Medicine and other ethnomedical traditions [28]. In a related vein, traditional, more nature-friendly methods of managing medicinal plants in the Himalaya have tended to become eroded through social change [19, 37-39]. One reason is that their frequent legal replacement by state controls which have proved ineffective [21, 25, 40]. Fortunately, elements of customary management sometimes remain, limiting the damage [15, 41].

Climate change is a threat to many medicinal plants in the Himalaya. The Intergovernmental Panel on Climate Change has indicated that global warming will be particularly pronounced at high altitudes, especially at lower latitudes (as the Himalaya). Warming is predicted to be 3-5 times faster than elsewhere [32].

Meeting of Valley Heritage Conservation Council, Keylong, Himachal Pradesh, India. A development associated with Pragya. PHOTO ALAN HAMILTON.

2.4. Current conservation initiatives on Himalayan medicinal plants

Experts in five Himalayan countries were invited to prepare National Reports, containing background information on medicinal plants, their conservation status and current conservation initiatives. The National Reports contain sections on current conservation initiatives on Himalayan medicinal plants, augmented at the Regional Workshop by extra contributions from Nepal. Medicinal plant conservation is a complex task and the authors of the National Reports concentrated on various different aspects.

This section summarises presentations made at the Regional Workshop, based on the five National Reports with additional presentations for Nepal (see Annex 3 for workshop participant list and contacts). This is not a complete review of all conservation initiatives on medicinal plants that are being or have been undertaken in the Himalaya. That would be a huge undertaking. Interested readers should consult a recent publication by MAPPA and WWF, which carefully reviews many recent experiences [49].

Bhutan. The National Report for Bhutan describes how the Royal Government of Bhutan has made a national commitment to uphold its obligation to future generations by charting a Middle Path, which views both environmental and cultural preservation as integral to the process of development. The government is committed to maintaining over 60% of the land under forest cover. Traditional medicine (Gso-ba-Rig-pa or Tibetan medicine) has an equal status to that of modern medicine. A central pharmaceutical unit has been constructed for the production of high quality traditional medicines, while cultivation of medicinal plants is being encouraged to ensure adequate supplies are available. Government projects (supported by the EU) have helped to assure systematic progress in the medicinal plants sector. An Institute for Traditional Medicine Services has been founded and there is an interest in developing exports based on sustainable production. The Ministry of Agriculture, through its Agriculture Marketing Services, is developing policies on export for different categories of medicinal plants, e.g. no export allowed for Convention on International Trade in Endangered Species (CITES) Category I species (easily threatened by over-harvesting) and

Village meeting organised by Ethnobotanical Society of Nepal (ESON) for raising awareness about medicinal plant conservation. Rasuwa, Nepal Himalaya. PHOTO KAMAL HUMAGAIN (ESON)

Special tools made locally for collecting wild medicinal plants, Tacheng, northwest Yunnan, China. PHOTO ALAN HAMILTON

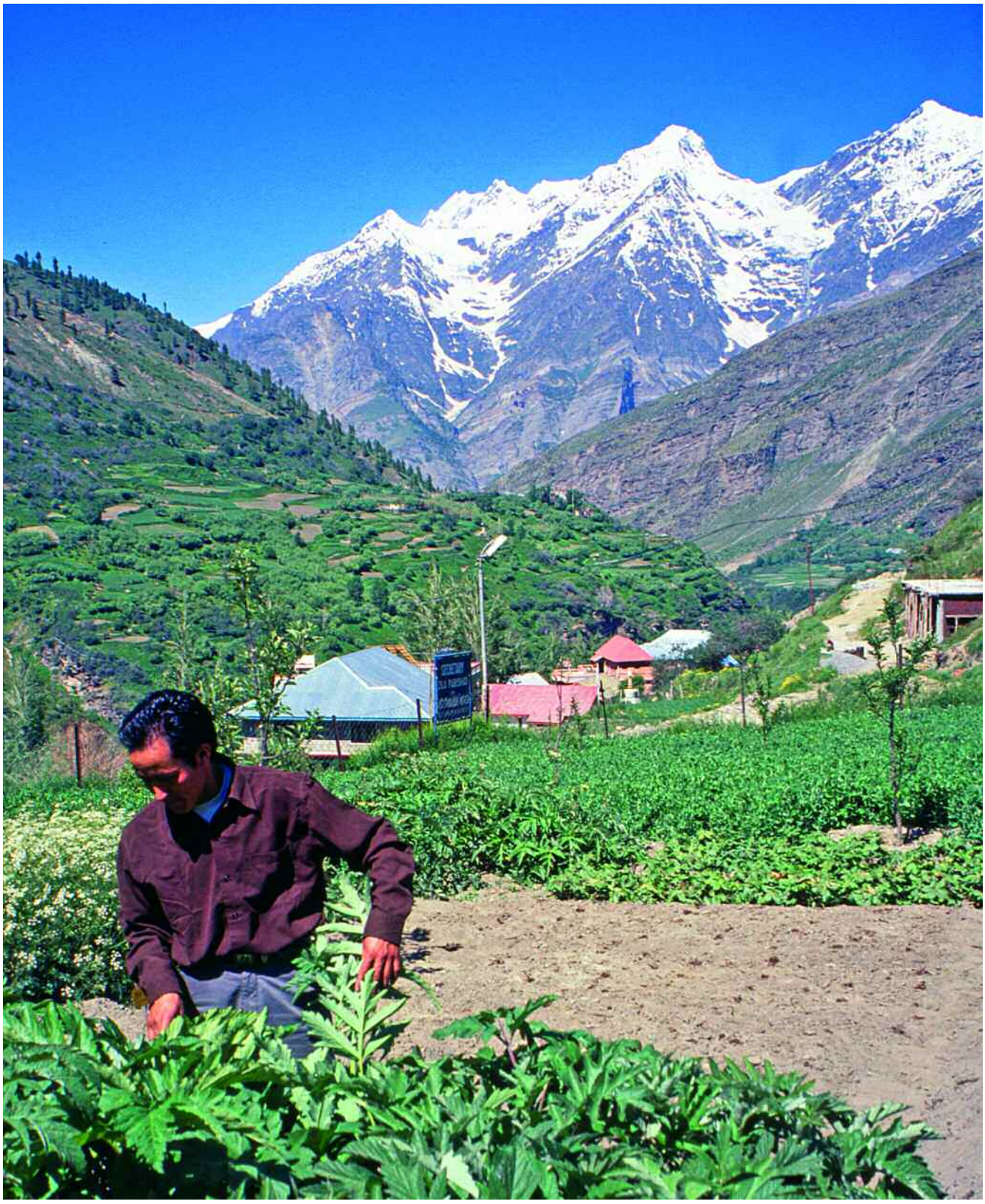
commercial trade from wild sources allowed for Category III species, provided a management plan has been prepared by the Department of Forests.

China. The Chinese Government began to give attention to the conservation of medicinal plants in the 1980s, with the passage of various laws. Among these was *Regulations on Protection and Management of Wild Medicinal Materials* (1987), establishing principles for the protection, regulation of wild collection and cultivation of medicinal plants. Species of medicinal plants have been prioritised in China into 3 categories: (1) species nearing extinction, rare or very precious – no collection allowed; (2) species suffering from reductions in their distributions and abundance – collection and trade allowed only under license; and (3) commonly used major medicinal species showing declines – these too may only to be collected or traded under license. There are various lists of the threatened medicinal plants of China, for example in the *Red Book of China* (which lists 168 endangered medicinal plant species) and in *China National Action Plan for Biodiversity Conservation* (which lists 19 medicinal plants requiring urgent protection) [46, 47]. Protected areas play an important role in conservation of medicinal plants in China. By 2004, China had established 2194 protected areas, constituting 14.8% of its land area and containing more than 50% of China's species of medicinal plants. Ten of the 220 botanical gardens in China have special gardens for medicinal plants. In 2004, a Southwest China Wild Plants Germplasm Bank was established by the Chinese Academy of Sciences at Kunming (Yunnan), with conservation of medicinal plants high on its agenda.

India. The National Report for India describes the community-based approaches of Pragya. Active in all 5 Himalayan states, Pragya is an NGO that strives to sensitise and empower villagers to preserve their cultural and natural heritage, and to assist them in their searches for sustainable development. The formation of Natural Heritage Conservation Councils (NHCCs) has been promoted, which are encouraged to seek out and conserve sites of special importance for medicinal plants – Community Reserves. In some cases, these Community Reserves are protected through social or physical fencing, or the engagement of caretakers. Three of the NHCCs have created Ethnobotanic Centres to conserve local knowledge about medicinal plants. Aspects include ethnobotanic museums and gardens, and traditional health clinics.

Farmers have been encouraged to grow medicinal plants and Medicinal Plant Growers Cooperatives have been formed to help with marketing. Women have been encouraged to start kitchen gardens of medicinal and aromatic plants (MAP) to provide them with household produce and sources of income. Village processing units are now being considered as a further step to enhance women's income. For *ex situ* conservation, nurseries have been developed and herb orphanages founded, the later conceived as places where experiments and trials can be undertaken to back up the conservation of high altitude species under threat. All these field activities of Pragya are supported by a Central Services Division, which includes a Natural Resource Management unit (which undertook the extensive surveys of medicinal plants described later in this report), a tissue culture laboratory and a High Altitude Medicinal Plant Research Centre, charged specifically to find solutions to the cultivation concerns of farmers.

Nepal. In addition to the Ethnobotanical Society for Nepal (ESON), several additional organisations gave presentations at the Regional Workshop on conservation activities on medicinal plants in Nepal. These organisations and their fields of work can only be briefly mentioned here. For those requiring more information, please contact the organisations concerned (Annex 3):



Sonam Nursery, Keylong, Himachal Pradesh, India, with *Heracleum candicans* Wall. A project supported by Pragya situtated within Chika-Peukar-Khangsar IPA. PHOTO ALAN HAMILTON

Lake Phoksundo near Rigmo, Dolpa within the Karnali IPA complex.
PHOTO ALAN HAMILTON

- The **Asia Network for Sustainable Agriculture and Bioresources (ANSAB)** has been active since 1992 following an enterprise-oriented approach to the conservation of medicinal plants. It has experience in developing village-based management systems for sustainable wild harvesting.
- **Dabur Nepal** is a part of an international company that, in Nepal, is involved in the domestication of medicinal plants for commercial cultivation. The company has a large nursery for medicinal plants near Kathmandu and outreach activities with communities.
- **ESON** has established a community-based conservation project on medicinal plants at Rasuwa near Langtang National Park, funded by an Allachy Award from Plantlife International.
- The **Herbs and NTFP Coordination Committee, Department of Plant Resources (HNCC/DPR)** is responsible for national policy on the conservation of medicinal plants and other non-timber forest products in Nepal.
- The **International Centre for Integrated Mountain Development (ICIMOD)**, with its headquarters in Kathmandu, is concerned with community development and conservation in the Himalayas, sometimes involving medicinal plants. It hosts the **Medicinal and Aromatic Plants Programme in Asia (MAPPA)**.
- The **Institute of Agriculture and Animal Science** (Rampur, Chitwan) runs 3 courses on medicinal plants and is involved in several related research and developmental activities.
- **Tribhuvan University** is undertaking research on several aspects of medicinal plants, including compiling a database on medicinal plants in collaboration with ESON.
- The **World Conservation Union (IUCN)** is working with communities in several parts of Nepal to raise conservation awareness, and to test and refine models for community conservation and sustainable use of non-timber forest products (NTFPs, a category that includes medicinal plants).

