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Research Article



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Diversity Resources, Distribution and Present Availability Status of *Oberonia Lindl.* An Epiphytic Orchid Species of Darjeeling Himalaya of India

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ABSTRACT

The present paper deals with Nine *Oberonia Lindl.* Orchid species diversity, distribution and present availability status in Darjeeling Himalaya of India. This attempt is the first step to correct taxonomic identification to workout currently accepted botanical names with Voucher specimens, habitat, altitudinal ranges, phenology and local and general distribution of *Oberonia* species in the regions.

Key words: Orchidaceae, *Oberonia* species, Diversity, Distribution, Status, Darjeeling Himalaya.

INTRODUCTION

Orchids are considered to be the most highly evolved in the floral specialization and diversified form among the monocotyledons. In India, Orchids form 9% of our flora and are the largest and highly advanced botanical family of higher plants. It is estimated that at about 25,000-35,000 species with 800-1,000 genera are distributed throughout the world. About 1300 species with 140 genera of Orchid species are found in India with temperate Himalayas as their natural home¹.

Darjeeling Himalaya is the northernmost part of the state of West Bengal. It is triangular in shape extending over an area of 3254.7 sq. kms. It is bordered by Sikkim in the north, Terai and Dooars in the south, Bhutan in the east and Nepal in the west. The Sub-Divisions of Darjeeling are Darjeeling, Kalimpong, Kurseong and Siliguri (Fig. 1). The Darjeeling district has two topographical features. Darjeeling, Kalimpong and Kurseong form the hill areas whereas Siliguri is stationed at the foot hill giving way to vast stretches of the plains. The hilly region covers 2320 sq.km. and the remaining 934.75 sq.km. of the area falls under Terai and plains. The altitudinal variations of the district ranges from 150m at Siliguri to 3636m at Sandakphu-Phalut with a sharp physiographic contrast between the plains and the mountainous regions. A trijunction of boundaries of Nepal, Sikkim and India is formed at the peak of Phalut (3600m). Darjeeling Himalaya is rich in Orchid diversity. In the present investigation, the current status of *Oberonia* genus of Orchid available in Darjeeling Himalaya has been carried out through the survey of national parks, forest area and far-flung villages of the region to find out the accurate status of the species.

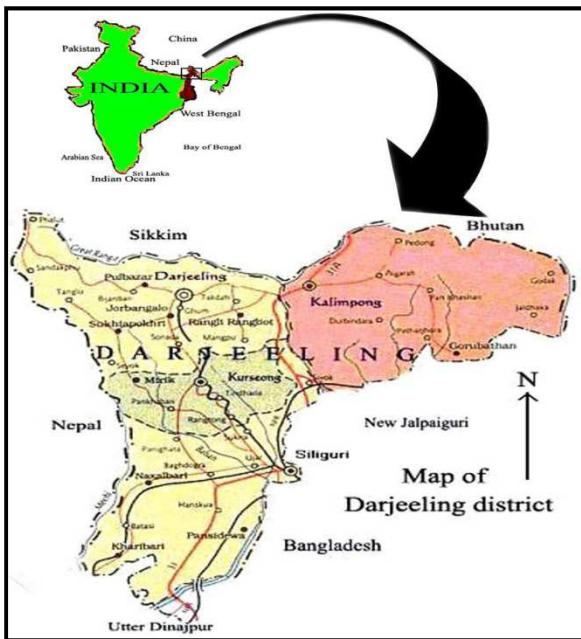


Fig. 1. Location of Darjeeling district (study area) of West Bengal, India

Botanical description

Plants epiphytic rarely lithophytic, small to medium in size, erect to pendent; roots basal, fibrous. Stems usually clustered, leafy, short to elongate. Leaves coriaceous or fleshy, distichous, forming a fan or distributed along the stem, bilaterally compressed to terete, often jointed to a compressed leaf base. Inflorescence terminal, racemose or spike, densely many-flowered, cylindric. Flowers minute, numerous, non-resupinate, flat, spiral to verticillate. Sepals and petals spreading, free, subequal; petals smaller and narrower than the sepals. Lip sessile, shorter than the sepals, deflexed, entire or variously lobed, hypochile more or less concave or with a nectar secreting pit near its base. Column very short, fleshy, usually enclosed by basal auricles of the lip; pollinia 4, pyriform, waxy, cohering in pair. The genus *Oberonia* was established in 1830 by John Lindley in his *Genera and Species of Orchidaceous Plants*. The genus comprises over 100 species in tropical Asia, extending to the Pacific Islands, Australia and with a single

species in Madagascar and tropical Africa. Ansari and Balakrishnan, 1990 done monographic study of Indian species of *Oberonia* Lindl.².

