Day One

Technical Session Two

Chairperson
Dr. R.K. Rai

A BRIEF ACCOUNT OF THE VEGETATION AND FLORA OF THE KANCHANJUNGA CONSERVATION AREA

K.K. SHRESTHA AND PEI SHENGJI

Introduction

The Himalayan region is the largest mountain system in the world, with unique functions and roles in the context of biodiversity. A comprehensive programme for the conservation of biodiversity in Nepal was introduced in 1972 by the formulation of a *National Parks and Wildlife Conservation Act*. Nepal's current network of eight national parks, four wildlife reserves, one hunting reserve, and two conservation areas encompasses over 13.74 per cent of its land area. Although most of the important highland areas are already covered within the protected area system, the designation of one new protected area - The Kanchanjunga Conservation Area, in the northeastern corner of Nepal, is in the advanced stages.

A feasibility study of biological, social, and cultural diversity and a forest inventory of the proposed Kanchanjunga Conservation Area were carried out by the WWF Nepal Programme in 1994 and 1996, respectively. Five Village Development Committees (VDCs) of Taplejung district, namely, Mamankhe, Yamphudin, Tapethok, Lelep, and Olangchung were selected and surveyed for the project area. Based on these reports, His Majesty's Government of Nepal has endorsed a project proposal to declare the Kanchanjunga region a protected area. It is now almost finalised that the area will be officially declared a Conservation area by the end of 1997. Establishment of the Kanchanjunga Conservation Area (KCA) will increase Nepal's protected area by 2,000sq.km., thereby expanding the total protected area from 13.74 to 15.11 per cent of the total area.

The Kanchanjunga Conservation Area

The proposed Kanchanjunga Conservation Area lies in the Taplejung district, the northeastern-most part of the country, bordered by Sikkim (India) in the east and Tibet (China) in the north. Previously, the proposed area of the

KCA was 2,011sq.km. (Shrestha 1994), covering 1.37 per cent of the total area of the country and 55.2 per cent of Taplejung district, but the revised area of the conservation area is ca. 1,650sq.km. (Anonymous 1996). The area represents high mountain physiographic regions with 65 per cent of its area covered by rocks and ice. The remaining 35 per cent of the area is covered by forests (14.1%), shrubland (10.1%), grassland (9.2%), and agricultural land (1.6%).

Photo: Krishna K. Shrestha

Plate 9: *Holboellia latifolia* ('Gufala'): Amjelassa (2,400m)

The altitude varies between ca. 1,200m (in the south) to 8,586m at the top of Mount Kanchanjunga. The climate varies from subtropical monsoon at the lower elevations to alpine. The area is well known for its three major river valleys: the Simbua *Khola* and the Ghunsa and Tamur valleys. These valleys are distinct from one another in that they possess varied forest types and floristic elements. The wide diversity of plants in this region is due to the presence of diverse ecological habitats such as marshes, river gullies, steep slopes with crevices, verdant valleys, and dry alpine grasslands. The area is phytogeographically interesting due to the presence of many Sino-Japanese and Sino-Himalayan elements.

Vegetation

Due to the diverse topography, altitude, soil, climate, and aspect, Nepal exhibits different types of vegetation ranging from tropical and subtropical to temperate, subalpine, and alpine. Taplejung district exhibits all the vegetation and forest types of Nepal, including upper tropical forests of hill Sal (*Shorea robusta*) in the south to the *Schima* (*Schima coallichii*), *Castanopsis* (*Castanopsis* spp), and Oak (*Quercus* spp) forests in the middle hills and dense coniferous forests of *Abies, Tsuga,* and *Juniperus* in the higher hills to bushes of *Rhododendron* spp in the upper subalpine to alpine grasslands. It is estimated that the forest cover in the KCA is about 14 per cent. The forests are very disturbed in the Ghunsa Valley and less degraded in the Tamur Valley, however, in Simbua *Khola* Valley, the forests are comparatively intact and virgin.

Several eastern Himalayan species are widely available here and extend up to Central Nepal. However, these species are widely recorded from other parts of the Himalayas, i.e., Sikkim, Bhutan, and S.E. Tibet. Examples of such elements include *Acer pectinatum, Berberis insignis, Castanopsis hystrix, Corylus ferox, Daphne bholua, Edgeworthia gardneri, Gaultheria hookeri, Larix griffithiana, Lithocarpus pachyphylla, Magnolia campbelli, Quercus lamellosa,* and several species of *Rhododendron*. Among them several species are endemic to eastern Nepal.