Pakistan. Four papers were submitted as contributions to the National Report for Pakistan [42-45]. One is the main IPA report, which recommends an integrated approach to conservation, based on these elements: (1) development of local institutions to manage medicinal plants on communal land; (2) introduction of rotational grazing and rotational harvesting, based on divisions of valleys into blocks for use at different times (plus use of quotas for critical species); (3) promotion of cultivation on private land (to take the pressure off wild collection); (4) engagement of local communities in appropriate ways, based on raised awareness and an equitable sharing of benefits (e.g. to encourage the collection of medicinal plants at the right times and in the right ways); (5) determination of the best times for collection of particular species, based on knowledge of their regeneration features and presence of active compounds; (6) provision of improved market information for collectors; and (7) basic field trials and demonstration plots. One of the other reports, on Baluchistan, describes a survey which revealed the many challenges facing development of the medicinal plant sector in the Suleiman Range. Collection of medicinal plants for sale is undertaken on a casual basis mostly by women and children, with very low prices paid to the collectors. The other two reports are on Swat, a district lying in the North West Frontier Province of Pakistan. One describes the results of some cultivation trials. Overall, cultivation only proved successful for 2 of the 6 species tried (*Valeriana jatamansi, Viola serpens*), demonstrating the hazards of promoting village cultivation of medicinal plants without prior research. The other Swat report outlines a plan for the sustainable production of medicinal and economic plants in Kalam. This report describes field studies on the availability of 25 selected species, with estimates of harvesting rates as required for sustainable wild collection.

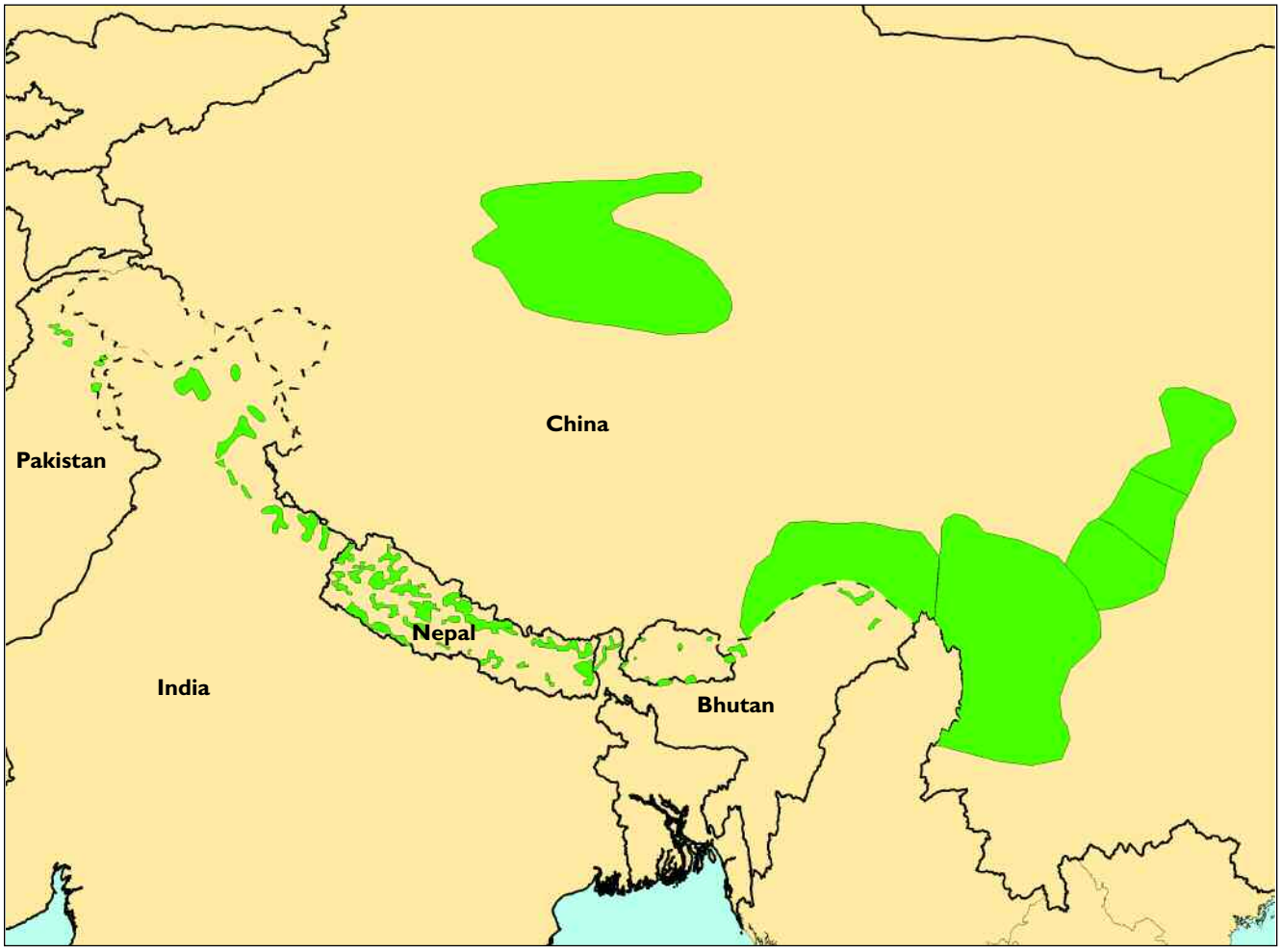
3. Important Plant Areas for Himalayan medicinal plants

3.1. Introduction

The project reported here represents the first attempt to apply the concept of Important Plant Areas in the Himalaya. Medicinal plants were selected as an initial group for this analysis, on the basis of the large number of medicinal species in the Himalaya, and the likelihood that their distributions and conservation status would be relatively well known. It also provided an opportunity for joint work between the IPA and Livelihoods programmes of Plantlife. As the project progressed, it became apparent that a further advantage of selecting this particular group is that it has helped to advance the 'conservation' element of IPA (contrasted with the hitherto more extensively addressed element of 'identification'). It has revealed how the use of plants, as resources, can provide be a powerful motivating force for conservation.

Major components in each of the five National Reports were accounts of original preliminary research undertaken for the identification of the IPAs. Funding for this research was made available from a grant to Plantlife International from the Rufford Maurice Laing Foundation. A broad overview of approaches to conservation of medicinal

Figure 1 IPAs across the Himalaya. Distribution of IPAs medicinal plants in all the Himalayan countries, according to the National Reports. The largest units recognised in the National Reports have been selected for the purpose of mapping, regardless of the terminology used for the different units (e.g. 'IPA Complexes', 'Core Tracts', 'Sites', etc.). This scale may be the most appropriate for monitoring progress in conservation against Target 5 of the GSPC (see text).



Conifer forest in the mist, Bhutan.
PHOTO CHRISTOPHER J. WATT

plants at IPAs drawing on all this work is presented here. The analysis is organised in sections, according to conservation processes and instruments associated with various geographical scales – the national level, the community level, cultural and commercial systems, and regional collaboration. They are all relevant to the conservation of medicinal plants at IPAs in the Himalaya.

3.2. IPA identification: the National Reports

3.2.1. Bhutan

Bhutan is an exceptionally well forested country, with a strong national interest in conservation. Several areas of exceptional botanical richness have previously been identified through national conservation planning. They are widely distributed by altitude. Bhutan has a very high cover of protected areas (compared to the international norm) and there are current efforts to enhance the network even further through developing ecological corridors between them. A total of 4411 species of gymnosperms and angiosperms has been recorded in Bhutan, of which 222-322 are regarded as medicinal according to various estimates. The medicinal species include 4 national endemics, 4 near-endemics and 68 introduced species. The export of medicinal plants has been banned from Bhutan since 1988 as a measure to prevent uncontrolled exploitation of these resources.

A number of medicinal species are threatened at the national scale. They include 7 species regarded as extremely rare and 26 species classified as rare. Most of these threatened species are high altitude plants, with some exceptions (e.g. *Aquilaria malaccensis*, a lowland forest tree).

Ten IPAs for medicinal plants are identified in the National Report, altogether providing a wide geographical and altitudinal coverage and containing a variety of vegetation types (Table 4). Many of these IPAs fall within existing protected areas.