MATERIALS AND METHODS

The intensive field survey was conducted during the year 2007-2012 covering all the seasons of the year in the entire Darjeeling district including the forest areas, floral nurseries and farms of as low as Siliguri which is located at 150m to as high as Sandakphu-Phalut located at 3636m of entire Darjeeling district of West Bengal, India. All the *Oberonia* species found were recorded in the field notebook with their necessary information. The collected specimens were dissected and examined in the laboratory during flowering period. Herbarium specimens were prepared by standard methods³ specimens so collected were processed, preserved and mounted on herbarium sheets and described, properly identified and authenticated with the help of the Flora of British India⁴; the Orchids of the Sikkim Himalaya⁵; Indian Orchids Guide to Identification and Culture⁶; Orchid Flora of Arunachal Pradesh⁷; Orchids of India⁸.

The Flora of Bhutan⁹; the Orchids of Sikkim and North East Himalaya¹⁰ and confirmed at CAL. Finally all the Voucher specimens were deposited in the Herbarium of Department of Botany, St. Joseph's College, North Point, Darjeeling and Taxonomy and Ethnobiology Research Laboratory, Cluny Women's College, Kalimpong. In the present investigation, all the *Oberonia* species are arranged alphabetically as per their altitude wise distribution in the area with botanical names, date of collection, voucher specimen numbers, habitat and phenology.

Enumeration

1. *Oberonia acaulis* Griff. Itin. Pl. Khasyah Mts.: 76 (1848). Plant epiphytic herb, 23-40 cm tall. Stem short. Leaves 3-5, 8-22 x 0.8-1.3 cm, linear-ensiform, falcate, acuminate, unequal. Inflorescence verticillate, long, slender, decurved, densely many-flowered; peduncle 4-8 cm long, terete, bracteate; peduncle bracts 3-4 mm long, linear, distant; rachis 17-33 cm long; pedicellate-ovary 1.5-2 mm long; floral bracts 1.5-2.5 mm long, lanceolate, acuminate, erose-fimbriate. Flowers ca 1.5 mm across, uniformly brown. Sepals similar, 0.6-0.9 mm, ovate, entire, reflexed. Petals 0.8-1 mm long, oblong, entire, truncate, reflexed. Lip 3-lobed, 1.8-2 x 1.1-1.3 mm, warty; side lobes broadly oblong, crenulate, obtuse; apical lobe large, divided into 2 broadly oblong, obtuse lobules, separated by a triangular to acute sinus. Column ca 0.23 mm long, simple. Fruit erect to pendent, ridged. Flowering: October – December; Fruiting: November – January. [Fig. 2].

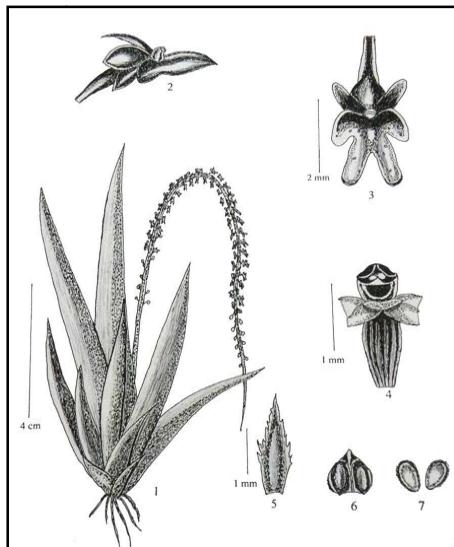


Fig. 2. *Oberonia acaulis* Griff. 1. Habit (whole plant with inflorescence); 2. Side view of flower; 3. Front view of flower; 4. Ventral view of tip of ovary, column with stigma and anther *in situ*; 5. Floral bract; 6. Anther; 7. Pollinia.

Specimen cited: Godok Busty 900 m; **Voucher specimen:** [Rajendra et al 1489]; **Habitat:** Epiphytic; **Altitudinal ranges:** 900-1900m; **Date of collection:** 5 October 2010; **Flowering:** September-November; **Status:** Sparse; **Local distribution within Darjeeling:** Todey, Tangta, Godok-Todey; **General distribution:** N. India, Thailand, Myanmar, China and Vietnam.

