



Conservation status of *Dendrobium tenuicaule* Hook. f. (Orchidaceae), a Middle Andaman Island endemic, India

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Abstract: The current distribution and threat assessment of *Dendrobium tenuicaule* Hook. f. (Orchidaceae), an endemic orchid of Middle Andaman Island is presented here. New data available from field surveys indicated the species is Critically Endangered as per the 2001 IUCN Red List Categories and Criteria.

Keywords: Conservation status, Critically Endangered, *Dendrobium tenuicaule*, distribution, Middle Andaman.

Andaman and Nicobar Islands are located about 1200km from the mainland, India, comprising 572 islands and islets. The Middle Andaman Island (12°15'–13°N & 92°30'–93°E) (Fig. 1) is the largest among the 324 islands of the Andaman group. The Andaman

group of islands are part of Indo-Burma Biodiversity Hotspot, one of the 34 in the world (Myers et al. 2000). The climate is warm and humid with the temperature ranging between 22°C and 30°C with average annual rainfall ranging from 3000–3500 mm and mean relative humidity between 82–85%. Currently, the Andaman and Nicobar Islands are known to harbor 2650 species of plants (Pandey & Diwakar 2008), of which 308 are considered as strict endemics.

Endemism is a significant attribute of any taxon with reference to its restricted distribution and endemic species especially of islands hold immense significance, as it can be assumed that the smaller its geographical distribution and population size and the more specific its habitat preferences, the rarer the species (IUCN/SSC Orchid Specialist Group, 1996). An in-depth assessment of their distribution pattern within a small geographical range is of great conservation concern. The IUCN system (IUCN 2001) assesses the threat to a species based on five core criteria: decline in populations over a period that is relevant for the species (based on generation time); the distribution of the species together with factors that may influence ongoing survival within its current distribution; small population size and continuing decline; very small populations or small distribution area; and quantitative assessment of extinction risk. Assessments are always done using the best available information, however, there is a dearth of knowledge in the case of the distribution pattern for many endemic species, especially those in remote islands. The recent studies by Rao et al. (2010, 2011) regarding conservation status on *Cycas beddomei* Dyer; and *Hildegardia populifolia* (Roxb.) Schott & Endl. has

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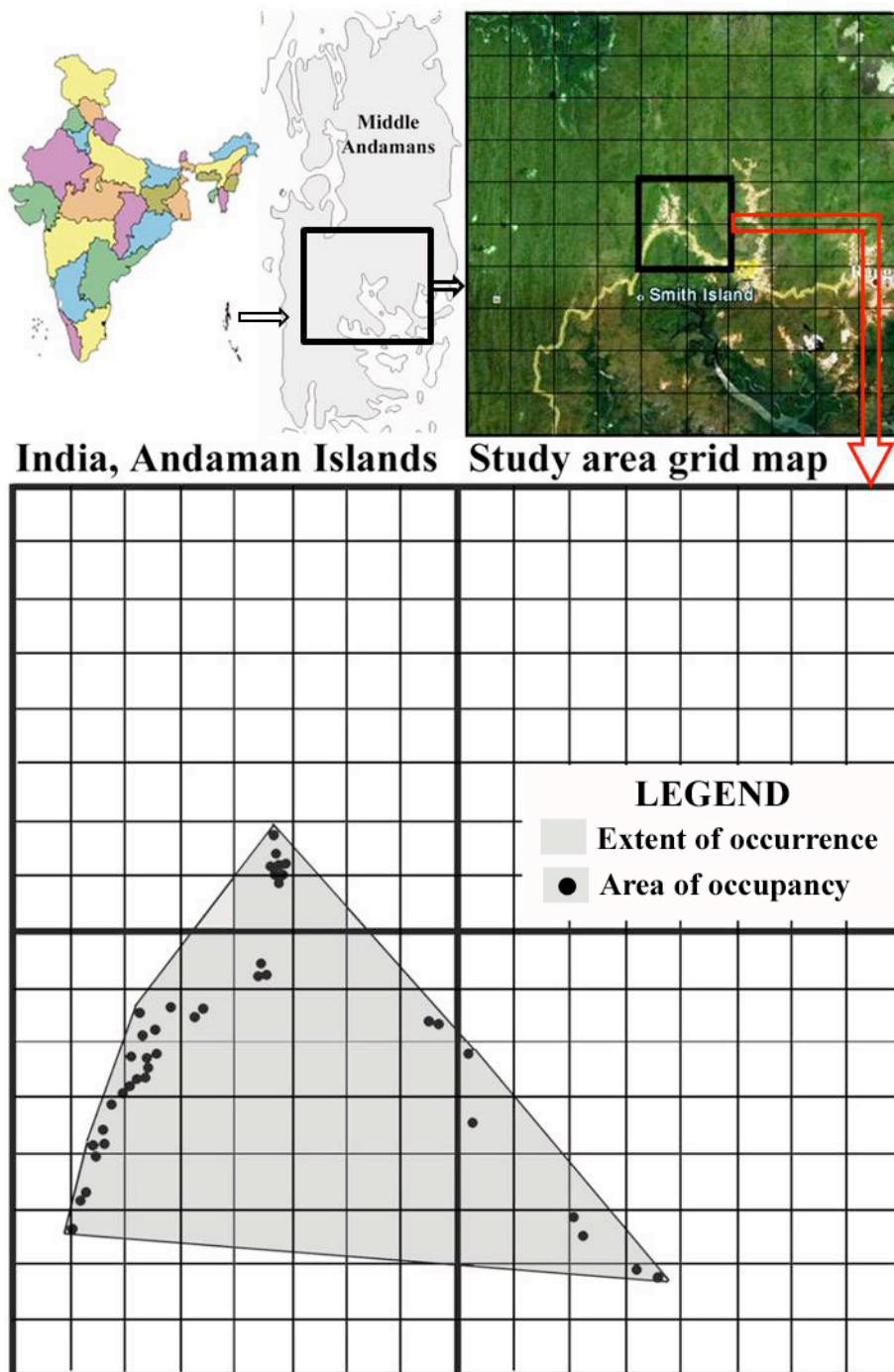


