

Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singalila Ridge, Eastern Nepal

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Sponsor: Critical Ecosystem Partnership Fund (CEPF), USA / WWF Nepal Program

Executant: ESON

Collaborators: Shree High Altitude Herb Growers Group, Ilam and Deep Jyoti Youth Club, Panchthar

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The Eastern Himalaya has been included among the Earth's biodiversity hotspots and it includes several centres for plant diversity. Kanchenjunga-Singalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species. It is designed as one of the WWF 'Global 2000' eco-regions and is declared as a 'Gift to the Earth'. The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts.



KCA along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2000 species of flowering plants of which, several are found to be endemic to the Himalayas. KCA, Upper Mai

Valley Forest and Lower Mai Valley Forests are noteworthy for their species and diverse habitats. The lush biodiversity in combination with the indigenous knowledge and traditional practices of the areas provide a great scope of research and development at the site. However, the biodiversity and knowledge have been put into excessive pressure beyond their resilience limits.

In this regard, present project was attained to compile a comprehensive list of flowering plants and habitats, their conservation status and develop conservation strategies through participatory and scientific approaches. The project was feasible with due support from CEPF for inventorying the plant biodiversity, identifying the conservation status of the species and habitats and developing the participatory-scientific conservation strategies to manage the prioritized species and habitats. The objectives of the project were to inventory and document of plant biodiversity and their associated habitats, identify and assess the rare, threatened, endemic and archaic plant species and key habitats, and develop conservation strategies of the species and habitats through participatory and scientific approaches.



Study area: Falaincha, Chyangthapu, Memeng, Prangbung and Sidin VDCs of Panchthar district and Maimajhuwa, Mabu, Jogmai and Jamuna VDCs of Ilam district.

Methods: Literature/specimen review, two pre and post monsoon plant collection expeditions, species identification and herbarium management, etc. were means for inventorying. Community consultations, rapid field appraisals, and ecological quadrat samplings were used for diversity and species richness study. Capacity building trainings, conservation strategy workshops and expert consultation meetings were taken as tools for strategy development. Participatory biodiversity monitoring mechanism was designed for identifying the direct and underlying threats of the biodiversity.



Findings: Inception workshops and participatory resource mapping were done on 18th March 2007. Two social mobilizers, one from each collaborating organization were recruited for field level work during inception. Two pre and post monsoon expeditions (pre four weeks long and post seven weeks long) were carried out respectively in June and August-September, 2007.

On average, about 1430 plant specimens of flowering plants were collected and managed. Since the field spot identification, identification at ESON office and identification in National Herbarium (KATH), Godawari and Tribhuvan University Central Herbarium (TUCH), 786 species were identified from 904 specimens. Further

taxonomic identification process is going on in Royal Botanical Garden Edinburgh, UK. To date, ten species of *Rubus*, six species of *Berberis*, six species of *Begonia* and five species of *Michelia* and *Magnolia* were identified. Endemic species *Ericoulon trisectoides*, *Heracleum lallii*; threatened species: *Paris polyphylla*, *Rheum nobile*, etc were also identified.

The comprehensive list of flowering plants and their status was aimed at maintaining and updating CEPF species outcome. The inventory and ecological assessments updated the distribution and population dynamics and contributed in managing the species and habitats through providing information of conservation status. The analysis revealed that there were two new records of varieties for Nepal, 10 new records of species for Nepal and one new species to the World. The new species to the World was *Begonia* and it was collected from Prangbung, Panchthar district. New varieties were from *Asparagus* and *Carex* species and both were from Ilam district (Table 1). Of total specimens collected, 560 specimens have been submitted to KATH, Godawari, Nepal, 550 specimens to RBGE, UK and 400 specimens to TUCH, Tribhuvan University.

Species richness and diversity of the plants and habitats and soil of associated habitats were analysed. Rapid appraisal and quadrat method (transect method) were adopted along the trail for assessment. A total of 122 primary/macro quadrat (plots) (50 in Ilam and 72 in Panchthar district), 244 secondary/meso plots and 366 tertiary/micro plots were laid within elevation 1900-4327m in all nine VDCs representing different resource management systems. Two permanent plots in each VDC were set for participatory biodiversity monitoring. The monitoring was monthly scheduled and operated by social mobilizers. Week long training was made for mobilizers in Kathmandu to train them about taxonomy and herbarium. Two M. Sc. students were trained for taxonomic and inventorying study.

