ASSESSMENT OF DISTRIBUTION PATTERN OF GENUS CYPRIPEDIUM IN PINDARI VALLEY, KUMAUN, WEST HIMALAYA

Renu Suyal¹, Ranbeer S Rawal¹, Indra D Bhatt¹ and Lalit M Tewari²

¹G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Kosi- Katarmal, Almora, Uttarakhand, India
²D.S.B. Campus, Kumaun University, Nainital, Uttarakhand, India

*Correspondence: renusuyal88@gmail.com

ABSTRACT
The present study is an attempt to assess distribution pattern and specific habitat requirements of three threatened species of genus Cypripedium i.e. C. cordigerum, C. elegans and C. himalaicum in Pindari valley, Kumaun West Himalaya. Results revealed that partially shaded places and humus rich soil forms the ideal habitat conditions for the growth of this species. However, restricted distribution and low plant density in the study sites reflects critically rare status of this species. The species is declining in natural habitat due to grazing, habitat loss and unsustainable collection. Hence, conservation planning is needed to protect the species and its habitat.

Keywords: Cypripedium, Pindari valley, Kumaun West Himalaya, Conservation.

INTRODUCTION
Cypripedium L. (Family- Orchidaceae) is a genus of perennial herb which are commonly known as Lady’s slipper orchids. The genus is differentiated from other genera in the Orchidaceae due to the presence of two fertile anthers and a slipper shaped lip or labellum. Globally, the genus comprises of about 59 species and 2 varieties (TPL 2017). The species is found distributed from Alaska, Canada, United States, Mexico, Guatemala, Honduras, and Russia federation, Pakistan, India, Nepal, Bhutan, China, North Korea, South Korea, Japan, Taiwan and Burma. The genus Cypripedium is represented by three species in Western Himalaya, viz. C. cordigerum D. Don, C. elegans Reichb.f. and C. himalaicum Rolfe (Deva et al., 1986; Jalal et al., 2008) (Fig. 1). These species are widely but sparsely distributed in the cool temperate and sub-alpine 2800-3500m regions and are known only from a few scattered populations mostly in small colonies. As per the International Union of Conservation for Nature and Natural Resources (IUCN) the overall population trend for these species is decreasing due to threats like overgrazing, collection, habitat loss and disturbance of its restricted range due to deforestation and climate change. All the three species of Cypripedium are sensitive to the environment and require specific habitat conditions i.e. associating mycorrhizal fungi, nutrient availability and sunlight for germination and growth (Kull 1999). In fact, owing to looming danger, all the species of genus Cypripedium are included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The present study therefore, attempts to provide quantitative details of genus Cypripedium in Kumaun Himalaya through assessment of distribution pattern and quantum of availability in natural habitats.

MATERIALS AND METHODS
STUDY AREA
The study area lies in between 30º5’- 30º10’ N- 79º48’-79º52’ E in close proximity of Pindari glacier range of Kumaun, West Himalaya, India. The elevation ranges from 3000-3500 m asl consisting of a wide variety of vegetation ranging from subtropical to alpine. The description of targeted orchids

---

1. C. Cordigerum
2. C. elegans
3. C. himalaicum

Fig. 1. Targeted species of genus Cypripedium
Table 1. Details of targeted species

<table>
<thead>
<tr>
<th>Species</th>
<th>Botanical description</th>
<th>Habitat</th>
<th>Medicinal uses**</th>
<th>Status (IUCN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. cordigerum</td>
<td>Glabrous erect herb, up to 40 cm tall, flowers solitary, terminal, greenish- pale yellow and white.</td>
<td>Found under partially shaded forest of Q. semicarpifolia</td>
<td>Roots are used as a tonic in Nepal Young leaves cooked and eaten as a vegetable</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>(3000m asl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June- September</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. elegans</td>
<td>Creeping underground rhizomatous herb, up to 13 cm tall, flower green with reddish tinge and light red veins on inner surface.</td>
<td>Moss covered humus rich soil, meadows on the thick humus layer</td>
<td>Nervine tonic in hysteria, spasm, madness, epilepsy and rheumatism</td>
<td>Endangered</td>
</tr>
<tr>
<td>(3217m asl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June-August</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. himalaicum</td>
<td>Rhizomatous herb, 20-40 cm tall, flowers greenish brown, reddish-chocolate or brownish purple or crimson purple with yellow column.</td>
<td>Partially shady places in meadows, on steep hill slopes, grass covered boulders.</td>
<td>Urine blocks treatment, Stone disease, heart disease, Chest disorder and cough</td>
<td>Endangered</td>
</tr>
<tr>
<td>(3350m asl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June-September</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Vij et al., 2013; ** Arditti et al., 1982; Arditti et al., 1984

along with their habitat characteristics, medicinal uses and status are given in Table 1.

