

Survey for the Orchids of Shivapuri National Park in Kathmandu (Nepal) and their conservation

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[Received revised 06.05.2013; Accepted 16.05.2013]

Abstract

Shivapuri National Park is country's ninth national park established in 2002. The landscape is mountainous and is situated on the northern fringe of Kathmandu Valley, the capital city of Nepal. It covers an area of 144 sq km. The altitude ranges from 1366m to 2732 m. About 80% of this area is covered with good natural forest. At the lower belt the forest is dominated by *Schima wallichii* and *Castanopsis indica*. At the upper belt the forest is dominated by *Quercus glauca*, *Q. semicarpifolia* and *Rhododendron arboreum*. Shivapuri National Park is rich in orchids. Buchanan-Hamilton (1802-1803) and Wallich (1820-1821) is pioneer plant explorer in Nepal. They collected many plants from Nepal especially from Kathmandu Valley. David Don (1825) described 17 new species of orchids from Shivapuri National Park based on their collection in the book "*Prodromus Florae Nepalensis*". Present survey of Shivapuri National Park Area recorded 77 species of orchids. The status of every species of orchids is recorded from the fieldwork. The conservation includes both *in situ* and *ex situ*. The *ex situ* conservation and propagation of threatened species has been carried out at Amrit Campus, Kathmandu.

Key words: orchid survey, Shivapuri National Park, conservation

INTRODUCTION

Shivapuri National Park (SNP) is country's ninth national park established in 2002. It lies within three districts of Nepal's Central Development region including the northern part of Kathmandu districts, the southern part of Nuwakot and western part of Sindupalchowk. It lies between 27°45'–27°52'N latitudes and 85°15'–85°30' E longitudes. The water source for SNP is the two major river systems, the Bagmati and Bisnumati. The landscape is mountainous and is situated on the northern fringe of Kathmandu Valley, 13 kilometers (eight miles) from the capital city of Nepal. It covers an area of 144 sq km. The altitude ranges from 1366 m to 2732 m amsl. About 80 % of this area is covered with good natural forests. At the lower belt, the forest is dominated by *Schima wallichii* and *Castanopsis indica*. At the upper belt the forest is dominated by *Quercus glauca*, *Q. semicarpifolia* and *Rhododendron arboreum*. The climate of Shivapuri area ranges from subtropical to warm temperate.

The park is a spiritually significant place for the popular shrines and meditation centers in the natural surroundings. The park consists of several religious and cultural heritage sites

for Hindus and Buddhists. They include the peaks of Shivapuri, Manichur, Tarkeswor and the head of the Bagmati and Bishnumati rivers. The other famous shrines worth visiting are Budhanilkantha, Sundarimai and the Nagi monastery those attract thousands of pilgrims during festive seasons.

Nepal is rich in orchid flora with ca. 386 orchid species in 102 genera (Bajracharya & Shakya 2002). Nepal's first published floristic work (Don 1825) was based on the plant collection of Buchanan-Hamilton and N. Wallich and described 51 species of orchids and many of those were new to the science. Hara *et al* (1978) listed 313 species of orchids in 89 genera. Another significant publication (Banerji & Pradhan 1984), in which 247 species of orchids are described and illustrated based mainly on the herbarium specimens deposited at the Department of Plant Resources, Godavari (KATH). Orchids, however, did not receive the due attention in preparation of a checklist of Nepalese plants (Koba *et al* 1994; Press *et al* 2000).

One of the important works carried out on the flora and conservation of orchids of Kathmandu Valley (Shakya *et al* 1994), 104 species of orchids were recorded. During this work 40 species of orchids were recorded from SNP.

Nepalnature.com prepared a list of flora of SNP. This web page enlisted 538 plant species under 99 families in which Orchidaceae alone includes 66 species. Buchanan-Hamilton (1802-03) and Nathaniel Wallich (1820-21) are the pioneer plant explorer in Nepal. They collected many plants from Nepal especially from Kathmandu Valley. David Don (1825) described 17 new species of orchids from Shivapuri based on the collection of Buchanan-Hamilton and Nathaniel Wallich. This indicates that this National Park is the type locality for many orchid species.

This study focuses on the orchid flora and its conservation in SNP. Present study recorded 77 species of orchids from this region (Table 1). The conservation includes both *in situ* and *ex situ*. The *ex situ* conservation and propagation of threatened species was carried out at Amrit Campus of the Tribhuban University. Therefore, this work was directly linked to National Park and the institute for research on conserving threatened orchids.