Plant biodiversity management trainings and community level plant biodiversity conservation strategy workshops were organized on 7-8 August, 2007 in Hangetham, Ilam and on 3-4 September, 2007 in Prangbung, Panchthar. A total of 90 participants were participated in the events. Each workshop incepted the 10 most important plant species, and sites, threats for plant biodiversity and management strategies.

One school level essay competition was organized in Memeng Lower Secondary School, Memeng on 1st Sept, 2007 with highlighting the importance of endemic, threatened and rare species. Two community forest user groups (Mahadev Kange CFUG, Jogmai -7, Ilam and Kanya Devi CFUG, Sidin-1, Panchthar) were selected for improvement of their operational plans. Based on the community level conservation strategy, threats, conservation priority of different organizations, and field observations, key 26 plant species were identified (Table 2).

Articles of the project were published in CEPF Eastern Himalayas Bulletin Dec. 10, 2007 www.cepf.net, in Nepali Times News Jan 05, 2008. www.nepalitimes.com and an article of the flora Kanchanjungha-Singalila Ridge is pipeline to publish in Nepal Journal of Plant Science Volume 2.

Table 1. New Record Species to Nepal from Lower Kanchenjunga Singhalila Ridge

S N	Call No.	Family	Species Name	Coll. date	Alt. (m)	Lat	Long	Locality	Remarks
1.	D 257	Umbelliferae	<i>Acronema ioniostyles</i> Farille & Lachard	09/29	2702	27 13 21	87 57 25	Dabale Deurali, Ilam	New variety to Nepal
2.	B 155 C 201	Liliaceae	<i>Asparagus filicinus</i> Buch.-Ham. ex D. Don. var. <i>lycopodineus</i> Baker	06/07 09/06	2245 2334	27.04 27 02 44	88.00 88 00 25	Jamuna 2, Ilam Jamuna-1, Ilam	New variety to Nepal
3.	B 157 B 163	Begoniaceae	<i>Begonia flaviflora</i> H. Hara	06/07	2245 2172	27.04	88.00	Jamuna 2, Hangetham, Ilam	New species to Nepal
4.	D 357	Begoniaceae	<i>Begonia panchtharensis</i> (sp. nov.)	10/02	2248	27 10 01	87 57 17	Prangbung, Panchthar	New to the World
5.	D 130	Poaceae	<i>Calamagrostis lahulensis</i> G. Singh	09/24	4337	27 26 11	88 03 16	Timbu Falaincha-9, Panchthar	New species to Nepal
6.	C 240	Cyperaceae	<i>Carex cruciata</i> Wahlenberg var. <i>argocarpa</i> C. B. Clarke	09/12	3210	27 18 45	88 01 22	Bie-Chitre, Jogmai-2, Ilam	New variety
7.	D 200	Fagaceae	<i>Castanopsis longispina</i> (King ex Hook.f.) C.C.Huang & Y.T.Zhang	09/27	1900	27 16 04	87 57 29	Falaincha-6, Tintine, Panchthar	New species to Nepal
8.	D 012	Juncaceae	<i>Juncus clarkei</i> Buchenau	09/19	3530	27 19 29	88 03 09	Chiwabhanjyang-Major, Panchthar	New species to Nepal
9.	D 013	Juncaceae	<i>Juncus khasiensis</i> Buchenau	09/19	3910	27 23 35	88 02 16	Chiwabhanjyang-Major, Panchthar	New species to Nepal
10.	A 006	Rosaceae	<i>Potentilla sundaica</i> (Blume) Kuntze	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya, Ilam	New species to Nepal
11.	D 279	Rubiaceae	<i>Rubia hispidicaulis</i> Long	09/29	2450	27 04 21	87 59 29	Narelung CF, Memeng-3, Panchthar	New species to Nepal
12.	C 191	Acanthaceae	<i>Strobilanthes helicta</i> Anderson	09/05	2656	27 04 07	87 59 37	Dobate, Hangetham, Ilam	New species to Nepal
13.	D 099	Gentianaceae	<i>Swertia wardii</i> Marquand	09/23	3910	27 23 35	88 02 16	Paharemeghu, Falaincha-9, Panchthar	New species to Nepal

Table 2. Conservation priority plant species of Kanchenjunga-Singalila Ridge, Eastern Nepal