Figure 1. Minimum convex polygon of *Dendrobium tenuicaule*.

provided valuable information for population status assessments. In the present study, an attempt has been made to assess the population and conservation status of an orchid species, *Dendrobium tenuicaule* Hook. f., endemic to Middle Andaman Island, India.

The family Orchidaceae is one of the largest groups in the plant kingdom comprising 22,075 species (APG III 2009). The family represent 1331 taxa in

India (Misra 2007) and 151 species from Andaman and Nicobar Islands (Pandey & Diwakar 2008). The genus *Dendrobium* Sw., is one of the largest genera of Orchidaceae represented by ca. 900 species and mostly distributed in the Indo-Malesio-Austrasian region (Kumar & Manilal 1994). In India, the genus is represented by 116 species (Misra 2007) and in Andaman and Nicobar Islands, 19 species (Pandey

& Diwakar 2008), of which three are endemic to Andaman and Nicobar Islands: *Dendrobium gunnarii* P.S.N. Rao, *D. shompenii* B.K. Sinha & P.S.N. Rao and *D. tenuicaule* Hook. f.

Methods

Study area and species: *Dendrobium tenuicaule* Hook. f. is endemic to Middle Andaman Island and categorised as Endangered (Balakrishnan & Rao 1983; Nayar & Sastry 1990; Rao et al. 2003); Extinct or Endangered (IUCN 1996). The species is also a part in CITES Appendix II (UNEP-WCMC 2003).

A perusal of literature and herbarium consultation in CAL and PBL herbaria has revealed interesting information about the species distribution. J.D. Hooker (1890) described the species based on a drawing of King along with a few dried flowers and cited the distribution of the species as Andaman Islands. Later, the illustration was published in King's Annals of the Calcutta Garden (King 1895). Since the first herbarium collection of the species was by Bhargava (Voucher No. 6372 in PBL) from Rangat forests of Middle Andaman in 1977, it was claimed as endemic to Middle Andaman Island by Nayar & Sastry (1990). There was no record of further collections of this extremely rare orchid from Middle Andaman till November, 2011 in Kousalyanagar forest, Middle Andaman Division, when it was recollected by the current authors. The voucher specimens are deposited in SKU (Department of Botany, S.K. University).

Dendrobium tenuicaule Hook. f. is an epiphytic orchid, with many stems clustered together and grow 40cm long with rooting at base of the branches. Pseudobulbs grow to 8cm long and 5cm thick. Leaves linear, 15x2 mm, acute, entire with sheathing base. Flowers few, terminal, solitary on axils of nodes, labellum with white and yellow stripes on lip, very delicate, sweet scented. Ovary pedicellate, slender, 1.5cm long. Dorsal sepal elliptic-ovate, 7-nerved; lateral sepals falcate, acute. Petals as long as sepals, lanceolate, acute, mentum twice as long as the lateral sepals, trumpet-shaped. Lip wedge-shaped, sessile at the base of the mentum, membranous; lobes thin, flimsy, rounded; mid lobe strongly bent downward, orbicular; side lobes short, erect; disc pubescent. Pollinia 4, in pairs, unequal, ellipsoid. Fruits oblong-ellipsoid, grayish-brown, 4–5 x 0.4–0.5cm (Image 1).

