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Cover: Fish species recorded in the Gowthami-Godavari Estuary, Andhra Pradesh: *Lutjanus johnii* (top left), *Triacanthus biaculeatus* (top right), *Acentrogobius cyanomos*, *Elops machnata*, *Trypauchen vagina*, *Oxyurichthys microlepis*. © Paromita Ray.



INTRODUCTION

Nokrek Biosphere Reserve (NBR) popularly called 'the Achik land' in the Garo language, located between 25.25–48°N and 90.22–90.50°E, was established on 13 September 1988 in the Garo district of Meghalaya State (Singh & Borthakur 2015). It occupies a geographic area of 820 km² in the state with 47.48 km² designated as Nokrek National Park. UNESCO added this biosphere reserve to its list in 2009 under Man & Biosphere (MAB) program, as it consists of three mountains, viz., Tura range, Arbella range, and Ranggira range (Singh 2015a,b). The well-recognized mountain peaks located in NBR includes Nokrek peak (1,412 m), followed by Arbella peak (999 m), Tura peak (872 m), and Ranggira peak (673 m); other important peaks are Meminram hill, Nengminjok hill, and Chitmomg hill (Singh et al. 2018). These mountainous belts are mainly composed of hilly granitic mass and compact block of hilly ranges having deep slopes and valleys with most of the ranges being more than 500 m. These mountain peaks are considered as an important source of several rivers and streams. The region is categorized as having a monsoon climate with temperature ranging 9.5–37.3°C. The climate as a whole is controlled by the south-west monsoon and seasonal winds; south-west and north-east monsoons are responsible for rainfall to the area ranging 3,900–6,800 mm/year (Singh et al. 2012a,b,c). It has been observed that the great heterogeneity in the ecologically rich ecosystem and the high range of altitudinal variations in the study area are responsible for the luxuriant, rich, and diverse vegetation of NBR (Singh 2015). Olson et al. (2001) categorized these mountain belts under the Indo-Malayan eco-region with the major vegetation types as the mixed tropical forests and subtropical forests (200–1,400 m), and small patches of temperate forests (above 1,400 m) at the higher mountains.

The Nokrek flora is the remnant of Indo-Malayan forests (Image 1), and the dense forests of these mountains provide a home to many narrowly endemic unique species of phytogeographical significance (Singh et al. 2011). The vegetation in many areas of the forests of Nokrek and adjoining areas has declined and plants are becoming threatened due to biotic pressure (Image 2). For instance, wild *Citrus indica* L., insectivorous plant *Nepenthes khasiana* Hook.f., the slipper orchids *Paphiopedilum* Pfitzer spp., Blue Vanda *Vanda coerulea* Griff. ex Lindl., which used to be common in Nokrek and Khasi mountains, are becoming rare and threatened due to illicit collection and destruction of virgin forests (Image 3). Considering the immense need for conservation

of these unique species, the area needs research and protection from human interference.

Plant species diversity contributes to ecosystem health, and each species is like a thread holding together an ecosystem (Mir et al. 2022). Therefore, if a species disappears, an entire ecosystem can start to unravel. The rapid loss in orchid diversity and the changing pattern of forest compositions due to various biotic and abiotic factors in Meghalaya have necessitated the qualitative and quantitative assessment of vegetation. However, numbers of floristic studies on community dynamics and phytogeographic affinities have been conducted qualitatively as well as quantitatively in northeastern India (Singh 2015a); there are a few studies incorporating orchid diversity (Singh & Borthakur 2015). However, no studies are available that give a detailed account of orchid diversity of Nokrek as NBR is less explored from the floristic point of view. Therefore, this work (i) emphasizes the need to study and explore the diversity of orchid species in NBR, (ii) collect samples and identify the tree species where orchid plants grow, and (iii) identify the localities rich in orchid diversity for conservation and management for local use.