2. *Oberonia angustifolia* Lindl., Fol. Orchid. Oberonia 8: 5, no.29 (1859). Plant epiphytic herb, 7-11 cm tall. Stem 2-4.8 cm long, leafy, covered by leaf sheaths. Leaves 4-6, 1.5-2.5 x 0.1-0.3 mm (including sheath), sheathing at base, conduplicate, linear-lanceolate, acute. Inflorescence erect, verticillate, many-flowered; peduncle 1-2 cm long; rachis 3.5-5.5 cm long; pedicellate-ovary 0.5-0.6 mm long; floral bracts 0.9-1 mm long, lanceolate, apiculate, apical margins erose. Flowers 0.4-0.5 mm long. Sepals 0.5-0.54 x 0.3-0.4 mm, similar, ovate-elliptic, acute. Petals 0.4-0.5 x 0.25-0.3 mm, ovate, acute, margins erose. Lip 0.6-0.7 x 0.6-0.7 mm (when spread), obscurely 3-lobed; side lobes broadly ovate, obtuse; apical lobe subquadrate, divided at apex into 2 irregularly truncate lobes. Column 0.2-0.3 mm tall. Fruit ovoid. Flowering: June – July; Fruiting: July – August. [Fig. 3].

Specimen cited: Sittong 1100 m; **Voucher specimen:** [Rajendra et al 0531]; **Habitat:** Epiphytic; **Altitudinal ranges:** 800-1800m; **Date of collection:** 26 June 2008; **Flowering:** June-July; **Status:** Rare; **Local distribution within Darjeeling:** Lungshel-Suntalay, Dello hill; **General distribution:** N.E. India.

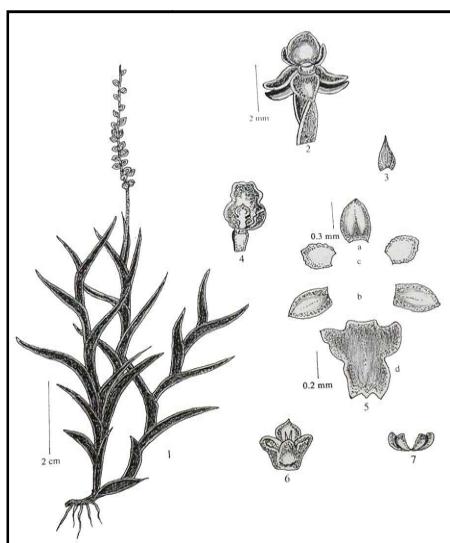


Fig. 3. *Oberonia angustifolia* Lindl. **1.** Habit (whole plant with young inflorescence); **2.** Dorsal view of flower; **3.** Floral bract; **4.** Dorsal view of tip of ovary, column with anther *in situ* and lip; **5.** Floral perigone, **a.** dorsal sepal, **b.** lateral sepals, **c.** petals, **d.** lip; **6.** Tip of column with anther in situ; **7.** Pollinia.

3. *Oberonia caulescens* Lindl., Fol. Orchid. Oberonia 2: 7, no.39 (1859). Plant epiphytic herb. Stems winged, 2.4-5 cm long. Leaves 4-5, 2-3 x 0.2-0.5 cm, linear-ensiform, acute to acuminate, slightly fleshy, sessile, jointed. Inflorescence erect, subdense, verticillate towards base; peduncle terete, short, bracteate, 2-3 cm long; peduncle bracts widely spaced, lanceolate, acute to acuminate, membranous, 1.5-2 mm long; rachis 0.9-1.1 mm long, slender, winged, 3-5 cm long; pedicel and ovary 1-1.3 mm long; floral bracts, lanceolate, apex aristate, ovate. Flowers 2-3 mm long, uniformly reddish-brown to yellow. Sepals *ca* 1 x 0.5 mm, similar, spreading, ovate, subacute, entire. Petals *ca* 1 mm long, spreading, lanceolate, acute, entire. Lip 1-1.6 mm long, 3-lobed, slender; side lobes triangular-falcate, apices recurved; apical lobe deeply divided; lobules caudate-acuminate, 0.3-0.5 mm long, separated by a deep, narrow, mucronate sinus. Column winged, 0.1-0.2 mm long. Flowering: June – September; Fruiting: July – October. [Fig.4].