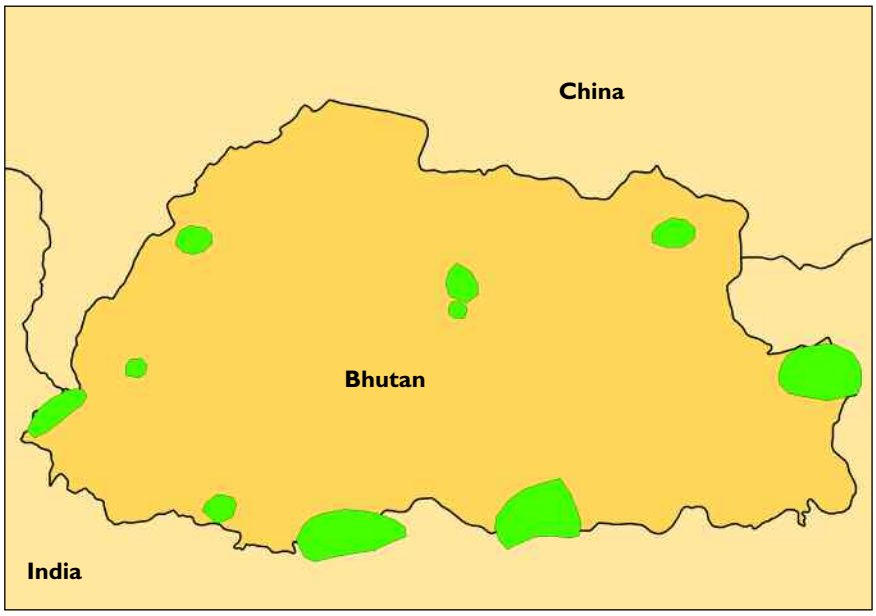


Figure 2. IPAs in Bhutan

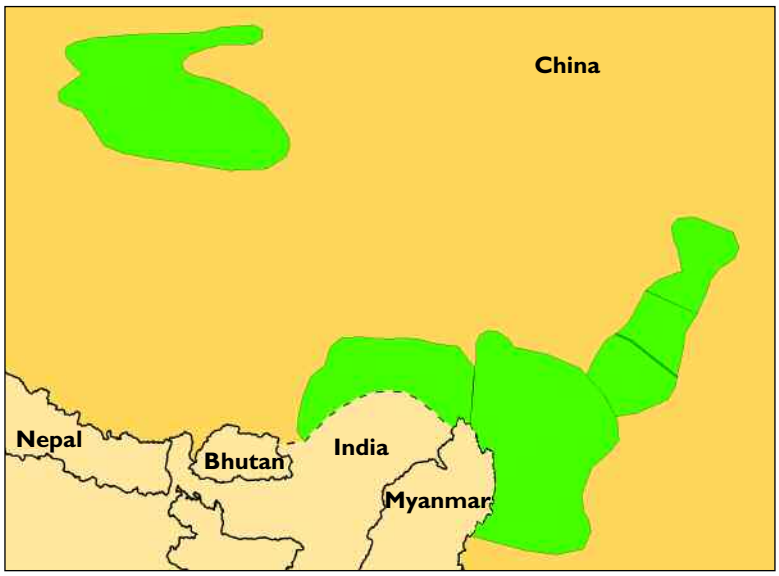
Important Plant Areas for medicinal plants	Part of country	Altitude (m)	Vegetation types
Lingshi	N	4000-5000	Fir; alpine
Chur Chu	C-N	3000-4500	Blue pine[a]; fir; alpine
Dong La	C-N	2700-3500	Blue pine[a]; fir; alpine
Chele La	C-N	2500-4000	Blue pine[a]; fir; alpine
Yorong La	C-N	3000-3500	Blue pine[a]; fir; alpine
Manas	S	200-2000	Sub-tropical; warm broad-leaved forest
Marichong	S	400-2000	Sub-tropical; warm broad-leaved forest
Torsa	C-S	1600-3000	Sub-tropical; warm broad-leaved forest
Phipsoo	S	200-1400	Sub-tropical
Sakden	C	2300-4000	Warm broad-leaved forest; alpine

Table 1. Provisional IPAs for medicinal plants in Bhutan. N north, C central, S south; a *Pinus wallichiana* Jackson.

3.2.2. China

The area covered in the National Report and workshop presentation included the Hengduan Mountains and the Tibetan Plateau, altogether a vast area extending over one-fifth of the landmass of China. The five provinces that cover this area vary considerably in floristic diversity, with Yunnan (17,000 species of higher plants) and Sichuan (9628) being much richer than Xizang (Tibet) (5476), Qinghai (2500) and Gansu (3000). This variation is reflected in the number of medicinal plant species recorded for the various provinces: Yunnan (4758), Sichuan (3962), Xizang (1460), Qinghai (1461) and Gansu (1270). No exact figures exist for the number of medicinal plants from the Chinese Himalaya in trade, though surveys of local markets in northwest Yunnan have recorded 574 species traded as crude drugs. Many of these are likely to be traded only locally and it is estimated that perhaps 150-200 species are traded on a major scale. A list of 100 of the most important of these was compiled for the purposes of the National Report, 35 being highlighted as likely candidates for over-harvesting. In view of the considerable differences in major medicinal species in trade reported for China compared with other parts of the Himalaya, a list of these species is provided (Annex 2).

Figure 3. IPAs in the Chinese Himalaya



The publication of a *Status Report on Chinese National Biodiversity* marked the first attempt to identify Critical Regions for Biodiversity Conservation in China [47]. Five of the 11 territorial Critical Regions so recognised lie in the Chinese Himalaya (fully or in part), the criteria used for their recognition including number of endemics and species richness (i.e. quite similar to the first 2 IPA criteria). These five Critical Regions are: (1) southern section of the Hengduan Mountains (also the richest area in China for fungal species); (2) the northern section of the Mingshan-Henduan Mountains; (3) the area bordering the high plateau of Qinghai-Tebiton-Xingjiang; (4) Xishuangbanna (a transition area between the Himalayan and Southeast Asian floras); and (5) the Qinling Mountains (a transition area between the Himalayan and East Asian floras).

***Pinus densata* and grassland rich in medicinal plants, below Jade Dragon mountain, Lijiang, within northwest Yunnan IPA complex in China.**
PHOTO ALAN HAMILTON

***Rhododendron arboreum* W.W. Smith subs. delavayi (Franchet) Chamberlain at Zixishan, China. This species is a sacred tree of the Yi people of NW Yunnan, who protect it through their religious beliefs. The Yi dance around this particular tree each year, and call on the soul of the tree to ensure a good harvest.**
PHOTO ALAN HAMILTON

Six vast areas are tentatively proposed as IPAs for Himalayan medicinal plants (Table 5). They have been selected on account of their diverse medicinal floras, importance as sources of supply for Chinese Traditional Medicine and Tibetan Medicine, and compatibility with the Critical Regions for Biodiversity Conservation already identified. The IPA of Northwest Yunnan was then used as a case-study to identify much smaller sites of a practical size for field-level conservation. Several additional criteria were invoked at this stage for site selection, notably the presence of indigenous communities with long traditions of medicinal plant use and management, community sizes of roughly 30-100 households, the engagement of substantial proportions (> 30%) of the households in collecting or cultivating medicinal plants, a willingness on the part of the communities to allow outsiders to enter and stay in their villages (i.e. the likelihood of success for externally stimulated conservation projects), and a distance between the sites of less than 150 km with road connections.

On the basis of these criteria, three small sites important for the conservation of Himalayan medicinal plants were identified, by way of examples. All are villages situated within Ludian Township of Yulong County, Lijiang Prefecture. Ludian has a rich tradition of herbal medicine with 363 species of medicinal plants recorded (several are locally endangered through over-harvesting). Ludian is exceptional in northwest Yunnan for its extensive, long-established, cultivation of medicinal plants. Up to 63 species are cultivated, though only 10-15 on a large scale. The three chosen villages vary in the ways that local people are engaged with medicinal plants. At Dian Nan, the sale of medicinal plants (mainly cultivated) contributes 10-70% to household income, with 30% of households being entirely dependent on this income source. In contrast, only about 10% of household income in Dian Bai comes from the sale of medicinal plants. The third village, Lameirong, is marked by extensive cultivation of medicinal plants (320 ha) in the form of plantations. These plantations engage 25 villagers as permanent workers with a further 100-150 seasonally employed.

Important Plant Area for medicinal plants	Altitude (m)	Number of medicinal plant species	Notable habitats for medicinal plants
Northwest Yunnan (S Hengduan Mts)	1200-6740	2000-2500	Mountain forests and pastures; cultivated lands
West Sichuan (Ming Shan Mts and N Hengduan Mts)	1000-5500	1000-1200	Mountains forests and pastures; cultivated lands
Southwest Sichuan (SE Hengduan Mts)	700-7557	800-1000	Hot dry valleys, mountains forests and pastures
South Gansu	2500-4500	1000-1200	High pastures and alpine communities
West Qinghai and N Tibet	4200-5500	500-600	High altitude cold pasture and desert
S Tibet	2800-5500	600-800	High altitude cold pasture and desert

Table 2. Provisional IPAs for medicinal plants in Himalayan China.

3.2.3. India

IPAs for medicinal plants in the Indian Himalaya were identified based on an extensive review of the literature, consultation with well-informed research institutes and original field surveys. Training for the field surveys (which were undertaken in 2003-2005) was provided to Pragya staff by the research institutes. Thirty-two localities were selected for the field surveys, 21 in the western Himalaya, 4 in the central Himalaya and 7 in the eastern Himalaya. Within these localities, likely areas for field recording were identified through ground reconnaissance and consultation with knowledgeable local residents, such as traditional healers, forest officers and scientists. A total of 115 stretches were selected in this way for detailed follow-up sampling, which was through recording the presence of plant species in quadrats 3 x 3 m in size. Altogether, 2700 quadrats were recorded and 2100 plant species encountered. The field surveys were restricted to higher altitudes (2500-5500 m), with only secondary sources of data used to identify IPAs at lower altitudes.

After field sampling, 9 *Conservation Assessment and Management Planning* (CAMP) workshops were held at regional and sub-regional levels to validate the threat status of the species (following IUCN guidelines) and to learn more about the population dynamics of the species according to local stakeholders. The data from the quadrats and secondary sources were then analysed to reveal tracts of habitat that met the first two IPA criteria ('presence of threatened species' and 'exceptional species richness'). The third IPA criterion ('presence of threatened habitats') proved difficult to apply in the absence of standard sources of information or methods of threat assessment for habitats.

The tracts, as identified above, were next grouped into clusters, of which 32 were initially recognised. The reasons for undertaking this clustering were to provide sufficient scale, to allow effective conservation of the species and also to generate and absorb focused attention. A typical cluster consists of several core areas for medicinal plants and the ground between them, the latter being poorer in medicinal plants but regarded as having the potential to be restored as ecological corridors. The parameters used for clustering included physical proximity, habitat homogeneity and delimitation by natural features, such as ranges and valleys. The physical geography of the Himalaya dictated some features of the clustering. For instance, the tracts in the eastern Himalaya tend to

***Peducularis longiflora* Rudolph. found across the Himalaya above 3000m used with other herbs for a variety of conditions including food poisoning, liver/stomach disorder and skin disease.** PHOTO TSEWANG GONBO, LADAKH SOCIETY FOR TRADITIONAL MEDICINES (LSTM).