MATERIALS AND METHODS

Field Survey, Orchid Collection, and Identification

Eleven field surveys were carried out from 2009 to 2015 along 57 forest trails of NBR, including buffer and core zones. Nokrek peak, Tura peak, Ranggira peak, Daribokgre, Neingmandalgre, Rongrengre, Chokpot, and other similar adjoining areas were selected as prioritized areas for frequent field surveys and exploration of plant diversity. The living samples were collected for those non-flowering samples and as herbarium vouchers for both non-flowering and flowering samples. During the period of study, the live orchids collected were introduced in the greenhouse and orchidarium in the Botanical Survey of India (BSI) in Shillong for ex situ conservation and identification once they bore flowers. Flowering materials were then preserved as herbarium vouchers. All visible morphological characters were studied in the field and at the laboratory of ASSAM herbarium in BSI and Department of Botany, University of Gauhati, Assam. The collections were processed according to the standard herbarium specimen preparation techniques with slight modification as mentioned by Jain & Rao (1977) and Bridson & Forman (1989). Specimens were identified using the diagnostic characters described and the identification keys mentioned by Hooker (1895), Duthie (1906), Holttum

(1957), Seidenfaden & Arora (1982), Kataki et al. (1984), Kataki (1986), Deva & Naithani (1986), Chowdhery (1998), Bose et al. (1999), and Singh (2015). Comparative studies of collected vouchers were undertaken with housed orchid specimens at ASSAM herbarium in BSI, Shillong. Indian specimens deposited in herbaria abroad were also studied online including the Royal Botanic Gardens Kew Herbarium (K) for further verification. Scientific names adopted here are those accepted by the latest ICN nomenclature mentioned in 'The Plant List', 'Kew World Checklist of Selected Plant Families', and 'Plants of the World Online' accessed via the websites (available at <http://www.theplantlist.org/>; <https://wcsp.science.kew.org/>; <http://www.plantsoftheworldonline.org/>). All studied herbarium vouchers were deposited in the herbarium of the Botanical Survey of India, Regional Centre, Shillong (acronym ASSAM), and at the herbarium of Gauhati University (HGU), Guwahati.

Presentation of the List of Orchids

All orchid species of the NBR are alphabetically presented genus-wise. The technical dichotomous key is prepared for all genera and species, and presented for easy identification of each species that belongs to a particular genus. The habit of each plant species was categorized as either epiphyte, terrestrial, or parasitic, followed by flower characters and colour, distribution range in Nokrek, and reported distribution in literature.

RESULTS AND DISCUSSION

Forest Characterization

Based on the plant species composition and consulting authentic published works (Champion & Seth 1968; FSI 2013; Singh et al. 2018), the forests of NBR were broadly grouped into four types, viz.: tropical forests, subtropical forests, riverine forests, and secondary forests. The tropical forests are important from the economic point of view as they are sources of medicine, timber, fodder, fuel, and provide shelter to the Achik tribe. Common tree species are *Artocarpus chama* Buch.-Ham., *Careya arborea* Roxb., *Dillenia indica* L., species of *Ficus* Tourn. ex L., *Garcinia* L., *Sterculia* L., *Syzygium* Gaertn., *Bombax ceiba* Burm.f., *Macaranga denticulata* (Blume) Mull.Arg., *Rhus chinensis* Mill., and many others. The subtropical forests are mostly confined to the Nokrek National Park so-called core zone, and the common tree species recorded while surveying and collecting orchids are species of *Terminalia* L., *Castanopsis* (D.Don) Spach, *Litsea* Lam., *Michelia* Kuntze, *Eurya acuminata*

DC., *Trema orientale* (L.) Blume, *Croton joufra* Roxb., *Sterculia lanceoifolia* Roxb., *Pandanus odoratissimus* Jacq., and several other species. Riverine forests are found along the river Simsang, Didari, and Chibima, and major tree species are *Aglaia elaeagnoidea* (A.Juss.) Benth., *Saraca asoca* (Roxb.) W.J.de Wilde, *Saurauia armata* Kurz, *Ayenia grandifolia* (DC.) Christenh. & Byng (= *Byttneria grandifolia* DC.), *Zanthoxylum rhetsa* (Roxb.) DC., *Balakata baccata* (Roxb.) Esser (= *Sapium baccatum* Roxb.), *Parkia timoriana* (DC.) Merr., and several others. Jhum cultivation is the major practice. Secondary forests are formed due to cutting of virgin forests (Image 4). Common species recorded are *Macaranga denticulata* (Blume) Mull. Arg., *Eurya acuminata* DC., *Mikania micrantha* Kunth, *Callicarpa arborea* Roxb., *Mallotus roxburghianus* Mull.-Arg., *Ziziphus oenopolia* (L.) Mill., and several others. Different species of bamboo, banana, and cane are also a peculiar vegetation composition of Nokrek hills.