Sampling design and population census: After

the first sighting of the species on *Mangifera indica* in Kousalya Nagar Forest, an intensive survey was made in Rangat Forest Division for the next eight months taking into consideration the first historical collection in Rangat forest. Random sampling method was adopted for the study. In epiphyte ecology, the sampling unit is often defined as one host tree (or part thereof), but unit area and unit forest-volume have also been used (van Dunne 2002). Hence we adopted IUCN sampling methodology (IUCN Standards and Petitions Subcommittee 2011) for determining the area of occupancy. Accordingly, the whole terrain of Middle Andamans was stratified into 4km² grids for this purpose. Within each grid, all the trees for locating the individuals of *D. tenuicaule* were observed. The localities of occurrence were recorded by Garmin Global Positioning System.

Following Garcia-Gonzalez et al. (2011), we counted all the individuals of *D. tenuicaule* inhabited on phorophytes that were found from the base of the trunk to the first primary branches; intersection between branches at various heights; and branches. We also classified the plants of the species by seedlings,



Image 1. A - habit; B - close up of flower; C - fruit.

earliest stage after the protocorm in which the young plant first acquires differentiated structures (2mm to 2cm); juvenile, sexually immature but well developed plants (>2cm) and adults, sexually mature plants that have flowered at least once. We counted all the individuals of each life stage on each of the microsites of every phorophyte within the study sites.

The species has been assessed for its conservation status based on 3.1 version of IUCN red list (IUCN, 2001). The Extent of Occurrence (EOO) and Area of Occupancy (AOO) are estimated.

Results and Discussion

Of the 100 grids laid in Rangat Forest Division, we located the *D. tenuicaule* only in three grids in Kousalyanagar Forest area of Bakunthala Range. We found only 56 clumps in the three grids comprising 41 mature and 12 juvenile individuals and three seedlings. All these individuals were found on 41 phorophytes (host trees) which were either *Mangifera indica* or *Areca catechu*. No other tree species was found hosting this orchid species. Of the 56 clumps, 47 were found on *Mangifera indica*, which represents 84% of the total population and nine clumps on *A. catechu*. It was observed that the species was found at an altitudinal range of 5–40 m. The maximum number of clumps (29) were found between 10–20 m covering about 52% of the total population. Further, this species was not found in the interior forests and appears to prefer open areas and forest edges. It was also observed that only one of the adult clumps was found in the fruiting stage.

Timber harvesting and commercial plantations in Kousalyanagar forests are threatening the species existence. Further, the historical collection site of the species by Bhargava (1977), 25km south-west of Rangat in the present Bakunthala range is now converted into a forest plantation and despite our repeated visits we could not locate the species at this point.

Conservation status

D. tenuicaule has been assessed as Endangered (Balakrishnan & Rao 1983; Nayar & Sastry 1990; Rao et al. 2003). Based on the field observations during the present study, the conservation status of the species has been evaluated following the latest IUCN Red List Criteria (Version 3.1; IUCN 2011). Of the five criteria (A–E) pertaining to threat categories the species

qualifies for criterion B1 (Extent of Occurrence - EOO) and B2 (Area of Occupancy - AOO) (Fig. 1); criterion C and D.

Criterion B: *Dendrobium tenuicaule* is restricted to a single location and has a highly restricted Extent of Occurrence (EOO; B1) and Area of Occupancy (AOO; B2).

Criterion B1: The EOO of *Dendrobium tenuicaule* is estimated to be 2.8km². Continuing decline of population is observed and inferred (subcriterion b) in terms of area, extent or quality of habitats (iii) and in the number of mature individuals (v). Hence the species falls under Critically Endangered category as its geographical range is less than 100km² and satisfies subcriterion b(iii and v).

Criterion B2: The AOO is 1km², and since this estimate is less than 10km², the species qualifies for Critically Endangered category under subcriterion b(iii and v).

Criterion C: Restricted population size and continuing decline. The total estimated population of the species comprises of 41 mature individuals. The species qualifies for Critically Endangered category. Further, there is a continuous decline observed, projected, inferred in numbers of individuals (subcriterion 2) there are no subpopulations and as the whole population contains not more than 50 mature individuals it further qualifies for subcriterion a(i).

Criterion D: Very small or restricted populations. Since the species population comprises only 41 mature individuals it falls under Critically Endangered category.

Based on field observations and overall assessment, *Dendrobium tenuicaule* is assessed as Critically Endangered [B1ab(iii,v)+2ab(iii,v); C2a(i); D].

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