Kanchanjunga Conservation Area is represented by subtropical vegetation in the lower mid-hills to alpine grasslands in the high hills and mountains. The vegetation types, with important associated species, are as follow (Dobremez and Shakya 1975; Shrestha 1994; Shrestha and Ghimire 1996).

Subtropical Bioclimatic Belt **(1,000 - 2,000m)**

Subtropical Evergreen to Semi-evergreen Forests: Tapethok-Hellok;

Yamphudin Mamankhe (1,100 - 1,700m): The characteristic species of this type of forest are *Schima wallichii, Engelhardtia spicata, Macaranga pustulata, Castanopsis indica, Betula alnoides, Saurauia nepalensis,* and *Rhododendron arboreum.*

Schima wallichii - Castanopsis tribuloides Forests: Tapethok, Lelep,Yamphudin (1,500 - 2,000m): Common tree species are *Schima wallichii, Castanopsis tribuloides, C. hystrix, Quercus glauca, Q. incana, Rhododendron arboreum,* and *Lyonia ovalifolia.*

Castanopsis tribuloides-Castanopsis hystrix Forests: Mamanke, Yamphudin (1,600 - 2,300m): A characteristic forest of the eastern Himalayas is comprised of species such as *Castanopsis tribuloides, Castanopsis hystrix, Rhododendron arboreum, Lyonia ovalifolia.*

Temperate Bioclimatic Belt (2,000 - 3,000m)

Oak-Laurel Forests*:* Iladanda, Amje Khola (2,300 - 2,500m): Dominant species of this forest are *Quercus glauca, Quercus lamellosa, Persea duthie, Castanopsis tribuloides, Machilus* sp, and *Lindera pulcherrima.*

Quercus lamellosa Forests (2,100 - 2,800m): This forest is predominantly abundant on the ridges that flank the upper Tamur. The characteristic species are *Quercus lamellosa, Q. lineta,* and *Castanopsis tribuloides.*

Quercus semecarpifolia Forests: Amjelassa-Thangyang (2,300 - 3,000m): The characteristic species of such degraded and disturbed forests include *Quercus semecarpifolia, Rhododendron arboreum, Lyonia ovalifolia,* and *Arundinaria maling.*

Mixed Broad-leaved Forests: Thangyang - Gyapla - Pholay (2,500 - 3,000m): *Quercus semecarpifolia, Tsuga dumosa, Abies spectabilis, Quercus lamellosa, Betula utilis, Acer* spp, *Rhododendron arboreum,* and *Corylus ferox.*

Lithocarpus pachyphylla Forests (2,600 - 3,150m): An east Himalayan species, only present in the extreme east of the country between the Tamur and the Sikkim border. Characteristic species include *Quercus lamellosa, Q. lineata, Hydrangea heteromala, Arundinaria maling, Rhododendron grande,* and *Magnolia campbelli.*

Sub-alpine Bioclimatic Belt **(3,000 - 4,000m)**

Tsuga dumosa - Abies spectabilis Forests: Pholay-Ghunsa, Dorangding (3,000 - 3,500m): *Tsuga dumosa, Abies spectabilis, Betula utilis, Juniperus indica, Juniperus recurva, Magnolia campbellii, Rhododendron campanulatum,* and *Rhododendron arboreum*

Abies spectabilis Forests: Ghunsa-Khambachen, Chairam (3,400 - 3,800m): *Abies spectabilis, Betula utilis, Juniperus indica,* and *Rhododendron campanulatum*

Larix griffithiana Forests: Ghunsa - Khambachen (3,200 - 3,900m): *Larix griffithiana, Abies spectabilis, Juniperus indica,* and *Betula utilis*

Juniperus indica Forests: Ghunsa - Khambachen, Chairam-Yalung (3,400 -4,050m): *Juniperus indica, Abies spectabilis, Betula utilis,* and *Juniperus recurva*

Rhododendron Forests: Gyapla-Olangchung, Ghunsa-Selele, Dorangding-Lase (3,000 - 3,600m): *Rhododendron hodgsonii, Abies spectabilis; Rhododendron falconeri, Rhododendron barbatum, Rhododendron arboreum, R. campanulatum, Betula utilis,* and *Salix* spp.