Orchid Composition and Analysis

A total of 127 orchids belongs to 56 genera were studied, of which 94 species were epiphytes or lithophytes, 32 terrestrial and one species mycoheterotrophic. Out of 56 genera, 33 are monotypic, viz., *Acanthophippium*, *Anoectochilus*, *Arundina*, *Brachycorythis*, *Calanthe*, *Ceratostylis*, *Cheirostylis*, *Corybas*, *Corymborkis*, *Crepidium*, *Cylindrolobus*, *Dienia*, *Diplomeris*, *Eria*, *Eriodes*, *Eulophia*, *Geodorum*, *Goodyera*, *Herminium*, *Herpysma*, *Luisia*, *Mycaranthes*, *Neogyna*, *Odontochilus*, *Otochilus*, *Papilionanthe*, *Porpax*, *Pteroceras*, *Rhynchostylis*, *Satyrium*, *Schoenorchis*, *Thelasis*, and *Thunia*. *Dendrobium* with 20 species is the dominant genus in terms of species composition, followed by *Bulbophyllum* (8 spp.), *Coelogyne* (8 spp.), *Liparis* (7 spp.), *Cymbidium* (5 spp.) and *Pinalia* (4 spp.). Other genera such as *Aerides*, *Agrostophyllum*, *Cleisostoma*, *Dendrolirium*, *Habenaria*, *Micropera*, *Paphiopedilum*, and *Pholidota* were represented by three species. A total of 10 genera recorded from Nokrek were represented by two species, which includes *Acampe*, *Cryptochilus*, *Gastrochilus*, *Oberonia*, *Peristylis*, *Phalaenopsis*, *Pleione*, *Spathoglottis* and *Vanda* (Figure 1).

First time inventorizations of orchids were undertaken from NBR and 32 plant species were recorded as new for Garo districts or western parts of Meghalaya mountains, and two new national records for India. It has been observed that the higher elevation in subtropical and temperate forests are conducive environment for the orchids to live because the temperature and higher humidity recorded in those areas are lower in comparison

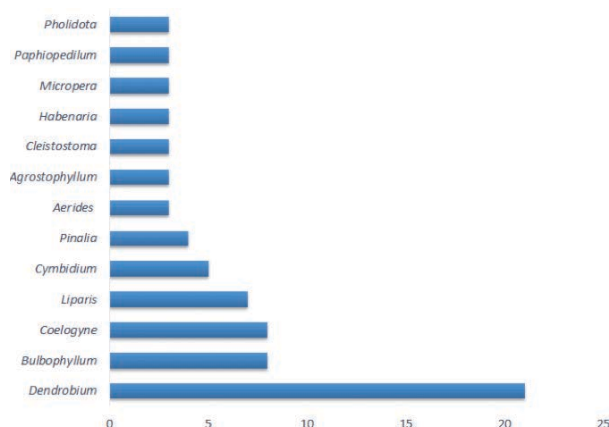


Figure 1. Generic diversity in Nokrek Biosphere Reserve.

to lower regions. During the study, the maximum orchid species collected were epiphytic or lithophytic and some terrestrials. The suitable climate coupled with soil as limiting factors allows the maximum orchid growth on trunks or hills layered with humus. From the ecological point of view, the species abundance was observed to be low and this is probably because the majority of plants were recorded as individual or minute in their natural growth.

MORPHOLOGY, ECOLOGY, AND DISTRIBUTION

1. *Acampe* Lindl.

The genus comprised of seven species distributed in southeastern Asia, tropical & subtropical Africa, Madagascar, and Islands of West Indian Ocean (<http://www.plantsoftheworldonline.org/>; Bose et al. 1999); six species in India (Gogoi et al. 2009); three species in Meghalaya (Kataki 1986), and two species in NBR.

Key to species

- 1a. Inflorescence paniced, equal to or longer than leaves; column with two short distinct horns 1. *A. ochracea*
- 1b. Inflorescence sub-umbellate, much shorter than leaves; column without horns ... 2. *A. praemorsa*

1.1. *Acampe ochracea* (Lindl.) Hochr. in Bull. New York Bot. Gard. 6: 270. 1910. *Saccolabium ochraceum* Lindl. in Edwards's Bot. Reg. 28(Misc.): 2. 1842.

Note: Epiphytic plant of flower pale lemon yellow with irregular brown markings, on trunks of *Quercus griffithii* and *Catanopsis indica* in the tropical and subtropical forests of NBR with elevation range of 500–1,400 m. Flowering was recorded in mid-November to late

December. The plant is rare and threatened due to the human ornamental needs in the study area. This species has a wide distribution in Bhutan, Cambodia, China, India (Assam, Arunachal Pradesh, Meghalaya, Sikkim), Laos, Nepal, Thailand, Myanmar, Laos, Sri Lanka, and Vietnam.