SN	Prioritized plant species of lower Kanchenjunga Singhalila Ridge	Priority score	Distribution (horiz & vert)
1.	<i>Taxus wallichiana</i> (Taxaceae) LOTH SALLA	10	ECW; 2300-3400m
2.	<i>Nardostachys grandiflora</i> (Valerianaceae) JATAMANSI	9	ECW; 3200-5000m
3.	<i>Aconitum ferox</i> , <i>A. spicatum</i> (Ranunculaceae) BIKHMA	9	ECW; 1800-4200m
4.	<i>Neopicrorhiza scrophulariiflora</i> (Scrophulariaceae) KUTKI	9	ECW; 3500-4800m
5.	<i>Swertia chirayita</i> (Gentianaceae) CHIRAITO, TITE	9	EC; 1500-2500m
6.	<i>Michelia</i> and <i>Magnolia</i> species (Magnoliaceae) CHAAMP	8	EC; 2000-2700m
7.	<i>Dactylorhiza hatagirea</i> (Orchidaceae) PANCHAUINLE	8	ECW; 2800-3960m
8.	<i>Rheum nobile</i> , <i>R. australe</i> (Polygonaceae) KYANJO	7	E; 3200-4300m
9.	<i>Dioscorea deltoidea</i> and other species (Dioscoreaceae) GITHHA, BHYAKUR	6	ECW; 500-3100m
10.	<i>Paris polyphylla</i> (Liliaceae) SATUWA, LALGEDI	5	EC; 1800-3300m
11.	<i>Cinnamomum glauscescens</i> (Lauraceae) MALAGIRI	5	ECW; 2000-2500m
12.	<i>Juglans regia</i> (Juglandaceae) OKHAR	5	ECW; 1200-2100m
13.	<i>Podophyllum hexandrum</i> (Berberidaceae) LAGHUPATRA	5	ECW; 3000-4500m
14.	<i>Castanopsis hystrix</i> (Fagaceae) PATALE KATUSH	4	E; 1000-2500m
15.	<i>Oroxylum indicum</i> (Bignoniaceae) TATELO	4	ECW; 400-1400m
16.	<i>Rhododendron</i> species (Ericaceae) SUNPATI, CHIMAL, GURANS	4	ECW; 1500-5100m
17.	<i>Schefflera impressa</i> (Araliaceae) BHALUCHINDE	4	EC; 2000-3400m
18.	<i>Asparagus racemosus</i> (Liliaceae) KURILO	4	EC; 600-2100m
19.	<i>Valeriana jatamansii</i> (Valerianaceae) SUGANDHWAL	4	ECW; 1500-3300m
20.	<i>Arundinaria</i> species (Poaceae) MALINGO & NIGALO	3	E; 1500-2000 m
21.	<i>Heracleum lallii</i> (Umbelliferae) CHIMPHING	3	ECW; 300-4400
22.	<i>Tetracentron sinense</i> (Tetracentraceae) KIMBUK	3	E; 2800-3200m
23.	<i>Rubia manjith</i> (Rubiaceae) MAJITHO	3	EC; 1200-2100m
24.	<i>Bergenia purpurascens</i> / <i>B. ciliata</i> (Saxifragaceae) PAKHANVED	2	EC; 3800-4700m
25.	<i>Zanthoxylum</i> species (Rutaceae) TIMUR	2	ECW; 1100-2500m
26.	<i>Cardiocrinum giganteum</i> (Liliaceae) CHAMELI	1	ECW; 1800-3000m

Challenges and lessons learned: Poaching, trapping, hunting and irrational exploitation were accounts due to free access, low level of community conservation awareness and absence of government inferences in the site. The traditional forest and land use system viz. KIPAT is a great challenge for conservation initiatives. Trans-boundary conflict was also a impediment to conservation initiatives. Decade long conflict over the resource utilization aggravated the resource management capacity of indigenous communities and institutions.

The area is a repository of biological resources specifically plant biodiversity along with diversity with respect to culture and indigenous knowledge. Some places viz. Timbu Pokhari, Chhintapu, Hangetham areas are exceptionally rich in rare, endangered, endemic and archaic floral species. *Sassurea* species, *Rheum nobile*, *Neopicrorhiza scrophulariiflora*, *Rhododendron anthopogon*, etc are flourishing around. These species and verdant areas are placed under added stress by anthropogenic activities importantly intense grazing by large herds of domestic livestock. Rampant collection and unsustainable harvesting of forest products including timber and non-timber forest products (NTFPs) are the chronic threats that contribute to the degradation of these sensitive ecosystems. The area is heavily doused and strong wind is common at the site. On the flip side, civil societies particularly the community forest user groups and some community based organizations have convincingly rich knowledge on biodiversity, conservation of important plant areas and they have successfully managed some sites enriched with medicinal and archaic plant species.

The needs of the locals must be addressed thereby respecting traditional rights over resources and resource use system. To guarantee their success, long term impact-oriented inclusive programs should be lunched in comprehensive and coordinated fashion.