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NOTE

Corallorhiza trifida Chatel.: a Little Known Partial Myco-heterotrophic Orchid from the Valley of Flowers National Park, Western Himalaya, India

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ABSTRACT: A small population of *Corallorhiza trifida* Chatel., a partial myco-heterotrophic orchid was recorded from the state of Uttarakhand after a gap of over 50 years. In this article we present an update on its systematics (nomenclature, morphology, phytogeography), ecology and aspects of conservation.

KEY WORDS: *Corallorhiza trifida* Chatel., Myco-heterotrophic orchid, Valley of Flowers, Western Himalaya.

INTRODUCTION

Corallorhiza Gagnebin, is a group of coralloid root bearing leafless orchids depending partially or entirely on the symbiotic fungi. The genus is represented by 11 species, 8 varieties and one form, distributed from temperate northern hemisphere to Central America and Caribbean (Govaerts et al., 2009). In India the genus is represented by a single species, i.e., *Corallorhiza trifida* Chatel. Another species *C. anandae* Malhotra & Balodi reported from Gori Valley in Western Himalaya (Malhotra and Balodi, 1985; Misra, 2007) but it is now considered as synonym of *C. trifida* (Deva and Naithani, 1986; Govaerts et al., 2009). This species was first collected in India by a French Botanist, Victor Jacquemont from Peer Panjal Range of the Western Himalaya (the exact date and location is not certain, but somewhere around 1828-1832, when he was travelling in Kashmir). The second collection of this plant was from Maratoli area of Pithoragarh district in Uttarakhand by T. A. Rao on 15.06.1958. In fact, collection of only one specimen from Uttarakhand in last 50 years had raised subtle doubt about its presence in the state among the orchidologists (Prof. Y.P.S. Pangtey, *personal communication*). Incidentally, during a recent botanical tour to the Valley of Flowers (VoF) National Park in Uttarakhand, the first two authors located a few individuals of this species. Intrigued by its sparse distribution, unique morphology and ecology, we present brief notes on its nomenclature, typification, morphology and ecology in this article.

SYSTEMATICS: AN UPDATE

Corallorhiza trifida Châtel., Spec. Inaug. Corallorrhiza: 8 (1760). Figs. 1-4

Ophrys corallorhiza L., Sp. Pl. 2: 945 (1753).
Epipactis corallorhiza (L.) Crantz, Stirp. Austr. Fasc., ed. 2, 6: 464 (1769).
Helleborine corallorhiza (L.) F.W. Schmidt, Fl. Boëm. 1: 79 (1793).
Cymbidium corallorhiza (L.) Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 238 (1800).
Epidendrum corallorhizon (L.) Poir. in J.B.A.M.de Lamarck, Encycl., Suppl. 1: 377 (1810).
Corallorhiza innata R.Br. in W.T. Aiton, Hortus Kew. 5: 209 (1813).
Corallorhiza corallorhiza (L.) H. Karst., Ill. Repet. Pharm.-Med. Bot.: 448 (1886), nom. inval.
Neottia corallorhiza (L.) Kuntze, Revis. Gen. Pl. 2: 674 (1891).
Corallorhiza anandae Malhotra & Balodi, Bull. Bot. Surv. India 26: 108 (1984 publ. 1985).

Type: Lectotype: *Carl Linnaeus 1056.5*, (LINN!), designated by Baumann et al. in *Mitteilungsbl. Arbeitskr. Heim. Orchid. Baden-Württemberg* 21: 449, Abb. 8 (1989) based on the specimen collected from Lapland in Finland by Carl Linnaeus in 1732.

Terrestrial, partial myco-heterotrophic, leafless herbs upto 30 cm in height. Rhizome pale white in colour, cylindrical, branched with distinct nodes and internodes. Scape upto 20 cm long, erect, slender glabrous, brownish-green turning yellowish green towards the top, longitudinally ridged. Lower portion of the scape, sheathed with 4-5 achlorophyllous scales. Raceme lax with 5-12 flowers. Flowers distinctly pedicellate, upto 0.7 cm long; ovary with pedicel 4.5 mm long. Bracts minute, shorter than ovary, greenish yellow, thin, membranous. Sepals oblong-lanceolate, spreading, petaloid, yellowish-green, slightly grooved longitudinally; lateral sepals longer than the dorsal ones. Petals shorter than sepals, falcate-oblong, arching over the column, with dark maroon elongated streaks