Specimen studied: Nokrek Peak (1,123 m), VNS & BS 116699 (ASSAM).

1.2. *Acampe praemorsa* (Roxb.) Blatt. & McCann in J.B.N.H.S. 35: 495. 1932. *Epidendrum praemorsum* Roxb. in Pl. Coromandel 1: 34. 1795.

Note: Epiphytic plant of flower yellow blotched with brown, on tree trunks of *Catanopsis indica* in the tropical and subtropical forests of Nokrek at 450–1,200 m. The flowering of this species recorded in October. Although this plant species is common in Meghalaya, this finding reports its occurrence only from Daribokgre, on way to Nokrek Peak, Bansamgre, and Chokpot in the NBR. The wide distribution of this species recorded from Bangladesh, Bhutan, China, India (Assam, Arunachal Pradesh, Meghalaya, Sikkim), Laos, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Daribokgre along Simsang river (874 m), VNS & BS 116700; other locality include Rongrengiri, Srinivasan 22222 (ASSAM).

2. *Acanthophippium* Blume

The genus comprises 13 species distributed in Southeast Asia from Sri Lanka, Nepal, and Japan in the world (<http://www.plantsoftheworldonline.org/>; Chung et al. 2005); one species in Meghalaya and one species in NBR.

Acanthophippium sylhetense Lindl. in Gen. Sp. Orchid. Pl. 177. 1831.

Note: Terrestrial plants of dull white flowers of yellow apex grow along with grasses in tree canopy area between the elevation ranges of 200–1,000 m in the study area. The flowering period of this species recorded between June and July. Distribution widely recorded from China, India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram), Myanmar, and Thailand.

Specimen studied: Nokrek hills, MKV Rao 59274 (ASSAM).

3. *Aerides* Lour.

The genus comprises about 28 species (<http://www.plantsoftheworldonline.org/>) distributed in the world; 12 species in India (Bora & Kumar 2003), three species in Meghalaya (Kataki 1986), and three species in NBR.

Key to species

- 1a. Mid-lobe of lip narrow, turning upwards; spur ca 1.2 cm long, prominent, horn-like 1. *A. odorata*
- 1b. Midlobe of lip broad, forward-pointing; spur short, inconspicuous 2
- 2a. Midlobe of lip cordate, apex emarginated-truncate 2. *A. multiflora*
- 2b. Midlobe of lip triangular, apex acute 3. *A. rosea*

3.1. *Aerides odorata* Lour. in Fl. Cochinch. 525. 1790. (Image 5)

Note: Epiphytic Plant of flower white with pale pink flushed, on tree trunks in a subtropical forest in NBR between. The flowering season was recorded in mid-March to early June. This species is rare in the study site. It is widely recorded from Bhutan, Bangladesh, India (Assam, Meghalaya, Mizoram, Sikkim, Tripura), Laos, Myanmar, Philippines, Sumatra, Thailand, and Vietnam.

Specimen studied: Way to Nabokgre, VNS & BS 118277 (ASSAM).

3.2. *Aerides multiflora* Roxb. in Pl. Coromandel 3: 68. 1820.

Note: Pendent epiphytic plant of flower white to pinkish-purple, usually growing on tree trunks in both the open and the dense tropical and subtropical forests between the elevation range of 600–1,417 m. Flowering twigs of this species were seen in March. This species is extremely rare in Nokrek, and during the survey, we could not locate any site of occurrence, but while studying the housed specimens at ASSAM herbarium, two sheets of MKV Rao earlier collection were recorded from the study site. The plant is recorded from Bangladesh, Bhutan, India (Assam, Arunachal Pradesh, Meghalaya, Sikkim), Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Gokha, MKVR 59292 (ASSAM); Way to Baghmara, MKVR 59328 (ASSAM).

3.3. *Aerides rosea* Lodd. ex Lindl. & Paxton in Paxton's Fl. Gard. 2: 109. 1851. (Image 6)

Note: Robust epiphytic plant of purple flowers arising from peduncle sheath recorded growing on the tree trunks between 700 and 1450m elevation in the study area. Flowering was recorded in August. Distribution recorded from Bhutan, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur), Myanmar, and Thailand.

Specimen studied: Nokrek hills, MKVR22464 (ASSAM).

4. *Agrostophyllum* Blume

The genus currently contains 135 species (<http://www.plantsoftheworldonline.org/>) distributed from the Seychelles to Samoa, New Guinea (Ormerod 2012), four species from Meghalaya, and three species in NBR.