MATERIALS AND METHODS

The study site Shivapuri National Park is the small sector of mountainous region of the Kathmandu Valley lying towards the northern fringe. SNP was selected because of its conserved natural vegetation and richness in orchids. The following methods were used in the study: (1) extensive field surveys of the study area were conducted periodically throughout the year. Describing each species and illustrating important species; (2) Threatened and endangered orchid species were assessed with the help of data on distribution patterns and orchid species abundance obtained in the field survey; (3) Park people and local people were initiated to conserve orchids by providing conservation education; (4) The *ex situ* conservation of orchids was carried out by constructing Orchidarium at Amrit Campus of the Tribhuban University which in future will provide materials for further research works.

RESULTS

Before organizing field visits an Orchedarium was constructed at Amrit Campus of the Tribhuban University for *ex situ* conservation. . About eight field visits were organized at different seasons for extensive field survey in SNP to study the orchid flora of SNP. Almost all the areas were covered during study. Their status is also studied by counting their population in the field.

1. Kakani to Jhor Trip

This area covers western sector of SNP. This trip covers about 14 km and the altitude varies between 1400 to 2060 m. The forest is mixed type with the dominance of *Quercus semicarpifolia* Smith, *Rhododendron arboreum* Smith and *Alnus nepalensis* D. Don. Twenty-one species of orchids have been recorded from this area. The trail is north facing and moist. Eleven species of orchids have been recorded from the north-facing slope. *Calanthe plantagenia* were blooming and found in small population of about fifteen plants. *Goodyera streklandiana* were found dominant throughout the route.

Forest of Jagat is an east-facing slope; the trail is going down to a stream. Ten species were recorded from this trail. *Liparis cordifolia* and *Cherostylis griffithii* were rare species recorded from this trail.

2. Sundarijal

Sundarijal Watershed area lays North of Kathmandu Valley at 1585 m. It is the Southern part of SNP. The forests are of evergreen type. Common trees of the forest are *Rhododendron arboreum* Smith, *Schima wallichii* (DC.) Korthals, *Lyonia ovalifolia* (Wallich) Drude etc. Two beautiful streams, Shyalmati and Nagmati, join the Bagmati River and the area has many beautiful waterfalls. The area's moist, cool and humid environment, altitudinal variation and aspect of mountain slope make it rich in orchid flora. About 31 species of orchids were recorded from this area

3. Shivapuri base

This area covers the south-facing slope of the Shivapuri peak (2732 m). This is the central southern part of SNP. Altitude varies between 1524 m to 2287 m. Up to 1829 m the forest is much disturbed. Above 1829 m the forest is very dense with tall trees. Most common trees are *Quercus lamellose* Smith, *Q. semicarpifolia* Smith, *Rhododendron arboreum* Smith, and *Schima wallichii* (DC.) Korthals. Three field trips were organized during the months of May and June.

This area is strictly controlled under the management of Shivapuri National Park, compared to other mountainous regions of the valley. Orchids of this area are well protected.

Many species of orchids have been recorded from this area; 23 species are recorded in the present work. *Chilochista usneoides* is very rare species recorded from 1829 m. *Calanthe brevicornu* is also rare species recorded along the watershed. Though the area is protected local people reported that two ornamental orchid species *Pleione praecox* and *Calanthe plantagenia* were much exploited in the past.

4. Sundarijal to Chisapani

Chisapani is in the northern sector of SNP. It is about 14 km from Sundarijal. The altitude variation is 1600 to 2200 m. The area covers major part of Mulkharka village. The forest away from village is undisturbed and rich in orchids. Most common trees are *Quercus semicarpifolia* Smith, *Rhododendron arboretum* Smith, and *Schima wallichii* (DC.) Korthals. About 50 species of orchids were recorded from this field trip. Rare species recorded from this region are *Bulbophyllum carniflorum*, *Chilochista lunifera* (?), *Gastrochilus acutifolius*, *Calanthe puberula*.

5. Bagdwar and Shivapuri Peak

Bagdwar and Shivapuri Peak is the southern part of National Park. The altitude variation is 1500 to 2732 m. This area covers major natural forest of the park. There is no human

settlement around this area and is rich in orchids. About 35 species of orchids were recorded from this field trip. Rare species recorded from this region are *Malaxis calophylla* and *Liparis purpusila*.