Betula utilis Forests: Kambachen, Ghunsa - Selele (3,800 - 4,000m): This type of forest occurs near the

timberline of the Kanchanjunga area. Most common species of this forest include *Betula utilis, Abies spectabilis,* and *Rhododendron* spp.

Alpine Bioclimatic Belt **(above 4,000m)**

Alpine Scrub: Kambachen-Lhonak, Selele, Yangma-Ramche (>4,000m): *Rhododendron anthopogon, Rhododendron setosum, Juniperus squamata*; *Rhododendron lepidotum,* and *Berberis* spp

Alpine Pasture or Meadow (Kambachen, Selele, Ramche: 4,200 - 4,600m): *Juncus effusus, Agrostis myriantha, Festuca rubra, Poa himalayana, Poa annua, Trisetum spicatum,* and *Carex* spp.

Flora

Approximately 3,000 species of flowering plants were reported from eastern Nepal, constituting about 60 per cent of the flowering plants of Nepal (Hara *et al.* 1978 - 1982). The Kanchanjunga area's diverse climate and topography bestow on it tremendous floristic diversity with approximately 2,000 species of flowering plants. Several plant collectors have explored the area since 1848 (Hooker 1854; Banerji 1965; Hara 1966; Numata 1975; Dobremez and Shakya 1975; Suzuki and Noshiro 1993; Shrestha 1994; and Shrestha and Ghimire 1996).

A partial list of flowering plants of Taplejung and the Kanchanjunga Conservation Area indicated the presence of 1,284 and 810 species of flowering plants respectively (Shrestha and Ghimire 1996). Although Kanchanjunga area covers only 1.48 per cent of the total land area of the country, it has a 16 per cent share in terms of the total flora of Nepal. The largest families in the Kanchanjunga Conservation Area are *Compositae* (56 spp), *Leguminosae* (51 spp), *Orchidaceae* (48 spp), *Rosaceae* (45 spp), *Ericaceae* (42 spp), and *Gramineae* (40 spp). Similarly, the largest genera are *Rhododendron* (23 spp), *Rubus* (14 spp), *Pedicularis* (10 spp), and *Primula* (10 spp).

Endangered and Endemic Species

Many species in Nepal are threatened because of several factors. Shrestha and Joshi (1992) listed 60 species of flowering plants as threatened species in Nepal. In the present study, 13 species of threatened plants are reported from Kanchanjunga and the surrounding areas. It was observed that one species is considered to be endangered (*Michelia kisopa*), three species to be commercially threatened *(Aconitum spicatum, Bergenia ciliata, Larix griffithiana*), five species belong to the vulnerable category (*Choerospondias axillaris, Nardostachys grandiflora, Paris polyphylla, Picrorhiza scrophulariiflora, Swertia chirayita*), and two species belong to the rare category (*Tetracentron sinense, Ulmus wallichiana*).

Shrestha and Joshi (1996) also listed 246 species of flowering plants as the endemic plants of Nepal. The majority of the species are reported from Central Nepal and a total of 68 species of endemic flowering plants occur in eastern Nepal. Twenty-three species of endemic flowering plants have been recorded so far from the Kanchanjunga and its surrounding areas, 11 species of which are reported from the Kanchanjunga Conservation Area. The common endemic species are *Aconitum alpine-nepalense, Aconitum staintonii, Begonia leptoptera, Cotoneaster staintonii, Euphorbia pseudosikki- mensis, Glochidion metanubigenum, Impatiens insignis, Microtoena nepalensis, Pedicularis tamurensis, Poa imperalis, Stellaria ovalifolia,* and *Strobilanthes*

tamburensis. It is obvious that most of the species are reported from the western part of Taplejung along the Tamur and Mewa rivers.

Exploitation of Plant Resources

The plant resources are encroached upon by humans (grazing of livestock, tree cutting, fires) throughout the Kanchanjunga area. Human encroachment is particularly high in the middle hills where the prime forest area is being converted into cultivable land.