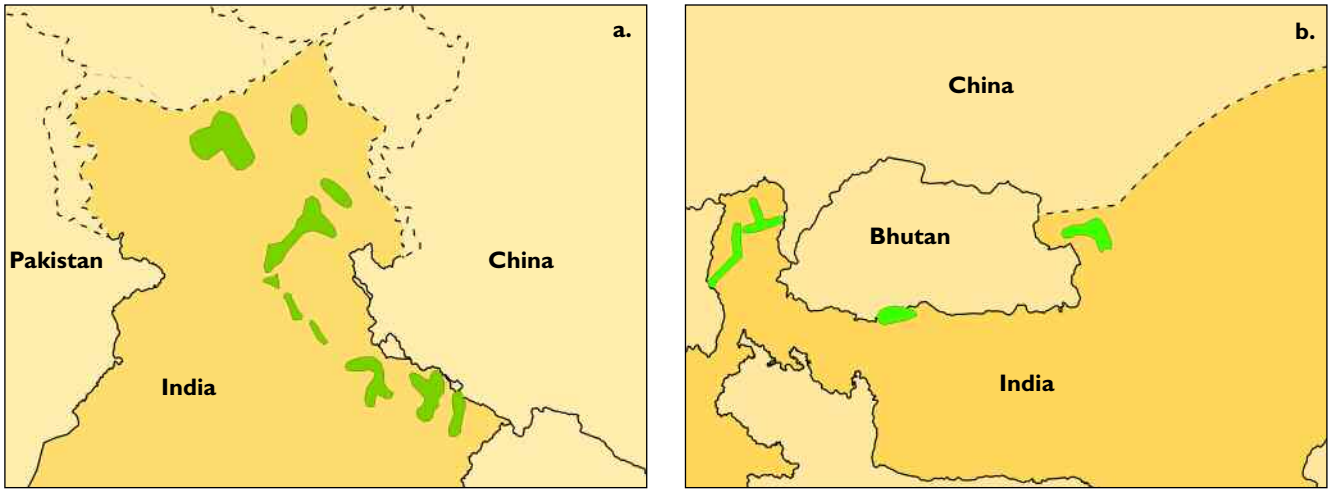


Figure 4. IPAs in the Indian Himalaya a) West Indian Himalaya b) East Indian Himalaya

be smaller, based on valleys and span multiple altitudinal belts. In contrast, tracts in the western Himalaya are often geographically more extensive but confined to particular altitudinal zones. The clustering process often proved to be hard, the boundaries of the clusters being difficult to establish precisely in this region of broken topography and fragmented habitats.

Finally, the clusters were reviewed to ensure good representation according to several major geographical features of the Indian Himalaya: (1) adequate coverage of all major Himalayan regions (western, central, eastern); (2) adequate coverage of all major administrative units (states and districts); and (3) adequate coverage of all altitudinal ecoregions (sub-tropical, temperate, alpine etc.). The review also considered representation in relation to the relative areas covered by these various geographical features. The end result was recognition of 15 IPAs for medicinal plants in the Indian Himalaya, each typically with a small number of tracts (Table 2).

There are several noteworthy features of these provisionally recognised IPAs. One is that, despite the procedures described above aimed at representation, most IPAs are concentrated at high altitudes. This reflects the high proportion of endemic species found at higher altitudes (alpine and sub-alpine zones), especially in the case of the western Himalaya (including the trans-Himalayan region), where even quite small sites can be exceptionally rich in endemics. It is also noteworthy that the core areas of many of the IPAs lie within protected areas, although there are places elsewhere (often of small size) rich in medicinal plants.

Himalayan division	**State**	**Important Plant Areas for medicinal plants** (designated IPA numbers and names)	**No. of tracts**	**Names of tracts**
Western Indian Himalaya	Jammu and Kashmir	1. Khardung-la	1	Khardung-la
		2. Sapi-Penzi-la	3	Sapi, Panikher-Parkachik, Penzi-la-Rangdum
		3. Argi-Sarchu	2	Argi, Sarchu
	Himachal Pradesh	4. Chika-Peukar-Khangsar	3	Chika-Rarik-Patseo, Peukar-Charji, Khangsar
		5. Rohtang and Solang	2	Rohtang pass, Solang valley
		6. Malana-Parbati-Sainj	3	Malana valley, Sainj-Tirthan, Manikaran-Mantalai
		7. Rakcham-Chitkul and Rupi-Bhaba	2	Rakcham-Chitkul, Rupi-Bhaba
Central Himalaya	Uttaranchal	8. Kedar-Gangotri	3	Kedarnath, Khatling-Sahastratal, Kedartal-Gangotri, Harsil-Bhaironghati
		9. Valley of Flowers and Niti	4	Mana-Valley of Flowers, Niti valley, Dronagiri, Kuari pass
		10. Gauri and Pindar	2	Gauri valley, Pindar valley
Eastern Indian Himalaya	West Bengal and Sikkim	11. Dzongri-Phedang and Sandakphu	2	Yuksam-Geochela, Sandakphu
		12. Lachen and Lachung	2	Lachen-Chopta, Lachung-Goechela
	Arunachal Pradesh	13. Dirang-Tawang	4	Thingbu-Luguthang, Geshela-PTTso, Sela-Bangajang, Senge-Nyukmadung
		14. Upper Siang and Dibang	2	Pemako, Anini-Bruini-Andra
		15. Western Lohit-Changlang	2	Deomali, Demwee-Tiding

Table 3. Provisional IPAs for medicinal plants in the Indian Himalaya.

3.2.4. Nepal

The report covers the whole country, including the *terai* zone at the foot of the Himalaya. The flora of Nepal contains about 7000 species of flowering plants, of which 246-310 are national endemics (according to various estimates). The great majority of these endemics are high altitude plants, very few being known from the terai [48]. The district with the highest number of endemic species is Mustang (78 species) followed by Dolpa (74 species) and Rasuwa (60 species).

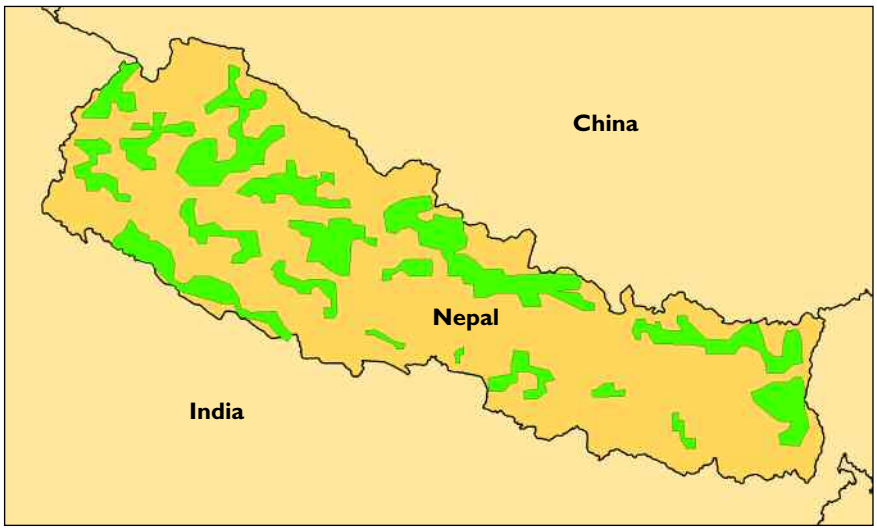


Figure 5. IPAs in Nepal

Estimates for the number of medicinal plant species in Nepal range from 593 to 1624 (figures that include about 60 imported species) [57]. The greatest number of species is found in central Nepal and, in particular, in the sub-tropical zone (including the *terai*). There are diminishing numbers towards the east and west, and with increasing altitude. Two criteria were used to identify the medicinal species under greatest threat. One was endemism and the other relates to pressures from collection. A short list of 30 priority species of traded medicinal plants was prepared through extensive consultation of the literature using several indicators, especially: (1) high levels of commercial or local demand (indicated by quantities collected or high market prices); (2) rarity (whether in terms of overall distribution or rarity where found); (3) slow growth rate; (4) potential for regeneration; and (5) difficulty of propagation. This short list was further refined at an Expert Consultation Meeting held in Kathmandu on 3 March 2006, attended by 20 organisations, and also through interviews with individual experts. The refined list forms the basis of that presented in Annex 1, which is an expanded version covering the whole of the Himalaya, developed at, and following, the Regional Workshop.

Available information on the geographical distribution of the priority medicinal species (as short-listed above) was then used as the main ingredient to determine the localities of IPAs for medicinal plants in Nepal. The third IPA criterion ('presence of threatened habitats') proved difficult to apply. A hierarchical approach was taken to the identification of the IPAs, resulting in recognition of 16 IPA Complexes, 1-9 Sites within each IPA Complex and a sum total of 238 IPAs within the Sites (Table 3). The study was backed up by detailed information compiled for each of the IPA Complexes under the following headings: medicinal plants present, major vegetation types, number of plant species belonging to various categories (e.g. 'endemics', 'threatened'), types of threat, organisations active in the area, and ownership of land.

***Incarvillea mairei* (H. Lév.) Grierson, a medicinal plant growing at Dolpa, Nepal.**
PHOTO ALAN HAMILTON

Medicinal Plant IPA Complexes	No. of Sites per IPA Complex	Names of Sites	No. of IPAs per Complex
Karnali	5	Humla, Mugu, Jumla, Kalikot, Dolpa	36
Upper Mahakali-Seti	3	Darchula, Bajhang, Bajura	18
Lower Mahakali-Seti	4	Baitadi, Dadeldhura, Doti, Achham	14
Upper Bheri-Rapti	2	Jajarkot, Rukum	6
Lower Bheri-Rapti	3	Dailekh, Surkhet, Salyan	6
Terai Arc Landscape-Nepal	8	Kailali, Bardiya, Banke, Dang, Palpa,Nawalparasi, Chitwan, Parsa	19
Upper Annapurna-Manaslu	3	Mustang, Manang, Gorkha	20
Lower Dhaulagiri-Annapurna	5	Baglung, Myagdi, Parbat, Kaski, Lamjung	23
Rapti-Lumbini	4	Pyuthan, Rolpa, Gulmi, Arghakhachi	6
Upper Bagmati	4	Dhading, Nuwakot, Rasuwa, Sindhupalchok	17
Narayani	2	Makawanpur, Bara	3
Upper Janakpur	2	Dolakha, Ramechhap	7
Lower Janakpur	2	Sindhuli, Sarlahi	4
Udayapur	1	Udayapur	3
Upper Sagarmatha-Kangchenjungha Complex	3	Solukhumbu, Sankhuwasabha, Taplejung	36
Lower Kangchenjjungha Complex	3	Terathum, Panchthar, Ilam	12
TOTALS	54		230

Table 4. Provisional IPAs for medicinal plants in Nepal.