Specimen cited: Damsang forest 1900 m; **Voucher specimen:** [Rajendra et al. 1583]; **Habitat:** Epiphytic; **Altitudinal ranges:** 1500-2700m; **Date of collection:** 18 July 2011; **Flowering:** June-August; **Status:** Rare; **Local distribution within Darjeeling:** Forest areas in Damsang Gari, Lava – Kalimpong; **General distribution:** India and China.

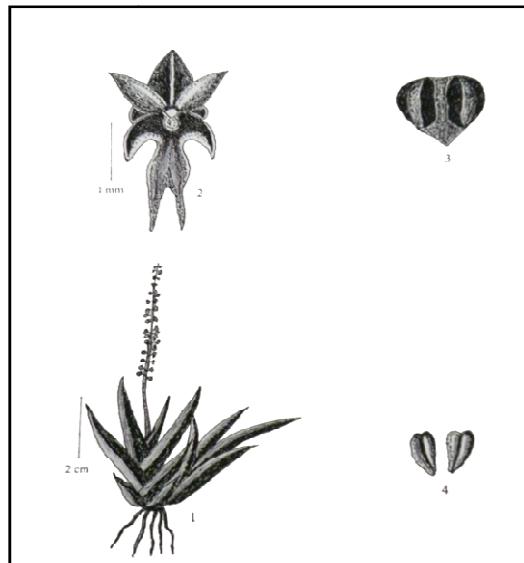


Fig. 4. *Oberonia caulescens* Lindl. **1.** Habit (whole plant with inflorescence); **2.** Front view of flower; **3.** Anther; **4.** Pollinia.

4. *Oberonia emarginata* King and Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 6, t.2A (1898). Plant epiphytic herb, small, 4-9 cm tall. Stem short. Leaves 5-7, 1.5-3.7 x 0.2-0.3 cm, linear-ensiform, acute to subacute. Inflorescence 4.5-7 cm long, erect, verticillate, densely many-flowered; peduncle 1-1.7 cm long, bracteate; peduncle bracts 2-3 mm long, linear, hyaline; rachis 3.5-6 cm long; pedicellate-ovary 0.5-0.7 mm long; floral bracts 0.7-1 mm long, linear-lanceolate, acute. Flowers 0.7-1 mm across, uniformly greenish to yellow orange. Sepals sub-equal, 0.5 x 0.4 mm, spreading, ovate, minutely papillose on outside; dorsal sepal entire, obtuse; lateral sepals subacuminate. Petals 0.5 x 0.4 mm, ovate, obtuse or acuminate. Lip 3-lobed, 0.6-0.7 x 0.5-0.7 mm, antrorse; side lobes oblong to wedge-shaped, rounded at apex; apical lobe quadrate to semi-orbicular, obscurely bilobed at apex, margins entire to dentate. Column ca 0.3 mm long. Anther white, glabrous; pollinia pale-yellow. Flowering: June – September; Fruiting: July – October. [Fig.5].

Specimen cited: Todey forest 1300 m; **Voucher specimen:** [Rajendra et al 0921]; **Habitat:** Epiphytic; **Altitudinal ranges:** 1100-2000m; **Date of collection:** 14 August 2009; **Flowering:** June-September; **Status:** Sparse; **Local distribution within Darjeeling:** Dello hill, Todey; **General distribution:** N.E. India and Thailand.

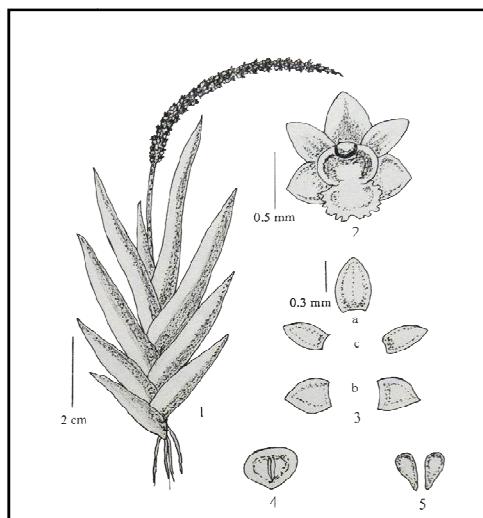


Fig. 5. *Oberonia emarginata* King and Pantling. **1.** Habit (whole plant with inflorescence); **2.** Front view of flower; **3.** Floral perigone, **a.** dorsal sepal, **b.** lateral sepals, **c.** petals, **4.** Anther; **5.** Pollinia.