**RESULTS AND DISCUSSION**

All three species of *Cyripedium* were identified and surveyed for distribution pattern and their specific habitat requirements. The site and habitat detail along with information on associated species are presented in Table 1 and 2. Study revealed extremely localized distribution of all the three species i.e. species were found in patches. Partially shaded forest and humus rich soil form the ideal habitat conditions for the species. The density for *C. cordigerum*, *C. elegans* and *C. himalaicum* were recorded 0.80, 5.50 and 0.90 individual/m², respectively. However, the relative contribution of the species to overall stand density was less than the other dominant associates (Table 2).

Since the species are having restricted availability (limited populations with poor density) the continuous harvesting, habitat degradation and over-grazing in sites of their occurrence are causing fast depletion of their population and reflects its critically rare status. Only few areas in the state are left where these plants are present (Jalal et al., 2008). Therefore, to ensure long term conservation and sustainable utilization of these beautiful species of *Cyripedium*, there is a need to promote awareness regarding in-situ conservation of species. Further adequate support for bringing species in cultivation seems only way-out.
Table 2. Occurrence of availability and distribution pattern

<table>
<thead>
<tr>
<th>Species</th>
<th>D (ind/m²)</th>
<th>RD</th>
<th>F (%)</th>
<th>A</th>
<th>A/F</th>
<th>Associated species</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. cordigerum D. Don</td>
<td>0.80</td>
<td>4.57</td>
<td>30.00</td>
<td>2.67</td>
<td>0.09</td>
<td><em>Thalictrum L.</em> (24); <em>Anemone tetrasepala</em> Royle (20); <em>Fragaria nubicola</em> (Hook. f.) Lindl. ex Lacaita (15); <em>Polygonum L.</em> (28); <em>Rhododendron lepidotum</em> Wall. ex G. Don (08)</td>
</tr>
<tr>
<td>C. elegans Rchb. f.</td>
<td>5.50</td>
<td>19.57</td>
<td>60.00</td>
<td>9.17</td>
<td>0.15</td>
<td><em>Anaphalis contorta</em> (D. Don) Hook. f. (5.69); <em>Artemisia L.</em> (4.63); <em>Oxalis corniculata L.</em> (11.39); <em>Geranium wallichianum</em> D. Don ex Sweet (23.13); <em>Viola biflora L.</em> (18.15); <em>Fragaria nubicola</em> (Hook. f.) Lindl. ex Lacaita (13.17); <em>Corydalis cashmeriana</em> Royle (4.27)</td>
</tr>
<tr>
<td>C. himalaicum Rolfe ex Hemsl</td>
<td>0.90</td>
<td>7.03</td>
<td>40</td>
<td>2.25</td>
<td>0.06</td>
<td><em>Polygonatum verticillatum</em> (L.) All. (10.94); <em>Anaphalis contorta</em> (D. Don) Hook. f. (20.31); <em>Artemisia L.</em> (10.16); <em>Oxalis corniculata L.</em> (25.0); <em>Rumex hastatus</em> D. Don (16.41); <em>Achyranthes bidentata</em> Blume (10.16)</td>
</tr>
</tbody>
</table>

ACKNOWLEDGMENTS
Authors are thankful to inhabitants of the Pindari Valley who shared their knowledge and information to make this work possible. The authors thank to Director, G.B. Pant National Institute of Himalayan Environment & Sustainable Development, Almora for the support and encouragement. The partial funding for this study under Botanical Garden Scheme of Ministry of Environment, Forest & Climate Change (MoEF&CC), New Delhi (F.N. BSI-290/6/2013-Tech; Date- 29/09/2013) is also gratefully acknowledged.

REFERENCES