Table 1. Status of Orchids in Shivapuri National Park, Kathmandu, Nepal

[Abbreviations used: NE = North East; SE = South East; S = South; W = West; Epi = Epiphytic; Ter = Terrestrial; + = very rare (up to 10 individuals); ++ = rare (11 – 20 individuals); +++ = occasional (21 – 40 individuals); ++++ = frequent (41 – 80 individuals); +++++ = common (above 80 individuals)]

Orchid species	Distribution				Habit	Local Population Status
	NE	S	SE	W		
<i>Acampe rigida</i> (Buchanon-Hamilton ex Smith) P.F. Hunt			+		Epi	++
<i>Agrostophyllum callosum</i> Reichenbach f.	+				Epi	++
<i>Anthogonium gracile</i> Wallich ex Lindley	+	+			Ter	+++++
<i>Bulbophyllum affine</i> Lindley		+	+		Epi	+++++
<i>Bulbophyllum careyanum</i> (Hooker) Sprengel	+				Epi	++
<i>Bulbophyllum cariniflorum</i> Reichenbach f.		+			Epi	+
<i>Bulbophyllum leopardinum</i> (Wallich) Lindley ex Wallich		+		+	Epi	+++
<i>Bulbophyllum polyrhizum</i> Lindley	+				Epi	++++
<i>Bulbophyllum reptans</i> (Lindley) Lindley ex Wallich	+				Epi	++++
<i>Bulbophyllum secundum</i> Hooker f.	+				Epi	++
<i>Bulbophyllum umbellatum</i> Lindley		+		+	Epi	+++++
<i>Bulbophyllum veridiflorum</i> (Hooker f.) Schlechter		+			Epi	++
<i>Calanthe plantaginea</i> Lindley				+	Ter	+++
<i>Calanthe puberula</i> Lindley	+				Ter	+
<i>Cherostylis griffithii</i> Lindley				+	Ter	+
<i>Chilochista usneoides</i> (D. Don) Lindley		+			Epi	+++
<i>Coelogyne corymbosa</i> Lindley	+				Epi	++++
<i>Coelogyne cristata</i> Lindley		+		+	Epi	+++++
<i>Coelogyne fuscescens</i> Lindley		+	+	+	Epi	++++
<i>Coelogyne nitida</i> (Wallich ex D. Don) Lindley		+		+	Epi	+++++
<i>Coelogyne stricta</i> (D. Don) Schlechter		+			Epi	+++
<i>Cryptochilus lutea</i> Lindley	+	+			Epi	++
<i>Cymbidium iridioides</i> D. Don		+			Epi	++
<i>Cymbidium longifolium</i> D. Don	+	+			Epi	++
<i>Dendrobium bicameratum</i> Lindley		+			Epi	+
<i>Dendrobium heterocarpum</i> Lindley		+			Epi	+++
<i>Dendrobium longicornu</i> Lindley	+	+	+	+	Epi	+++++
<i>Dendrobium transparens</i> Wallich ex Lindley		+			Epi	++++

Orchid species	Distribution				Habit	Local Population Status
	NE	S	SE	W		
<i>Epigenum amplum</i> (Lindley) Summerhayes		+		+	Epi	++++
<i>Eria amica</i> Reichenbach f.	+	+			Epi	++++
<i>Eria apertiflora</i> Summerhayes		+			Epi	++++
<i>Eria bipunctata</i> Lindley		+			Epi	++++
<i>Eria coronaria</i> (Lindley) Reichenbach f.	+	+		+	Epi	++++
<i>Eria graminifolia</i> Lindley	+			+	Epi	++++
<i>Eria excavata</i> Lindley	+	+			Epi	++++
<i>Eria spicata</i> (D. Don) Handel-Mazzetti	+	+			Epi	++++
<i>Gastrochilus acutifolius</i> (Lindley) Kuntze		+			Epi	+
<i>Gastrochilus calceolaris</i> (Smith) D. Don		+		+	Epi	++
<i>Gastrochilus distichus</i> (Lindley) Kuntze	+	+			Epi	+
<i>Goodyera repens</i> (Linnaeus) R. Brown		+		+	Ter	++
<i>Goodyera schlechtendaliana</i> Reichenbach f.	+			+	Ter	+++++
<i>Habenaria arietina</i> Hooker f.	+				Ter	+++
<i>Habenaria pectinata</i> (Smith) D. Don	+				Ter	+++
<i>Herminium lanceum</i> (Thunberg ex Swartz) J. Vuijk	+	+			Ter	+++
<i>Ione bicolor</i> (Lindley) Lindley	+				Epi	+++++
<i>Ione cirrhata</i> Lindley		+			Epi	+++
<i>Liparis bootanensis</i> Griffith				+	Epi	+++++
<i>Liparis cordifolia</i> Hooker f.				+	Ter	+
<i>Liparis nervosa</i> (Thunb.) Lindley				+	Ter	+
<i>Liparis plantaginea</i> Lindley				+	Ter	+++
<i>Liparis perpusilla</i> Hooker f.		+			Epi	++
<i>Liparis resupinata</i> Ridley	+				Epi	+++
<i>Liparis viridifolia</i> (Blume) Lindley				+	Epi	++
<i>Malaxis acuminata</i> D. Don				+	Ter	+++++
<i>Malaxis callophylla</i> (Reichenbach f.) Kuntze		+			Ter	+++
<i>Malaxis cylindrostachya</i> (Lindley) Kuntze	+				Ter	+++
<i>Malaxis muscifera</i> (Lindley) Kuntze		+			Ter	+
<i>Oberonia caulescens</i> Lindley	+				Epi	+
<i>Oberonia myriantha</i> Lindley			+		Epi	+
<i>Odontochilus lanceolatus</i> (Lindley) Blume		+			Ter	+++
<i>Otochilus albus</i> Lindley	+	+	+		Epi	+++++
<i>Otochilus fuscus</i> Lindley		+			Epi	+++
<i>Panisea demissa</i> (D. Don) Pfitzer	+				Epi	+++
<i>Peristylus superantha</i> J. J. Wood	+				Ter	+++
<i>Phalaenopsis taenialis</i> (Lindley) E.A. Christenson & Pradhan		+			Epi	+++