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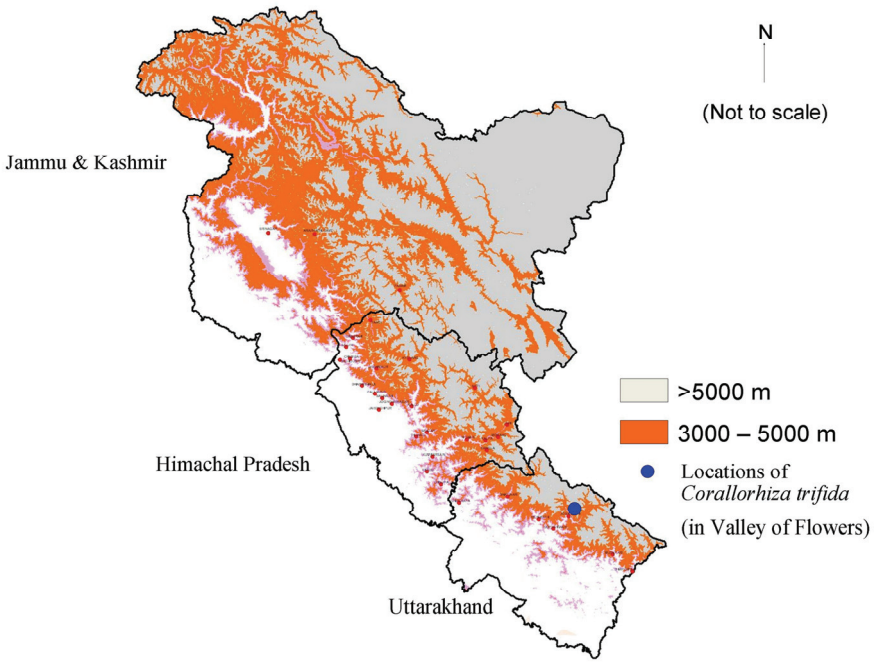


Fig. 1. Map showing location of *Corallorhiza trifida* Chatel. in Valley of Flowers National Park.



Fig. 2. A view of habitat of *Corallorhiza trifida* Chatel. in Valley of Flowers National Park.

near the base, white at base and yellowish green towards apex. Labellum almost equal to the lateral sepals, white with maroon spot towards the base, oblong-ligulate, trilobed, sidelobes short, white with maroon spots; lamellae two, running longitudinally parallel to each other, starting from the lower half of the labellum and ending in the mid of apical half of labellum; minutely papillose; tip of the labellum convolute upwards; base of the lip forming a small inconspicuous spur; lateral lobes short teeth like. Column 2.5 cm, arched curving towards labellum, yellowish green, sometimes spotted purple basally, with shallow adaxial channel. Pollinia 4, in 2 unequal pairs. Capsules ellipsoid.

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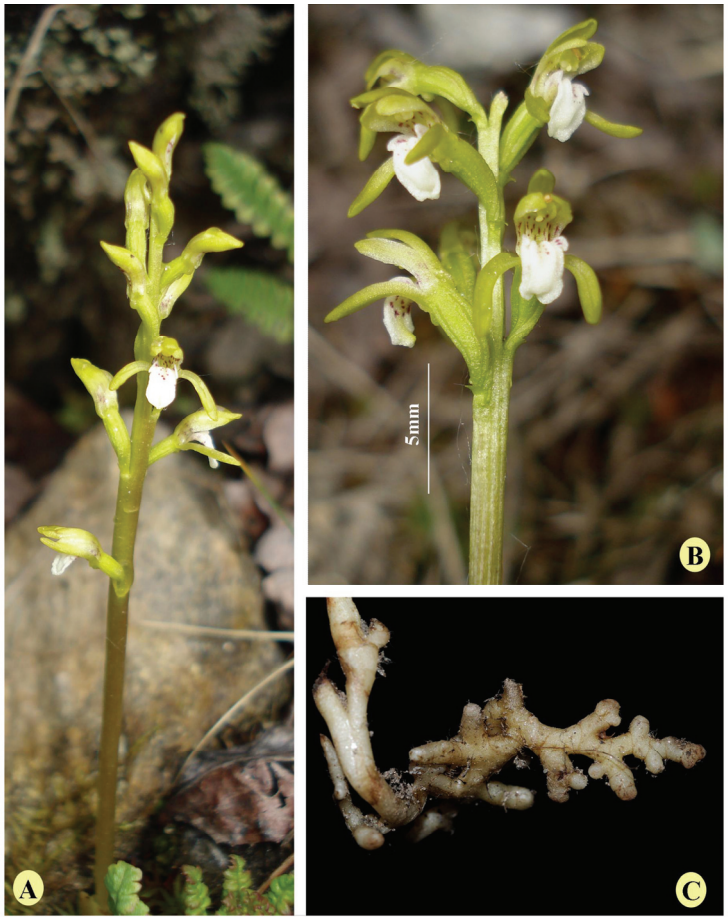