5. *Oberonia ensiformis* (J.E. Smith) Lindl., Fol. Orchid. Oberonia 8: 4, no.21 (1859). Plant epiphytic herb. Stem short. Leaves 4-5, 5.5-35 x 0.8-1.5 cm, linear-ensiform, falcate, acute, overlapping, flabellate at base. Inflorescence erect, subtruncate, densely many-flowered; peduncle bracteates, 5-8 cm tall; peduncle bracts distant, lanceolate, acute, 2-4 cm long; rachis 6.5-14 cm long, thick, fleshy; pedicel and ovary ca 0.8-1 mm long; floral bracts 2-3.5 x 1-1.5 mm, convolute, ovate-orbicular, acute, apex erose. Flowers 2-3 mm long, uniformly pale brown. Sepals 1.2-1.5 mm long, subsimilar, broadly ovate, subacute, entire, reflexed. Petals 1.2-1.5 mm long, ovate, subacute, pubescent, margins entire, ciliate. Lip 2.1-2.5 x 1-1.5 mm, 3-lobed, setose; side lobes rounded, entire; apical lobe subquadrate, slightly concave, apex reniform, with lobules separated by an apical sinus; calluses 2, lateral at base of lateral lobes. Column short, simple. Pollinia pyriform. Fruit ridged. Flowering: October – November; Fruiting: November – December.

Specimen cited: 27th mile, N.H.P.C. Project side 550 m; **Voucher specimen:** [Rajendra et al. 1699]; **Habitat:** Epiphytic; **Altitudinal ranges:** 450-700m; **Date of collection:** 7 October 2011; **Flowering:** October-November; **Status:** Rare; **Local distribution within Darjeeling:** NHPC Project side, Najok forest – Kalimpong; **General distribution:** India, Nepal, Thailand, Myanmar, China and Indo-China.

6. *Oberonia falcata* King and Pantling in J. Asiatic. Soc. Bengal 64(3): 329 (1896). Plant epiphytic herb. Stem leafy, flexuose, covered by leaf sheaths, 6-11 cm tall. Leaves 5-6, 1.6-5.5 x 0.2-0.4 cm, linear-ensiform, falcate, sheathing at base. Inflorescence erect, subverticillate, densely many-flowered; peduncle short, terete, 1-2 cm long; rachis slender, 4-13 cm long; pedicel and ovary 1.3-1.5 mm long; floral bracts 1.2-1.5 x 0.5-0.7 mm, lanceolate, acute, hyaline, erose. Flowers 1.5-2 mm across, uniformly pale green to yellowish-green. Sepals ca 0.5 mm long, subsimilar, ovate-elliptic, acute, entire, reflexed to spreading. Petals ca 0.5 mm long, linear-oblong, obtuse, entire. Lip 3-lobed, 1.3-1.5 mm long; side lobes obtuse, forming small triangular projections; apical lobe deeply divided into 2, lanceolate, diverging lobules with an emarginated sinus between. Column ca 0.2 mm long, winged. Anther ovate, light white; pollinia ovate, orange yellow. Flowering: July – October; Fruiting: August – November. [Fig. 6].

Specimen cited: Kafer Busty 1700 m; **Voucher specimen:** [Rajendra et al. 1693]; **Habitat:** Epiphytic; **Altitudinal ranges:** 1300-1800m; **Date of collection:** 19 September 2011; **Flowering:** July-October; **Status:** Rare; **Local distribution within Darjeeling:** Forest areas in Kaffer, Lava – Kalimpong; **General distribution:** N. India, Nepal, Thailand, Vietnam and Malaysia.

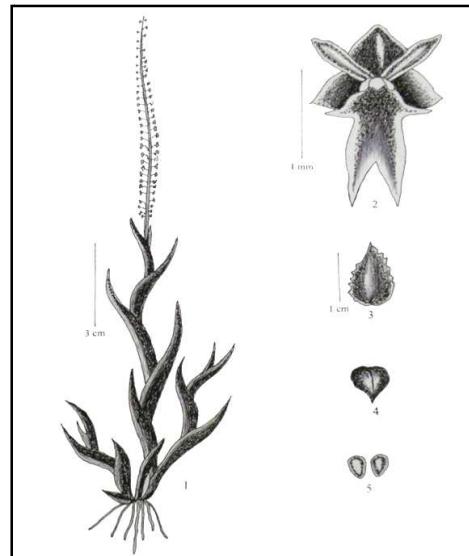


Fig. 6. *Oberonia falcata* King and Pantling, **1.** Habit (whole plant with inflorescence); **2.** Front view of flower; **3.** Floral bract; **4.** Anther; **5.** Pollinia.