3.2.5. Pakistan (Himalaya and Hindu Kush)

This report covers both the Himalaya and Hindu Kush, adjoining mountain ranges lying mostly within the North West Frontier Province of Pakistan. These mountains comprise the richest floristic region of Pakistan, containing 2500 of the country's 6000 species of vascular plants (10% of which are regarded as medicinal). Ninety percent of the endemic plant species of Pakistan are found here. Pakistan ranks among the top 8 exporting countries for medicinal plants worldwide, 60% of its production originating from the Hindu Kush-Himalaya; virtually all is wild-collected.

Local women and some examples of medicinal plants collected in the wild at Miandam, Pakistan. The species include *Paeonia emodi* Wall. ex Royle, *Skimmia laureola* Sieb. & Zucc., *Valeriana jatamansi* Jones and *Viola biflora*. L.
PHOTO SHABANA HAIDER.

The authors note that it is important to conserve plant diversity throughout the **whole** Hindu Kush-Himalayan region, not just at selected sites. Nevertheless, they select seven sites held as of 'strategic importance' for the conservation of medicinal plants (several other sites have been provisionally identified for later confirmation). These seven locations have been identified with reference to the IPA criteria supplied by Plantlife International, as well as using several additional criteria, including: their significance for the provision of plant resources generally (i.e. not just medicinal plants); their contributions to the provision of ecological services (such as water supplies); the extent of engagement of local people with medicinal plants; and an assessment of the practical scope for improvements in conservation. The extent of people's engagement with medicinal plants was judged by the degree of local

***Taxus wallichiana* Zucc.used medicinally throughout the Himalaya; over-harvested and protected in Nepal, endangered in China and prioritised for recovery in Pakistan.** PHOTO S. RAJBHANDRY (ESON)

dependency on income from the sale of medicinal plants and estimates of the likelihood of the local people putting much effort into improving the management of these resources.

All seven IPAs are valley-based and have substantial numbers of inhabitants (Table 1). Altogether, these sites contain a total of about 560 species of higher plants, about 300 of which are considered to be medicinal (though not necessarily so used locally). Several species are regarded as threatened. For example, at one site (Daral valley), four species are considered to be Critically Endangered, seven Endangered, six Commercially Threatened, six Rare and one has become locally extinct (*Saussurea costus*). Many commercial species are becoming increasingly rare, as indicated by the greater effort now needed for their collection. For instance, it is reported that collectors must now travel for 5 hours to obtain the same quantity of *Valeriana jatamansi* as could be collected in just 2 hours, 20 years ago.

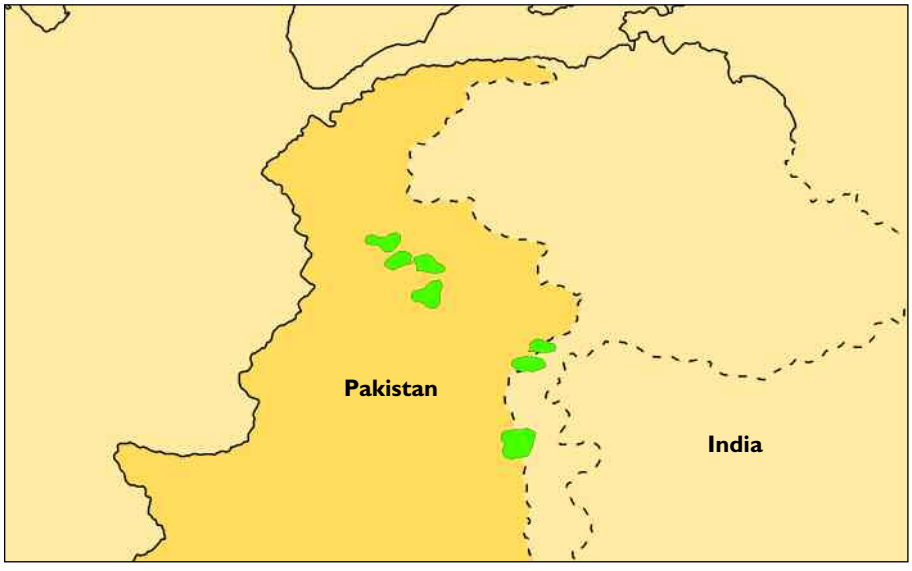


Figure 6. IPAs in the Himalaya and Hindu Kush of Pakistan.

Important Plant Areas for medicinal plants	Altitude (m)	Vegetation	Community
		HINDU KUSH RANGE	
Utrorr valley	2300-4000	Oak scrub, dry temperate conifer forest, alpine and sub-alpine meadows,cold desert	16 hamlets. Population 12,000
Gurnai valley	1400-4200	Oak and coniferous forest, alpine and sub-alpine meadows	4 villages, 9 hamlets. Population 14,000
Daral valley	1400-4500	Dry temperate, alpine and sub-alpine meadows; oak groves	10 villages, 12 hamlets. Population 15,000
Miandam valley	1190-3600	Moist temperate broad-leaved forest, coniferous forest, alpine and sub-alpine meadows	11 villages and 15 hamlets. Population 10,000
		HIMALAYA RANGE	
Siran valley	1200-4800	Oak scrub, temperate coniferous forest, sub-alpine and alpine meadows	10 villages, 12 hamlets. Population 20,000
Shogran valley	1200-4800	Oak scrub, temperate coniferous forest, sub-alpine and alpine meadows	10 villages, 12 hamlets. Population 20,000
Nathiagali	1800-2980	Moist temperate forest (mainly coniferous), alpine and sub-alpine meadows	12 villages. Population 50,000

Table 5. Provisional IPAs for medicinal plants in the Himalaya and Hindu Kush of Pakistan.

3.2.6. Analysis of IPA identification in the National Reports

Information basis. The evidential basis used in the National Reports for recognition of the IPAs varies greatly between the countries, in part reflecting variations in the amounts of available published information. The National Report for India is exceptional for its extensive use of primary data from the field (surveys undertaken by Pragya in 2003-2005). In general, there is a massive deficiency in current information on the distribution and conservation status of medicinal plants in the Himalaya. The results reported here on the identification of IPAs should be regarded as provisional, being based on what is currently known by the authors of the National Reports through the research possible with the (very limited) resources made available for the preparation of these reports. **Therefore, some IPAs will undoubtedly have been missed.** In principle, this is regarded as not a problem for the IPA process, because the identification of IPAs is seen as a dynamic (ongoing) matter with adjustments in IPA lists possible as more information accumulates.

Use of the standard IPA criteria. All authors placed most emphasis on the two IPA 'species' criteria ('presence of threatened species' and 'species richness'). There was general agreement that two types of threatened species can be recognised – narrow-range endemics and more widespread medicinal species threatened by commercial trade. Many narrow-range endemics are regarded as potentially under threat because of their susceptibility to casual disturbance of their habitats and climatic change. Some species believed to be under widespread threat from commercial trade are listed in Annex 1. The habitat criterion ('threatened habitats') proved more problematic to apply, which may be why comparatively few IPAs have been recognised for lower altitudes (see 'Understanding processes', below).

Use of additional criteria. Extra criteria were widely used to support the three standard IPA criteria. They include the importance of places regarding: (1) knowledge or use of medicinal plants (seen as resources); (2) provision of other types of plant resources; (3) provision of ecosystem services (such as water supplies); and (4) the presence of local people believed to be willing to actually engage in conservation. A resource approach to the identification of the IPAs is a particularly noticeable feature of the National Report for China.

In some cases, it is possible that the criteria were widened through fear that places not classified as IPAs may be neglected in conservation initiatives. For example, the National Report for Pakistan states that: "*It is important to conserve plant diversity throughout the* ***whole*** *… region, not just at selected sites (our emphasis)*" (see Section 8 for further remarks about the importance of landscape-level conservation in the Himalaya).

It is stressed here that the selection of places for field initiatives in plant conservation will (and should) be determined by several factors, not just concentrating on sites recognised as IPAs. These factors will include the particular interests and capabilities of the people or organisations undertaking the initiatives – which will vary enormously. Also to be taken into account should be the values that particular places have for different aspects of plant conservation, apart from their contributions to global plant species conservation (the focus for IPA programmes). These other aspects include conservation of plant species on other scales, conservation of genetic diversity within species, conservation of plant resources and conservation of species or vegetation types because of their contributions towards the provision of ecosystem services. IPAs are just one aspect of geographical prioritisation in plant conservation.

Recommendation on the use of criteria. It is suggested that the criteria for recognition of IPAs not be widened beyond the standard three, so as to avoid confusion about what IPAs represent. The selection of a site as an IPA should be guided by the fundamental principle that 'an IPA is a site selected at national level for its importance for the conservation of global plant species diversity' (i.e. loss of certain plant diversity at the site would represent a significant loss to global plant diversity). It is also stressed that IPAs should be considered as national networks, i.e. not just for their values as individual sites – a point recognised especially in the National Reports for Bhutan, China and India. The National Report for India adjusted their selection of IPAs to achieve reasonable coverage of all major administrative divisions (states, districts) in the Indian Himalaya. It is suggested that other large countries or countries with devolved administrations may also consider recognition of IPAs at the sub-national level.

Understanding processes. Interpreting the patterns of IPAs, as given in the National Reports, is greatly assisted if something is known (or hypothesised) about the processes responsible for determining the patterns of plant distribution, as seen today. This helps in making guesses about the localities of possible missed IPAs, extrapolating from the (sparse) available data. For example, it can be postulated that the rugged topography of the Himalaya is likely to have stimulated genetic divergence and speciation among isolated populations of plants, especially at higher altitudes. This helps to explain the observed pattern of a greater concentration of endemic species at higher altitudes and suggests that there may be additional, as yet undiscovered, sites (especially at higher altitudes) that are rich in narrow-range endemics and which could qualify as IPAs on this account. Likewise, rampant destruction and degradation of forests in the temperate and sub-tropical zones of the Himalaya must be a factor threatening many species of these

***Inula racemosa* (Hook. f) in cultivation at high altitude in Leh, India.**
PHOTO PRAGYA

Narrow endemic species of *Clematis* at Dolpa, Nepal – part of the Karnali IPA complex. PHOTO ALAN HAMILTON

habitats. The 'threatened habitats' criterion for recognition of IPAs was generally underused, because of a stated lack of precise information available on habitats and their threats. Thus, it can be supposed that, if more precise information were available on forest decline in the Himalaya, then many more sites at mid- and low altitude would be recognised as IPAs.