Key to species

- 1a. Leaves more than 1.5 cm broad, epichile or lip broader than long, a transverse ridge dividing the hypochile from epichile 3. *A. planicaule*
- 1b. Leaves less than 1.3 cm broad, lip with a transverse callus on hypochile 2
- 2a. Stem clavate with few leaves on the upper part of the stem below which are large imbricate sheaths; capitula about 2 cm across 1. *A. brevipes*
- 2b. Stem with many leaves; capitula more than 3 cm across 2. *A. callosum*

4.1. *Agrostophyllum brevipes* King & Pantl. in Ann. Roy. Bot. Gard. (Calcutta) 8: 156. 1890.

Note: Epiphytic plant of white flowers grows in subtropical forests between the elevation ranges of 1,300–1,480 m elevation in the study area forests. It flowering and fruiting period is between December and June. Wide distribution reported from India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim), Nepal, Sri Lanka, and Thailand.

Specimen studied: Nokrek hills, RN De 17137 (ASSAM).

4.2. *Agrostophyllum callosum* Rchb.f. in B. Seemann, Fl. Vit. 296. 1868.

Note: Terrestrial plant of reddish-pink flowers grows in subtropical forests at 900–1,480 m elevation in the study area. Distribution reported from Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram, Sikkim), Nepal, Myanmar, and Thailand.

Specimen studied: Nokrek Peak, Das 46857 (ASSAM).

4.3. *Agrostophyllum planicaule* (Wall. ex Lindl.) Rchb.f. in W.G. Walpers, Ann. Bot. Syst. 6: 909. 1864. *Eria planicaulis* Wall. ex Lindl.). in Edwards's Bot. Reg. 26(Misc.): 8. 1840.

Note: Terrestrial Plant of white flowers grows in open as well as dense places along forest margin between the elevation ranges of 200–1,000 m in the Nokrek area. Distribution Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Sikkim), Nepal,



Image 1. View of Nokrek Biosphere Reserve.



Image 3. Buttress formation of huge tree in core area of Nokrek.



Image 2. View of local hanging bridge in Nokrek Hills.



Image 4. View of traditional tree house in Nokrek hills for protecting jhum land.

Myanmar, Malaysia, and Thailand.

Specimen studied: Nokrek hills, VNS & BS35839 (ASSAM).

5. *Anoectochilus* Blume

The genus comprises 46 species (<http://www.plantsoftheworldonline.org/>) distributed from Sri Lanka

and the Himalayan region throughout southeastern Asia to Oceania (Tian et al. 2008), six species in Meghalaya, and one species in NBR.

5.1 *Anoectochilus roxburghii* (Wall.) Lindl. in J.F. Royle, III. Bot. Himal. Mts. 368. 1839. *Chrysobaphus roxburghii* Wall. in Tent. Fl. Nepal. 37. 1826.

Note: Terrestrial plant of pale pink to white flower, occurring in shaded humus soil of the subtropical forests between the altitudes of 100–1,400 m. The flowering season recorded in the study area is from August to late September. The species is rare and is recorded for the first time from the Garo district of Meghalaya. Widely distribution recorded from Bangladesh, Bhutan, and India (Arunachal Pradesh, Sikkim, Assam, Meghalaya, Nagaland, Manipur, Mizoram).

Specimen studied: Nokrek, NPB 50096 (ASSAM).

6. *Arundina* Blume

The genus comprises two species (<http://www.theplantlist.org>) distributed in southern and southeastern Asia and both are found in India; one species from Meghalaya (Kataki 1986).

6.1 *Arundina graminifolia* (D.Don.) Hochr. in Bull. New York Bot. Gard. 6: 270. 1910. *Bletia graminifolia* D.Don in Prodr. Fl. Nepal. 29. 1825.

Note: Terrestrial plant of pale pinkish-purple flower, occasionally the plant is viviparous in nature in grassland, secondary forests and forest borders of the tropical and subtropical zone at 500–1,400 m. Flowering was observed in June and last till August. It is widely recorded from Bhutan, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim), Nepal, Myanmar, and Thailand.

Specimen studied: Way to Baghmara, MKVR 64516 (ASSAM).

7. *Brachycorythis* Lindl.

The genus was proposed by Lindley in 1938 and comprised of 37 species (<http://www.plantsoftheworldonline.org/>) distributed in tropical Asia, Africa, Australia, Madagascar, and Myanmar (Hoque & Huda 2008), five species have been reported from India (Bose et al. 1999), one species from Meghalaya, and one species in NBR.