7. *Oberonia mucronata* (D. Don) Ormerod & Seidenfaden in Seidenfaden, Contrib. Orch. Flora Thailand XIII: 20 (1997). Plant epiphytic herb, 21-33 cm tall. Stem very short. Leaves 4-6, 4.5-23 x 1.5-2.5 cm, broadly ensiform, acute to mucronate, overlapping at base, fleshy, the lower ones smaller. Inflorescence decurved, densely many-flowered; peduncle 6-8.5 cm long, widely winged; rachis 16-24 cm long, slender, ridged; pedicellate-ovary 1-1.1 mm long; floral bracts 0.6-1.5 x 0.4-0.5 mm long, minute, elliptic, obtuse, coarsely erose, convolute around ovary. Flowers 1-1.3 mm long, sub-vorticillate, uniformly pale green to yellow. Sepals similar, 1 mm long, ovate, reflexed, overlapping the ovary, entire. Petals 0.8-1 mm long, ovate, reflexed, overlapping on the ovary, erose. Lip 1.2-1.5 x 0.6-1 mm, orbicular, faintly 3-lobed; side lobes pectinate, erose; apical lobe broad, transversely oblong, margins deeply fimbriate-erose to emarginate. Column very short. Anther two chambered; pollinia oblong ovate. fruit broadly ovoid. Flowering: October – November; Fruiting: November – December.

Specimen cited: Kumai 600 m; **Voucher specimen:** [Rajendra et al 0162]; **Habitat:** Epiphytic; **Altitudinal ranges:** 300-900m; **Date of collection:** 25 October 2007; **Flowering:** October-November; **Status:** Common; **Local distribution within Darjeeling:** Charkhol, Relli, Kalijhora; **General distribution:** N.W. Himalaya, Nepal, Bangladesh, China, Philippines, Malaysia, Indonesia and the Pacific Islands.

8. *Oberonia pachyrachis* Rchb. f. ex Hook. f., Fl. Brit. India 5(2): 681 (1890). Plant epiphytic or lithophytic herb, 6-14 cm tall. Stem short, tufted. Leaves 2 to 3, 2.5-10 x 0.5-1.1 cm, ensiform, slightly falcate, tapering to base, acute. Inflorescence densely many-flowered, vorticillate, stout; peduncle 0.5-0.9 cm long, broad, compressed, adnate to leaf apex; rachis fleshy, terete, tapering, erect; pedicellate ovary very short; floral bracts ovate-orbicular, irregularly, deeply serrate. Flowers 1-1.2 mm long, sunk into pits in rachis; sepals and petals dull orange-yellow to brown, lip deeper coloured. Sepals similar, 0.5 x 0.24 mm, elliptic, obtuse, glandular at back, lying on surface of rachis. Petals 0.5 x 0.15 mm, linear-oblong, obtuse. Lip ca 0.5 x 0.25 mm, orbicular-elliptic, obtuse, concave, faintly erose at apex; base with a deep depression under the column. Column 0.1-0.2 mm long, simple. Fruit swollen. Flowering: October – January; Fruiting: November – February.

Specimen cited: Yangmakum Busty 600 m; **Voucher specimen:** [Rajendra et al 0733]; **Habitat:** Epiphytic; **Altitudinal ranges:** 300-800m; **Date of collection:** 14 November 2008; **Flowering:** October-January; **Status:** Common; **Local distribution within Darjeeling:** Kalijhora, Rambi, Relli, Ratay-Makum forest; **General distribution:** N. India, Nepal, Myanmar, China and Thailand.