Fig. 3. *Corallorhiza trifida* Chatel. A: Plant in habit. B: Closeup of flowers. C: Coralloid root.

Flowering and fruiting: June – August.

English names: Coralroot, Yellow coralroot.

Specimens examined: *Carl Linnaeus 1056.4*, *1056.5* (type), *1056.6*, *1056.7*, sine loc. [LINN]; *A. Zingler 51323*, Switzerland, 02.06.1856 [RENZ]; *V. Jacquemont 566*, Peer Panjal Range, Western Himalaya, [L]; *T. A. Rao 6851 B – C*, Maratoli Bughyals, Pithoragarh, Uttarakhand [BSD]; *I.D.Rai & P.Kumar 11449*, Valley of Flowers National Park, Uttarakhand (30°44.024' N, 079°38.363' E, 3866 m Slope 55° to 60°, Aspect 336° NW; 30.06.2009), [WII].

Distribution in India: Uttarakhand and Jammu & Kashmir.

Distribution in the World: Species is native to North America and Eurasia and distributed from Temperate and Subarctic Northern Hemisphere in Europe, Asia Temperate, Indian Sub-continent and Northern America. Countries of distribution are Denmark, Finland, Great Britain, Iceland, Norway, Sweden, Austria, Czech Republic, Germany, Hungary, Turkey, Central China,. Manchuria, Northern China, Mongolia, Korea, Nepal, Pakistan, Western Himalaya, Alaska, Netherlands, Poland, Switzerland, France, Spain, Bulgaria, Italy, Romania, Yugoslavia, Belarus, Baltic states, Krym, Russia, Ukraine, Altay, Buryatia, Chita, Irkutsk, Krasnoyarsk, Tuva, West Siberia, Yakutiya, Amur, Kamchatka, Khabrovsk, Kuril Islands, Magadan, Kazakhstan, Kirgistan, North Caucasus, Transcaucasus, Greenland, Nunavat, Northwest Territories, Yukon, Aalberta, British Columbia, Manitoba, Saskatchewan, Labrador, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec, Colorado, Idaho, Montana, Oregon, Washington, Wyoming, Illinois, Minnesota, South Dakota, Wisconsin, Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, California, Utah, New Mexico, Delaware, Maryland and District of Columbia (Govaerts et al., 2009).

Notes: The species is widely distributed throughout the world and it shows a lot of variation in morphology as well as colour. This is one of the main reasons why the species has so often been misidentified. *Corallorhiza anandae* has been unscrupulously described as a new species by Malhotra and Badoli

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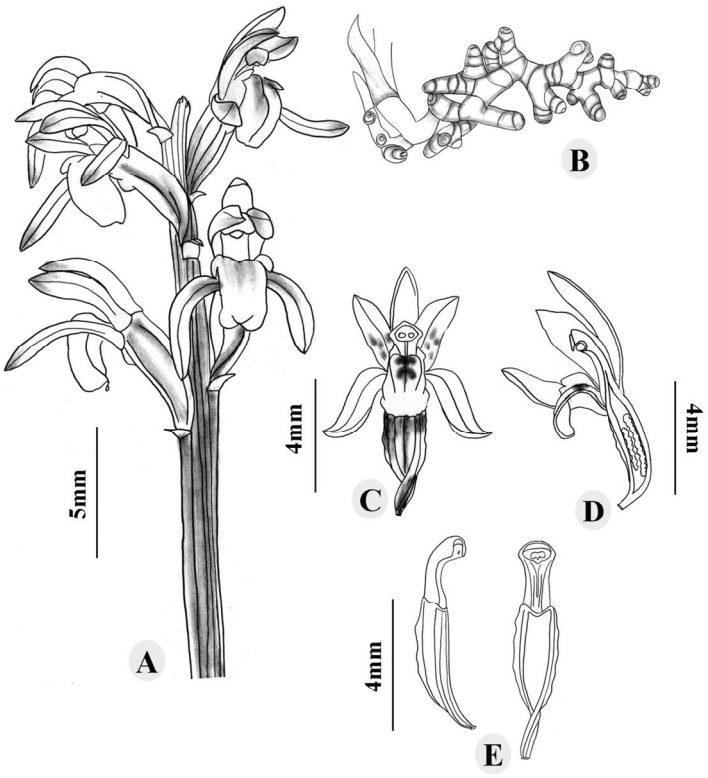