Chiraito is used extensively for curing colds, coughs, and fever. Similarly, the firewood species used extensively are *Alnus nepalensis* (*utis*) and *Eurya acuminata* (*jhingano*) followed by *Quercus incana* (*banjh*), *Q. glauca* (*phalant*), *Castanopsis indica* (*dhalne katush*), *Engelhardtia spicata* (*mauwa*), and *Schima wallichii* (*chilaune*) in the middle hills (1,000-2,500m); and in the higher hills (2,500-4,000m) they include *Rhododendron campanulatum* (*chimal*), *Juniperus recurva* (*dhupi*),

Photo: Krishna K. Shrestha

Plate 10: *Juniperus indica* (Juniper) Forest Tseram (3,000m)

In addition, slash-and-burn practices were found to be the prominent factor in the depletion of biodiversity. Collection of firewood, timber, and medicinal herbs indiscriminately, in the middle hills particularly, has threatened some of the important plant species.

In many places, especially in the higher hills, traditional medicinal plants such as *chiraito* (*Swertia chirayita*), *kutki* (*Picrorrhiza scrophulariiflora*), *paanchaunle* (*Dactylorhiza hatagirea*), and *pakhanved* (*Bergenia ciliata*) are used to some extent, whereas in the middle hills they seldom use local herbs as medicines, they either prefer a lama (*jhar phook*) or modern allopathic medicines. It is noticed that only *Betula utilis* (*bhoj patra*), and *Quercus lamellosa* (*bajranth*). However, *Rhododendron arboreum* (*gurans*) and *Lyonia ovalifolia* (*angeri*) are the most popular firewoods in the lower as well as the higher hills.

Conclusion and Recommendations

Conservation of biodiversity calls for both global attention and prompt action at the regional level. The Kanchanjunga Area harbours a unique and enormous diversity in terms of ecosystem, fauna and flora, and cultural aspects, and many floristic elements unique to the country are restricted to this part of Nepal. The typical east Himalayan types of vegetation restricted to this area are *Lithocarpus*

pachyphylla forests, *Larix griffithiana* forest, and *Castanopsis hystrix* forests. The presence of large numbers of *Rhododendron* species (there are several endemic and rare species in the Kanchanjunga area) reinforces the belief that this pristine area of the country should be included in the protected area system. It is thus recommended that a special conservation programme be launched to conserve and protect the unique flora and vegetation of the Kanchanjunga area.

References

Anonymous, 1996. *Brief Information on Kanchanjunga Conservation Area.* Kathmandu, Nepal: WWF Nepal Programme.

Banerji, M.L., 1965. 'Contribution to the Flora of East Nepal'. In *Rec. Bot. Surv. India* Vol. 19 (2): 1-90.

Dobremez, J.F. and Shakya, P.R., 1975. 'Ecological Map of Nepal 6. Biratnagar - Kanchanjunga Area, 1/250000'. In *Doc. Carte Ecol.* 16, pp 33-48, Grenoble, France.

Hara, H., 1966. *The Flora of Eastern Himalaya. Part 1.* Tokyo: University of Tokyo Press.

Hara, H., Stearn, W.T. and Williams, L.H.J., 1978. *An Enumeration of the Flowering Plants of Nepal. Vol. 1.* London: British (Natural History) Museum.

Hooker, J.D., 1854. *Himalayan Journals.* Himalayan Journals Vols. 1-2. London: J. Murray.

Numata, M., 1975. 'Ecological Studies in the Nepal Himalayas'. In: Numata, M. (ed), *Structure and Dynamics of Vegetation in Eastern Nepal.* Japan: Faculty of Science, Laboratory of Ecology Chiba University.

Shrestha, K.K., 1994. *Floristic Diversity, Vegetation and Ethnobotany of the Proposed Kanchanjunga Conservation Area.* WWF Nepal Programme, Report Series # 6. Kathmandu, Nepal: WWF Nepal Programme.

Shrestha, K.K., and Ghimire, S.K., 1996. *Plant Diversity Inventory of the Proposed Kanchanjunga Conservation Area (Ghunsa and Simbua Valley).* Report Series # 22Kathmandu, Nepal: WWF Nepal Programme.

Shrestha, T.B. and Joshi, R.M., 1996. *Rare, Endemic and Endangered Plants of Nepal.* Kathmandu, Nepal: WWF Nepal Programme.

Suzuki, M. and Noshiro, S., 1993. 'Japan - Nepal Cooperative Botanical Research in East Nepal'. In M. Suzuki (ed), *Wood Anatomical Expeditions in Nepal Himalaya, pp21-27.* Japan: Kanazawa University.