9. *Oberonia recurva* Lindl. in Bot. Reg. 25: misc.14, no.8 (1839). Plant epiphytic herb, 3-7.5 cm tall. Stem short. Leaves 3 or 4, 1-2.7 x 0.3-0.5 cm, ensiform-lanceolate, tapering to an acute apex, straight to weakly falcate, overlapping at base. Inflorescence erect to decurved, densely many-flowered; peduncle 0.5-0.7 cm long, terete, stout, bracteate; peduncle 0.9-1 mm long, bracts lanceolate, acute; rachis 2-2.7 cm long, terete, grooved; pedicellate-ovary 1-1.1 mm long; floral bracts 0.6-1.5 mm long, oblong-lanceolate to elliptic, subacute, crenulate to subentire. Flowers 0.8-1 mm across, uniformly reddish-brown. Sepals similar, 0.4-0.6 x 0.3-0.4 mm, ovate-cordate, entire, spreading. Petals 0.4-0.6 x 0.1-0.3 mm, oblong, obtuse, weakly crenulate to entire. Lip 0.7-1 x 0.5-0.6 mm, 3-lobed, oblong; base with a large depression; side lobes orbicular, erose-dentate; apical lobe with 2 long, obtuse, orbicular, incurved lobules, separated by a deep, obtuse sinus. Column 0.1-0.2 mm tall. Fruit ovoid. Flowering: October – March; Fruiting: November – April.

Specimen cited: Gorubathan 400 m; **Voucher specimen:** [Rajendra et al 0221]; **Habitat:** Epiphytic; **Altitudinal ranges:** 200-900m; **Date of collection:** 14 March 2008; **Flowering:** October-March; **Status:** Sparse; **Local distribution within Darjeeling:** Kalijhora, Relli, Sevoke, Gorubathan; **General distribution:** India and China.

RESULTS AND DISCUSSION

During the field survey conducted in the study area, 9 species of *Oberonia* Lindl. Orchid species were found to occur in Darjeeling Himalaya. The present field survey revealed that the present availability status of three species viz., *O. acaulis*, *O. emarginata*, *O. recurva* are found as sparse status. *Oberonia mucronata* and *O. pachyrachis* are commonly available while four species viz., *O. angustifolia*, *O. caulescens*, *O. falcata* and *O. ensiformis* are found rare in the study regions (Fig. 7). During the survey, it was observed that the studied species flower almost the year round. *Oberonia angustifolia*, *O. caulescens*, *O. emarginata* flower during June to September; *O. falcata*, during July to October; *O. acaulis* flower during September to November,

O. ensiformis, *O. mucronata* flower during October to November, *O. pachyrachis* flower during October to January and *O. recurva* flower during October to March. These species are found at as low as 200m at Sevoke forest area near Siliguri (*O. recurva*) to as high as 2000m at Lava forest range of Kalimpong sub-division (*O. emerginata*) and 2700m at Todey forest of Kalimpong sub-division (*O. caulescens*). They have wide range of adaptation and distribution throughout the regions. Tubers of *O. caulescens* are useful to treat liver diseases¹¹. Regular degradation of natural habitat by many means makes whole Orchidaceae family in threatened status, and its distribution is very meager in the regions¹².

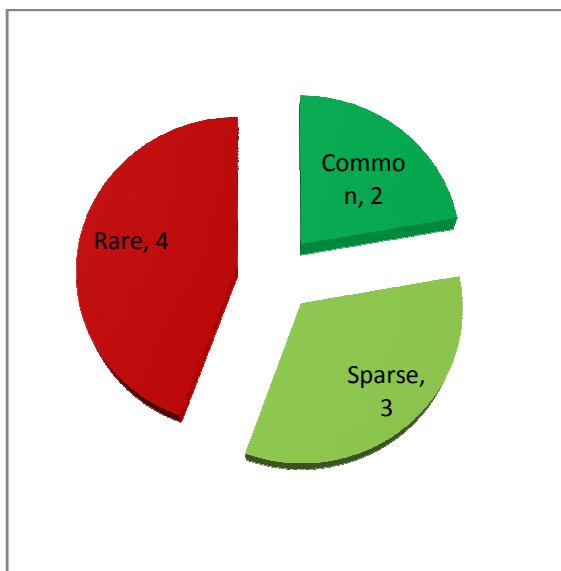


Fig. 7. Present status of *Oberonia* Orchid species in Darjeeling Himalaya of India

CONCLUSION

It is observed that the luxuriant growth and diversity of the Orchid species in the undisturbed sites of the study area and the meager development in distressed sites clearly indicates the change or disturbance in the microclimatic conditions in habitat by anthropogenic activities. Falling of epiphytic trees cause major harm to the natural population of *Oberonia* species in the region. Therefore, it is necessary to conserve our precious Orchid species diversity wealth from extinction in natural habitat.

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