Numbers, sizes and scales. The National Reports diverge widely over the numbers and sizes of IPAs recognised in each country. It is stressed that identification of IPAs in terms of numbers and sizes is a matter of country choice. All authors noted several scales at which places meeting the IPA criteria can be recognised, provided them with names such as 'complexes' 'tracts' and 'smaller IPA sites'. Table 6 is an attempt to compare the various categories for the countries according to their approximate spatial equivalence. In principle, there is no problem in choosing several scales for the recognition of IPAs, if this is regarded as suitable for the countries. However, it is most useful if decisions on size and scale can be based on an appreciation of how the IPAs will actually be used for conservation. For example, it is possible that the larger scales might be most appropriate in the Himalayas for monitoring progress in plant conservation against Target 5 of the GSPC (see Section 8.2).

Geographic scale	Pakistan	India	Nepal	Bhutan	China
Scale 1 (largest)					6 very large IPAs (corresponding to existing Critical Regions)
Scale 2		15 IPAs often based on river valleys or ridges	16 IPA Complexes (based on river basins & mountain ranges)	10 IPAs	
Scale 3	6 IPAs, based on valleys	1 to several 'core tracts' within each of the above	54 Sites within the Complexes (equivalent to districts)		3 sites, each representing ca. 100 households
Scale 4 (smallest, suitable for direct field-based management)	(Community based conservation should focus on smaller sites within these)	Smaller sites within core tracts (<40 km^2) appropriate for community management	230 micro-IPAs within the Sites (appropriate for community management)	Smaller sites for practical field management (to be located later)	Land managed by individual households, including home gardens, forest patches & wild cultivation sites

Table 6. Spatial units recognised as significant for the conservation of medicinal plants in the Himalaya. The table was constructed on the basis of the National Reports and subsequent discussions at the Regional Workshop. The units for the different countries are arranged according to their approximate spatial equivalence. Terminology for the units as in the National Reports.

Management as specific sites. It has become obvious through discussions at the workshop and subsequently that in the Himalaya the need for IPAs to be significant units at the national scale and the requirement that they can be 'managed as specific sites' are irreconcilable. The most useful 'specific sites' for conservation of Himalayan medicinal plants are small community-managed places (e.g. perhaps a small section of a forest, a particular pasture or a hill, under the management of one person or a small number of

individuals). There are potentially tens of thousands of such places across the Himalaya. They are far too numerous to achieve significant recognition at the national level. This contrasts with the situation in many European countries, where huge tracts of the countryside have been profoundly modified. Here, even tiny (e.g. field size) areas of habitat can (and are) recognised at the national level as being of significance for the conservation of global plant species diversity and thus are IPAs.

Itinerant traders in morels in the Himalayan region of Pakistan (*Morchella* spp.), collected for export to Europe. PHOTO ALAN HAMILTON

3.3. Conservation of medicinal plants at IPAs

3.3.1. Introduction

It is clear from presentations made at the Regional Workshop that the conservation of medicinal plants at IPAs in the Himalaya requires action on several fronts. The various National Reports lay emphasis on different aspects. Table 7 summarises these and group them according to the scale and type of instruments and processes available for conservation. Some instruments and processes refer to the national scale and therefore relate directly to the IPA networks. A second, profoundly important, scale for conservation action is that of the community. Other instruments and processes cross-cut the community/state hierarchy, following the geography of cultural and commercial systems. Given that there are so many aspects of conservation of medicinal plants, only a few remarks on selected aspects of conservation can be mentioned here. A recent review provides a fuller account [49].

Categories of conservation instruments and processes	Stakeholders in medicinal plant conservation and the conservation instruments and processes available to them
National-level	**Government: (1)** declaration of reserves (protected areas, forest reserves); (2) laws about plant collection, trade and export (including CITES); (3) policy frameworks covering joint resource management, traditional medicine, community and cultural development, and standards in the herbal industry; (4) supportive services (herbaria, information, education, advisory, etc.); and (5) scientific research (especially on conservation methodologies; also for further identification of IPAs). **NGOs:** facilitate case studies and policy analyses on medicinal plant conservation.
Community-level	**Communities on their own land:** identification of important places and species for priority attention, based on community interest (whole community and sectional interests – healthcare, income and culture); community agreements on community protected areas; development of adaptive management systems for sustainable use; and cultivation to relieve the pressure on wild resources.
Culturally related (cross-cutting)	**Communities and reserves:** agreements with parks or forestry departments on rights and responsibilities in relation to management and use of the reserves.
	Communities and industry: agreements with industry in favour of sustainable use (see below).
	Traditional healers and indigenous groups: advocacy of conservation by cultural leaders and traditional healers, related to healthcare, cultural heritage and sustainable development.
Trade related (cross-cutting)	**Traders, industry, consumers:** agreements between industry and communities assuring sustainable use (good quality, sustainably produced plant materials for fair and assured prices); direct support by industry (e.g. technical help with cultivation trials or value-adding processes); company social responsibility; ethical purchasing; and certification

Table 7. Major stakeholders for conservation of Himalayan medicinal plants, and some related conservation instruments and processes.

Ayubia national park and Kashmir – the landscape of Nathagali IPA, Pakistan.
PHOTO ALAN HAMILTON

***Rhodiola* sp. Ladakh, India.**
PHOTO TSEWANG GONBO, LADAKH SOCIETY FOR TRADITIONAL MEDICINES (LSTM).

3.3.2. National-level instruments and processes

Monitoring. IPAs can be used to monitor progress against Target 5 of the GSPC '*Protection of 50 per cent of the most important areas for plant diversity assured*' (to be met by 2010). It is possible that the larger scales of IPAs could be the most suitable for this purpose (i.e. for most countries, the scale shown on Figure 1). Choosing a larger scale would mean a smaller number of sites, each of which could then be monitored more carefully. The National Report for India makes a significant comment on the question of the scale chosen for IPAs, stating that this should be adequate for 'generating and absorbing focused attention'. Monitoring will require the selection of indictors to assess conservation progress. It is recommended here that the indicators chosen should include social processes and instruments (Table 7), as well as measurements of the actual states of sample populations of plants or habitats.

Landscape planning. This is an obvious use of IPAs at the national level, including for providing evidence regarding the siting of reserves. Given the likelihood that some IPAs are yet to be recognised, it is probably best at present to place more emphasis on the overall patterns revealed by the IPAs (as identified so far) than on specific sites. Taking this approach, the most remarkable feature of the distribution of IPAs (as currently identified) is their evenly spread west-east scatter along the Himalaya. The obvious conclusion from this is that efforts are needed along the whole length of the Himalaya to conserve its plants.

Apart from the evidence provided by the distribution of IPAs, a landscape approach to plant conservation in the Himalaya would seem eminently sensible anyway. Conserving plant diversity across the Himalayan landscape will: (1) help to mitigate against plant loss in the face of climatic change; (2) provide the inhabitants of the Himalaya with plant resources, wherever they live; and (3) help to preserve vital ecosystem services, such as water supplies and soil stability. Plant conservation is such an important matter for human survival in the Himalaya that it should be pursued everywhere, a conclusion which accords to the ecosystem approach to conservation (required by the CBD) and which is supported by Tibetan philosophy [7].

Protected areas. The National Reports suggest that reserves (especially protected areas) are significant tools for the conservation of medicinal plants in the Himalaya. This is very clearly accepted in Bhutan, which combines a high level of official interest in conservation with a high coverage of protected areas. Many of the core areas for conservation of Himalayan medicinal plants identified in India fall within protected areas, while the National Report for China reports that more than 50% of Chinese medicinal plant species are found in protected areas. What would now be a useful exercise is to review the geography of protected areas in the Himalaya to ensure that they adequately cover all natural habitats along both the west-east and altitudinal axes. A good coverage along these dimensions will help to ensure that the genetic diversity of medicinal species is conserved (including in places where the species are not used medicinally and so are just 'ordinary plants', i.e. not potentially benefiting from special local interest). It will also provide the flora with resilience against climatic change.

Policy frameworks. Progress in conservation of Himalayan medicinal plants will be achieved primarily through community-level processes, which can be fostered by support from traditional healers, cultural groups and industry (see following sections). The government can help by creating suitable policy frameworks, covering such fields

***Paris polyphylla* Sm. and fruit, Sagarmatha National Park.** PHOTO A. MILLER (ROYAL BOTANIC GARDEN EDINBURGH) AND S. RAJBHANDRY (ESON)

as the rights of communities in protected areas, joint forest management, recognition of traditional medicine, community and cultural development, and standards in the herbal industry.

Joint forest management. A particular field in which the government can help, working with scientists, is to find ways to improve the effectiveness of agreements between communities and reserves over national resource management. If suitable agreements are not made, then the medicinal plants within protected areas and forest reserves can effectively become 'common pool' resources and, given the difficulties of policing in the Himalaya, the reserves could then become depleted through unregulated harvesting. One approach to involving the locals is to hand over the entire management of reserves to local communities, as has just been achieved for the Kangchenjunga Conservation Area (Nepal) after many years of building capacity among local institutions. In the case of Nandi Devi and Great Himalaya National Parks (India), the agencies responsible for the parks have sought local cooperation through undertaking developmental activities with communities in buffer zones around the parks, based on stimulating cultivation of medicinal plants (described in the National Report for India). As

Tibetan doctor (Amchi Gurmet Namgyal) reading the pulse, Kanji, Ladakh, India. PHOTO ALAN HAMILTON.

for forest reserves, the greatest progress in involving people seems to have been made in India and Nepal, both pioneers in joint forest management (JFM). So far, over 14,000 forest patches have been handed over for community management in Nepal. These arrangements are based on agreements on the rights of local forest user groups to collect produce from the forests under agreed terms. JFM in Nepal has mainly been applied to timber, only recently expanding to medicinal plants.

3.3.3. Community-level instruments and processes

Achievement of conservation of medicinal plants at the community level is the key conservation challenge regarding Himalayan medicinal plants. Recognition of traditionally protected sites and landscapes, which are numerous in the Himalaya, is an important aspect [50]. Apart from this, the main conservation instrument is sustainable use. Conservation at the community land is needed regardless of whether the medicinal plants are on private land, community land or in reserves (where agreements with the responsible agencies are needed – see above). Agreements with industry may have the potential to foster sustainable use (Section 3.3.5).

Community-based conservation of medicinal plants requires the identification of local stakeholders, and also of areas of land sufficiently small in size to be capable of direct management, e.g. in terms of restricting use (as with sacred sites), regulating plant collection, grazing and burning, and controlling unauthorised activities by outsiders ('important plant resource areas'). The size of these management units is likely to vary greatly depending on the habitat. They will be much bigger in dry pastoral areas than on well-watered, heavily populated land.