Fig. 4. *Corallorhiza trifida* Chatel. A: Inflorescence. B: Coralloid rhizome. C: Single flower (front view). D: Single flower (side view, longitudinally dissected). E: Column with ovary and pedicel (front and lateral view). [Illustrations by Dr. Pankaj Kumar: A and B drawn from fresh specimen. C, D and E redrawn from Muller and Kraenzlin 1904].

(1985) just on the basis of simple oblong labellum with undulate margin and absence of pink blotch. Though some authors (e.g., Mishra, 2007) believe *Corallorhiza anandae* as a distinct species, we concur with Deva and Naithani (1986) and consider it merely a synonym of the former.

ECOLOGY AND CONSERVATION

All the three localities of this species within India have been close to upper treeline in close vicinity of birch (*Betula utilis*) forests. In the Valley of Flowers (present locality), a total of 23 individuals were recorded on moist bouldery slope, well drained by snow melt water. The area is close to the terminal moraine of Tipra glacier that has receded considerably in recent decades. The snout of the glacier presently lies at a horizontal distance of around 250 m and approximately at a depth of 100 m from the spot. The location where the individuals of this species were found is known to be covered with snow for most of the times in winter, from November to April. The site is close to timberline formed by *Betula utilis, Rhododendron companulatum* and *Salix denticulata*. The plants were found growing in association with a number of herbs, namely, *Nomocharis nana*, *Polygonatum* sp., *Aletris pauciflora*, *Lloydia longiscapa*, *Orobanche* alba, *Ranunculus hirtellus*., *Sibbaldia cuneata*, *Anaphalis nepalensis*, *Meconopsis aculeata*, *Sassurea taraxacifolia*, *Primula macrophylla*, *Gaultheria trichophylla*, *Bistorta vivipara*, *Tilia* sp., *Viola biflora*, *Rhodiola heterodonta*, *Primula denticulata, Anemone tetrasepala*, *Berginia stracheyi, Bistorta affinis*, one unidentified fern and two ground orchids i.e., *Goodyera fusca* and *Aorchis spathulata*.

There have been no studies on life-history and reproductive biology of this species in India. In Europe the species is visited and pollinated by small Diptera, Hymenoptera and Coleoptera. Cingel (2001) has reported that in southern Finland this species is visited by syrphid fly (*Syrphus cinctellus*). It is believed that the insect pollination is incidental in this species because pollinia do not attached to insects easily and they crumble with age (Cingel, 2001). Pijl and Dodson (1966) called it a special syrphid-fly flower. Claessens and Kleynen (1998) observed that this species undergoes self pollination (pollinia usually fall from the stamens onto the stigma below). Nectar is absent and the flowers are weakly scented. However, the scent is musk like. With 85% - 100% seed set, this

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seems to be quite an effective method of fertilization. The ovary and also the sepals remain green and actively produce food for the maturing seeds. The excellent level of food production enables the plant to colonise any new suitable habitats in the neighbourhood. On the other hand the means of vegetative multiplication are not as effective as in other saprophytic orchids but can be done by autonomous separation of branches of the rhizome (Pijl and Dodson, 1966).

The natural habitat of this species in VoF is well protected from anthropogenic pressures but the site within the park needs to be marked for long term monitoring of its population in close coordination with the management authorities. Rapid changes in habitat condition due to autogenic (e.g., succession) and allogenic factors (e.g., global warming) could affect this population.

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生長在印度西喜馬拉雅花之谷國家公園的一種鮮為人知的腐生黃珊瑚根蘭

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摘要：一小族群的腐生黃珊瑚根蘭在 50 年後重新被發現生長於印度 Uttarakhand 州。本文提供有關命名、形態、植物地理、生態與保育方面之觀點。

關鍵詞：腐生蘭、黃珊瑚根蘭、花之谷、西喜馬拉雅。

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