Orchid species	Distribution				Habit	Local Population Status
	NE	S	SE	W		
<i>Pholidota articulata</i> Lindley	+	+			Epi	+++++
<i>Pholidota imbricata</i> Hooker		+			Epi	++++
<i>Pholidota protracta</i> Hooker f.		+			Epi	++
<i>Platanthera edgeworthii</i> (Hooker f. ex Collett) R.K. Gupta	+				Ter	+++
<i>Pleione hookeriana</i> (Lindley) B.S. Willams	+				Epi	+++
<i>Pleione humilis</i> (Smith) D. Don	+				Epi & Litho	+++
<i>Pleione praecox</i> (Smith) D. Don	+	+	+		Epi & Litho	+++
<i>Rynchosstylis retusa</i> (Linnaeus) Blume		+	+		Epi	++
<i>Satyrium nepalense</i> D. Don	+	+			Ter	+++++
<i>Spiranthes sinensis</i> (Persoon) Ames	+	+			Ter	+++++
<i>Trudelia cristata</i> (Lindley) Senghas	+	+		+	Epi	++
<i>Vandopsis undulata</i> (Lindley) J.J. Smith	+	+	+		Epi	+++

Threats to orchid Diversity in Shivapuri National Park

The greatest threat to the conservation of orchids in Nepal is the habitat loss resulting from forest destruction, degradation, and fragmentation. Another serious concern is the global demand for selected orchids for ornamental and medicinal purposes.

There is no major threat to the orchids of Shivapuri National Park. Major forests are well conserved because this park consists of several religious and cultural heritage sites for the Hindus as well as for Buddhists. Nepal Army strictly controls the forests of national park. However, a threat to different species of *Pleione* and *Calanthe* has been noticed from some plant collectors.

CONSERVATION

In situ conservation of orchids is a global problem. Today many orchid species are considered to be at risk of extinction, directly or indirectly by human activities. Habitat destruction, modification, fragmentation, and over-collection are the main causes for the rapid depletion of orchids from natural habitats.

In Nepal also orchids are being depleted at an alarming rate from their natural habitats as the result of habitat alteration and over collection. Within Protected Areas (nine national parks, three wildlife reserves, one hunting reserve and three conservation areas), orchids are well conserved in Nepal. These areas, however, constitute a total of 26,970 km² or only 18.32 % of the country (HMGN/MFSC 2002). Other areas do not provide adequate management for protection of habitat and thus are vulnerable.

Although Shivapuri National Park was established in 2002, flora and fauna of the park are well protected. National Park authorities and Nepal army are playing important role to manage protection of the flora and fauna of the park. Present work focuses on both *in-situ* and *ex-situ* conservation of the orchid flora of this National Park. The authors are managing

to educate both National Park authorities and Nepal army people regarding *in-situ* conservation of orchids within National Park. An Orchidarium is built at Amrit Campus of the Tribhuvan University with the name “Ascol Orchidarium” for the *ex-situ* conservation and for micro propagation of orchids.

Acknowledgments

We thank the San Diego Orchid Society for financial support. We thank Mr. Madan Shakya, former Campus Chief for giving us permission to construct an Orchidarium in the Campus. We thank Sarada Devi Shrestha, former head of the Botany Department, Amrit Campus, Tribhuvan University, Nepal for providing laboratory facilities.

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