In principle, these management areas should **not** be designated by scientists without community input. This is partly because the locals will generally know much more about their local botany than visiting scientists can discover. It is also because research has shown that professional botanists and local people have different ways of prioritizing species for conservation and can come up with different lists [51]. It is also necessarily to take into consideration the opinions of different sub-sectors of society (men, women; traditional doctors, commercial collectors, etc.), each with its particular slant. Strategies for community-based conservation will only be successful if diverse perspectives are considered. Therefore, the identification of sites and species for special attention should form a part of participatory planning with communities, rather than being independent scientific exercises [52]. The same is true for determining management arrangements. According to ANSAB [21, 53, 54], some key requirements for successful implementation of sustainable use of wild medicinal plants include: (1) clear property rights; (2) resource management plans that consider all community interests; (3) biological monitoring and information on sustainable yields (not known for most species); and (4), ideally, access to value-added processes to increase the incentives to communities.

Cleaning *Neopicrorhiza scrophulariiflora* (Pennell) Hong, Lomangthan Mustang, Central Nepal. PHOTO ARIANA WAGNER (ESON)

Community-based conservation of medicinal plants is possible wherever there is a sufficient local interest in these resources – whether this is for healthcare, income or culture. Currently, many Himalayan communities remain interested in medicinal plants and so there is a possibility of forming a 'conservation grid' across the Himalaya, founded on community concern (a vision expressed in the National Report for India). Initially based on core sites, such a grid could subsequently be enlarged and strengthened through the restoration of degraded intervening land. Based on thousands of Himalayan villages, the grid would form a buffer for maintaining the diversity of the flora across the landscape and for providing resilience against climatic change.

3.3.4. Culturally related processes

Conservation of plant diversity has to be based on knowledge and motivation. Religious beliefs often play a major role [50, 55]. The *Menri* or Medicine Mountains, part of the Hengduan Mountains of Yunnan (China), are viewed as a special repository for medicinal plants for Tibetan medicine. The highest peak, *Khawa Karpo*, is the second most sacred mountain for Tibetan Buddhism. It is circumambulated by thousands of pilgrims from all over Tibet each year [7]. There are numerous sacred sites on Mount Khawa Karpo, found between 1900 and 4000 m. At higher elevations (4000 m) the whole area is considered a sacred landscape [50]. A statistically based study on Mount *Khawa Karpo* has found that useful species and endemic species of plants are significantly more numerous at sacred sites than elsewhere; also, that sacred sites are significantly close to villages. The high elevation parts of the mountain (the sacred landscape) are significantly richer in endemic plant species than lower altitudes.

There is no surer foundation for conservation of medicinal plants in the Himalaya than that provided by the exceptional knowledge and social standing of traditional doctors. Herbal doctors – the botanists of the Himalaya – have traditionally been concerned that they collect medicinal plants in sustainable ways [15, 18]. Herbal doctors can be active for plant conservation on many scales, sometimes cross-cutting communities and states.

Himalayan alpine pasture, Solukhumbu within the Upper Sagarmatha-Kanchenjungha IPA complex, East Nepal. PHOTO KK SHRESTHA (ESON)

Village herbalists will likely wish to conserve certain plants at the local level so that they can easily obtain them for their medicines, while promoters of Tibetan medicine will wish to maintain medicinal resources widely across the Tibetan cultural area, which crosses national frontiers. Several conservation initiatives, such as those of NOMAD and the Ladakh Society for Traditional Medicines in Ladakh (India) and WWF-Nepal at Dolpa (Nepal), have sought to improve the management of medicinal plants through supporting and strengthening traditional medicine [17, 18].

Members of different cultures view the world differently and will have different priorities in their selections of plants and places for conservation. This is why participatory research involving scientists and the community is needed to identify the plants and places most in need of attention. Furthermore, within the community, the possibly divergent values and knowledge of significant sub-groups should be taken into account (traditional doctors, commercial collectors, men, women, etc). Research at *Khawa Karpo* revealed that, using scientific concepts and methods, medicinal plants were found to be concentrated in certain altitudinal zones and vegetation types [7]. However, the Tibetan doctors on the research team emphasised that "*all vegetation provides plants for their use and that all vegetation types are important for Tibetan subsistence and culture. Loss of any vegetation type would seriously hinder Tibetan life and culture*". Such an holistic approach to conservation and livelihoods is in line with the ecosystem-based approach advocated by the CBD. It may sound rather theoretical, but one Himalayan country (Bhutan) has actually based its approaches to conservation and development on this philosophy.

3.3.5. Commercial systems

Very often herbal companies buy medicinal plants from traders who draw on supplies from extensive areas. Thus, the companies usually have very little idea about how ecologically sustainable are their sources of supply. To contribute to conservation, it is necessary for companies to be connected in a firm way to the actual places and people where the medicinal plants originate, i.e. to individual collectors or farmers. Thus, achievement of sustainable production at community-level (see above) is a precondition for achieving sustainability for industry. The community once again emerges as the key geographical level for conservation of Himalayan medicinal plants. There are two ways to forge firm connections between industry and producers – direct purchasing or certification. The basic deal, drawing on the interests of both parties, is for communities to supply sustainably produced, high quality, materials to industry, in exchange for fair and assured prices. Contractual arrangements are liable to be much easier to forge in the Himalaya (where land-holdings are tiny and collectors numerous), if individual collectors or farmers are organised into associations.

Weighing medicinal plants, Rasuwa, Nepal Himalaya. PHOTO KAMAL HUMAGAIN (ESON)

Very little progress has been made to date in tying industry into conservation in the Himalaya. However, the company Dabur Nepal reports that it is making efforts in this direction in Nepal, while WWF-Pakistan has facilitated progressive agreements between communities at Swat and Qarshi Industries, a pharmaceutical company based on Unani Medicine. The Asia Network for Sustainable Agriculture and Bioresources (ANSAB) based in Nepal has developed exceptional experience in helping communities organise themselves for sustainable production of wild commercial species. It has even achieved certification in some cases (organic and FSC).

3.3.6. NGO initiatives

Depending on the country, non-governmental organisations (NGOs) can play very useful roles through raising public awareness about conservation of Himalayan medicinal plants and carrying out innovative projects (especially at the critical community level). In this way they can contribute to the development and testing of conservation methodologies, and thus provide empirical evidence to inform the development of national policies. Progress on a large scale will depend on the uptake of standard operating procedures in favour of conservation by relevant line agencies, such as the departments of forestry, agricultural, health and industry. NGOs can assist by working with these line agencies and other partners to develop suitable protocols.

***Panax pseudoginseng* Wall.** PHOTO © ASHOKA TRUST FOR RESEARCH INTO ECOLOGY AND THE ENVIRONMENT (ATREE)

3.3.7. Regional collaboration

The Regional Workshop provided an excellent opportunity to discuss how regional and international co-operation can assist the conservation of Himalayan medicinal plants. Several networks are already active or planned, a witness to the perceived value of international collaboration in this field (Box 1). According to participants at the workshop, principal roles for regional and international collaboration include the co-ordinated development of case studies, the analysis of best practice and the sharing of lessons. There is no doubt that much can be gained from cross-learning between the Himalayan countries, and also with sharing information with other parts of the world involved in conservation of medicinal plants. Regional and international collaboration can also help to tackle conservation issues that cross borders, such as unsustainable international trade in medicinal plants.

Miandam, Pakistan. A town within the Miandam Valley IPA, Swat, North West Frontier Province, where 3000 people collect medicinal plants from the wild to sell – about 1000 of them are entirely dependent on this trade for an income. PHOTO ALAN HAMILTON

Box 1. Himalayan networks active or planned working on conservation and development related to medicinal plants.

- ANSAB: Asia Network for Sustainable Agriculture and Bioresources, active in Nepal and India.
- MAPPA: Medicinal and Aromatic Plants Programme in Asia, a network that covers the Himalaya (and other countries), based at the International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- IUCN: The World Conservation Union, which has had several projects on medicinal plants in the Himalayas, and also has a Medicinal and Aromatic Plants Specialist Group, with members from Himalayan countries.
- Plantlife International and associated organisations, involved in the Regional Workshop or supporting field projects.
- SAARC: Reportedly, the South Asian Association for Regional Cooperation will establish a non-timber forest products (NTFP) based in Bhutan.
- WWF, with representation in all Himalayan countries and active in medicinal plant conservation especially in Pakistan and Nepal.

Drying chirayta (*Swertia chirayita* (Roxb. ex Fleming) H. Karst.), Chilime, Rasuwa, Nepal. PHOTO KAMAL HUMAGAIN (ESON)

4. Conclusions and recommendations on Important Plant Areas and conservation of Himalayan medicinal plants

4.1. Geographical prioritisation of places for conservation

- Prioritisation of places for conservation of Himalayan medicinal plants is essential.
- Achievement of conservation and sustainable use for Himalayan medicinal plants requires geographical prioritisation, to focus conservation attention on key sites.
- Priority sites will vary according to the particular interests, remits and capabilities of concerned individuals or groups. IPAs are one way to prioritise sites for conservation, serving certain purposes.

4.2. Community-based conservation

- The community level is the critical level for conservation of Himalayan medicinal plants.
- Recognition of important areas for plant conservation (including sustainable use) at the community level should be based on community values and knowledge.
- Participatory research and planning between communities and scientists can be useful for identifying priority sites for improving the management of medicinal plants and for working out how this might be achieved.
- Different community perspectives (local healthcare, income, culture; men, women, etc.) should be considered in making decisions on the use and management of medicinal plants.
- Traditional doctors associations, religious leaders and indigenous groups can provide encouragement and guidance to communities seeking to conserve their medicinal plants.
- The herbal industry can assist communities to achieve conservation of medicinal plants through making agreements that specify fair and assured prices for medicinal materials from sustainable sources.
- Natural resource managers can assist communities to conserve medicinal plants through making agreements that provide benefits in the buffer zones of protected areas (e.g. assistance with cultivation of medicinal plants) or rights of sustainable use within forest reserves.
- Governments can assist communities to conserve medicinal plants through providing appropriate policy frameworks (natural resource management, traditional medicine, community and cultural development, standards in the herbal industry). They also have responsibilities with respect to education, training, advisory services and central scientific services (e.g. herbaria, etc.).
- Non-governmental organisations (NGOs) can play catalytic roles through developing innovative conservation case studies, especially at the critical community level, and contributing analyses to identify best practice.

4.3. Recognition and further development of IPA networks

IPAs (sites of international significance for the conservation of plant diversity recognised at national level) can usefully be recognised in the Himalaya. The initial sites recognised here are provisional, recognising that the information base is weak. They are currently based only on medicinal plants.

A Dai girl collecting *Craib-leg* (*Viscum articulatum* Burm. f.), growing on thousand year-old tea trees, Yunnan, China. This parasitic plant (mistletoe) is used to make a herbal tea and its price is 300 Euro per kg . PHOTO PEI SHENGJI.

Children contribute their knowledge at a medicinal plant workshop in Ladakh. PHOTO ALAN HAMILTON

***Saussurea costus* (Falc.) Lipsch. (Syn. *S. lappa* (Decne.) C.B. Clarke; *Aucklandia lappa* Decne.)** PHOTO ALAN HAMILTON

- IPA networks of sites should be further developed, as information on both medicinal and non-medicinal species accumulates. They should be developed to be of use for national level plant conservation processes, including monitoring progress in plant conservation (including against Target 5 of the GSPC) and for landscape-level planning.
- Based on the distribution of IPAs (as recognised so far), protected area networks in the Himalaya should be reviewed to achieve a good coverage along both the W-E and altitudinal axes. This will help to ensure that the genetic diversity of medicinal plants is conserved (important with useful species) and provide resilience against climatic change.

4.4. Regional collaboration

- Further regional collaboration with respect to medicinal plants will serve the Himalayan nations well through the sharing case-studies and analyses of best practice, and for joint initiatives on cross-border issues such as unsustainable trade in medicinal plants.

Annex 1

A preliminary list of widely distributed commercially threatened species of medicinal plants requiring conservation attention in the Himalayas

This list is based on an original list compiled by ESON for Nepal. Discussions at the workshop and subsequent correspondence have allowed the list to be revised to cover the whole Himalaya. A few of the species included are only recorded from single countries, but, within them, are regarded as major commercial species under threat. The Chinese Himalaya are somewhat distinctive in their threatened medicinal flora and a supplementary list is provided for that country in Annex 2.

Distributions (organised west to east): P Pakistan, I India (w – west, c – central, e – east, p – pan-Indian Himalaya), N Nepal, B Bhutan, C China.

[a] Indicates species among the top 20 species traded from Nepal to India and believed to be vulnerable, considering the part of the plant collected [6].

[b] Top ranking sensitive Himalayan taxa in the Ranunculaceae, identified as priorities for conservation attention [56].

[c] As indicated in the National Report for China.

[d] As recognised under various evaluations in China, including the Red Data Book for China [26, 46].

[e] As indicated in the National Report for Pakistan. Apart from those in the list, one other species is indicated as a high conservation priority – *Berberis lycium* Royle.

[f] Subsequent to the workshop, the following additional species were noted as commercially threatened in the Indian Himalaya: (1) critically endangered (IUCN) – *Aconitum falconeri* Stapf, *Angelica glauca* Edgew., *Arnebia benthamii* (Wall. ex G. Don) Johnston, *Delphinium denudatum* Wall. ex Hook. f. & Thoms. and *Meconopsis aculeata* Royle; (2) Endangered (IUCN) – *Rhododendron anthopogon* D. Don., *Saussurea obvallata* Wall. and *Swertia angustifolia* Buch.-Ham. ex D. Don' and (3) Vulnerable (IUCN) – *Thalictrum foliolosum* DC.

Taxon [f]	Distribution	Notes
Acacia catechu (L.f.) Willd.	P I N B	Protected (N)
Aconitum balfourii Stapf	I(c) N	Endangered (I – IUCN)
Aconitum ferox Wall. ex Ser.[b]	I(e) N B	Vulnerable (IUCN). Over-harvested (N)
Aconitum heterophyllum Wall. ex Royle [b]	P I(w) N B	Regarded as high conservation priority (I). Commercially threatened (N)
Aconitum leave Royle	P I(w) N	
Aconitum spicatum Stapf	I(e) N B	Commercially threatened (N)
Aconitum violaceum Jacq. ex Stapf	P I(w,c)	
Acorus calamus L.[a]	P I(w,c,e) N	Vulnerable (I – IUCN)
Anisodus tanguticus (Maxim.) Pascher	C	
Asparagus adscendens Roxb.	P I(w)	
Asparagus racemosus Willd.[a]	P I N B C	Cultivated (I). Over-harvested (N)
Atropa acuminata Royle	P I(w)	Critically endangered (I – IUCN)
Bergenia ciliata (Haw.) Sternb.	P I N	Commercially threatened (I)
Bistorta amplexicaulis (G. Don) Greene	P I(p)	High conservation priority (P) [e]
Bunium persicum (Boiss.) B. Fedtsch.	P I(w)	High conservation priority (P) [e]
Butea monosperma (Lam.) Kuntze	P I N	Cultivated in I, so regarded as low risk
Cephalotaxus fortunei Hook. f.	C	
Colchicum luteum Baker	P I(w,c)	High conservation priority (P) [e]
Coptis teeta Wall. [b]	I(e) C	Endangered (C) [d]
Cordyceps sinensis (Berk.) Sacc.	I N B C	Over-harvested and protected (N). Extremely rare (B) [c]. Vulnerable (C) [d]
Dactylorhiza hatagirea (D. Don) Soo	P I(p) N B	CITES Appendix II. High conservation priority (I). Over-harvested and protected (N)
Delphinium himalayai Munz.	N	Commercially over-harvested (N)
Dioscorea deltoidea Wall. ex Griseb.[a]	P I(p) N B	CITES Appendix II. High conservation priority (I). Commercially threatened (N)
Ephedra gerardiana Wall. ex Stapf	P I(w) N B	High conservation priority (I).
Fritillaria cirrhosa D. Don	I(c,e) N C	NB: Several spp. of *Fritillaria* are protected (C)
Gastrodia elata Bl.	C	Vulnerable (C) [d]
Meconopsis punicea Maxim.	C	
Morchella esculenta (L.) Pers. (NB. Also *Morchella* generally [a])	P N	Prioritised for recovery (P) [e]. Over-harvested (N)
Nardostachys grandiflora DC. [a]	I(p) N B	Endangered (IUCN). CITES Appendix II. Over-harvested and protected (N)
Neopicrorhiza scrophulariiflora (Pennell) Hong [a] (*Picrorhiza kurrooa* Royle ex Benth. in western Himalaya)	I N B C	*N. scrophulariiflora*: Vulnerable (IUCN). *P. kurrooa*: on CITES Appendix II. Over-harvested (N). Protected (N, C). Extremely rare (B) [c]
Oroxylum indicum (L.) Kurz	P I N	Vulnerable (IUCN)
Paeonia emodi Wall. ex Royle	P I(w)	Endangered (I – IUCN)
Paris polyphylla Sm.	I(p) N B C	Vulnerable (IUCN), (C) [d]. Over-harvested (N)
Pinus gerardiana Wall. ex D. Don	P	Prioritised for recovery (P) [e]
Pistacia chinensis Bunge	P I N C	Over-harvested and rare (N)
Polygonatum multiflorum (L.) All.	P I(w,c)	Rare (I)
Przewalskia tangutica Maxim.	C	
Psammosilene tunicoides W.C.Wu & C.Y.Wu	C	Rare (C) [d], Endangered (C) [d]
Rauvolfia serpentina (L.) Benth. ex Kurz	I(p) N B	CITES Appendix II. Over-harvested and protected (N)
Rheum australe D. Don	P I N	Syn. *R. emodi* Wall. ex Meisn. Vulnerable (I – IUCN)
Rheum tanguticum Maxim.	C	
Rhodiola rosea L.	C	

Taxon [f]	Distribution	Notes
Rubia manjith Roxb. ex Fleming [a]	P I N B	Threatened and not yet domesticated (I)
Saussurea medusa Maxim.	C	
Saussurea costus (Falc.) Lipsch. (Syn. S. lappa (Decne.) C.B. Clarke; *Aucklandia lappa* Decne.)	P I B C	CITES Appendix I. CITE Appendix II. Prioritised for recovery (P) [e]
Saussurea involucrata Kar. et Kir.	C	
Sinopodophyllum emodi (Wall. ex Honigberger) T.S. Ying (syn. P. emodi Wall. ex Honigberger, *Podophyllum hexandrum* Royle)	P I(p) N B C	Vulnerable (IUCN). CITES Appendix II. High conservation priority (P) [e]. Critically endangered (I – IUCN). Rare (C) [d]
Swertia chirayita (Roxb. ex Fleming) H. Karst. [a]	P I(p) N B	Vulnerable (IUCN). Over-harvested (N)
Taxus wallichiana Zucc.	P I(p) N B C	CITES Appendix II. Over-harvested and protected (N). Endangered (C). Prioritised for recovery (P) [e]
Valeriana jatamansi Jones [a]	P I(p) N B	Protected (N). High conservation priority (P) [e]
Viola canescens Wall. ex Roxb. (Syn. V. serpens Wall.)	P I B	High conservation priority (P) [e]

Annex 2

Some over-harvested medicinal plants of the Chinese Himalaya

From the National Report for China. These species are additional to those included for China in Annex 1

Aquilaria sinensis (Lour.) Gilg., *Bergenia purpurascens* (J. D. Hooker and Thomson) Engler, *Cistanche salsa* (C. A. Meyer) Beck, *Codyceps sinensis* (Berk.) Sacc., *Coptis teeta* Wall., *Coptis omeiensis* (Chen) C. Y. Cheng, *Dendrobium* spp., *Dioscorea deltoidea* Wall. ex Griseb., *Dioscorea nipponica* Makino, *Dioscorea zingiberensis* C. H. Wright, *Dracaena cochinchinensis* S. C. Chen, *Ephedra sinica* Stapf, *Epimedium brevicornum* Maxim., *Erigeron breviscapus* (Vant.) Hand.-Mazz., *Eucomia ulmoides* Oliv., *Fritillaria* spp., *Gastrodia alata* Bl., *Gentiana macrophylla* Pallas, *Gentiana scabra* Bunge, *Glycyrrhiza uralensis* Fisch., *Homalomena occulta* (Lour.) Schott, *Panax ginseng* C. A. Meyer, *Panax pseudoginseng* Wall., *Paris polyphylla* Sm., *Neopicrorhiza scrophulariiflora* (Pennell) Hong, *Psammosilene tunicoides* W. C. Wu and C. Y. Wu, *Rauwolfia yunnanensis* Tsiang, *Rheum officinale* Baill, *Salvia miltiorrhiza* Bunge, *Saussurea costus* (Falc.) Lipsch., *Sinopodophyllum emodi* (Wall. ex Honigberger) T.S. Ting, *Stephania epigaea* Lo, *Stephani yunnanensis* Lo, *Taxus chinensis* (Pilger) Rehder, *Taxus wallichiana* Zucc.

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