7.1 *Brachycorythis obcordata* (Lindl. ex Wall.) Summerh. in Kew Bull. 10: 243. 1955. *Orchis obcordata* Lindl. ex Wall. in Prodr. Fl. Nepal. 23. 1825.

Note: Terrestrial plant of uniformly pink to pale purple flowers seen grows along with grasslands in forest borders at 1,000–1,400 m elevation in the study area. It flowers between May and September. Distribution recorded from Bhutan, China, India (Arunachal Pradesh, Meghalaya), Nepal, Myanmar, and Thailand.

Specimen studied: Sadhoa forest, Kanjilal 8190 (ASSAM).

8. *Bulbophyllum* Thouars

The genus is comprised of 2,058 species (<http://www.plantsoftheworldonline.org/>) distributed throughout the World; about 300 species in tropical regions (Kataki 1986); 37 species in Meghalaya, and eight species in NBR.

Key to species

- 1a. Pseudobulbs disc-like; stelia linear, sharply pointed 2
- 1b. Pseudobulbs and stelia otherwise 3
- 2a. Flowers reddish brown, mottled with yellow and lip purple 8. *B. sarcophyllum*
- 2b. Flowers white with purple veined 7. *B. roseopictum*
- 3a. Inflorescence umbellate heads 4. *B. odoratissimum*
- 3b. Inflorescence not umbellate 4
- 4a. Inflorescence cylindric, densely many flowered 5
- 4b. Inflorescence lax raceme 6
- 5a. Peduncle laxly sheathed; peduncle more than 4 cm long; stelia long 1. *B. careyanum*
- 5b. Peduncle with dense, swollen sheaths throughout, peduncle less than 2 cm long; stelia short 2. *B. crassipes*
- 6a. Flowers reddish-purple to yellow blotched with reddish-purple, lip deep reddish-purple 6. *B. rolfei*
- 6b. Flowers yellowish-creamy, with or without red spots externally; lip yellow 7
- 7a. Leaves 8–20 cm long; petals serrate on margin 3. *B. gymnopus*
- 7b. Leaves 6–10 cm long; petals entire on margin *B. reptans*

8.1. *Bulbophyllum careyanum* (Hook.) Spreng. in Syst. Veg. 3: 732. 1826. *Anisopetalum careyanum* Hook. in Exot. Fl. 2: t. 149. 1825.

Note: Epiphytic plant of flower orange-yellow spotted with red-brown or purple and lip yellow blotched with violet, recorded on a tree trunk in tropical forests of NBR between the altitude ranges of 400–800 m. Flowerings start in early October and continue till January. The species is recorded for the first time from the Garo district of Meghalaya. It is reported from Bhutan, India (Arunachal Pradesh, Meghalaya, Sikkim), Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: 6th Mile area, VNS & BS 118464 (ASSAM).



8.2. *Bulbophyllum crassipes* Hook.f. in Fl. Brit. India 5: 760. 1890. (Image 7)

Note: Epiphytic plant of flower greenish-yellow, base spotted red-purple, grows on tree trunks in dense tropical forests along the river side. The flowering of this species was recorded in September and still flowering at the end of October or early November. Critically endangered in Nokrek, and is reported for the first time from the state of Meghalaya. Bhutan, China, India (Meghalaya, Sikkim), Malaysia, Myanmar, Thailand, and Vietnam.

Specimen studied: Near Rongrengiri (265m), VNS & BS118223 (ASSAM).

8.3. *Bulbophyllum gymnopus* Hook.f. in Fl. Brit. India 5: 764. 1890.

Note: Epiphytic plant of white flower, although bracts are slightly yellowish to brown, growing on tree trunks and branches covered with moss in subtropical forests at 1,200–1,400m. Flowering is usually recorded in December and continues till the end of January. Occasionally found in Nokrek. The species is reported from Bhutan, China, India (Arunachal Pradesh, Meghalaya, Sikkim), Myanmar, and Thailand.

Specimen studied: Daribokgre, VNS & BS 116708 (ASSAM).

8.4. *Bulbophyllum odoratissimum* (Sm.) Lindl. ex Wall. in Numer. List. No. 1987. 1829. *Stelis odoratissima* Sm. in A.Rees, Cycl. 34. No. 12. 1816.

Note: Usually epiphytic, occasionally lithophytic plant of white flower tipped with yellow, recorded growing on tree trunks of subtropical forests. The flowering period starts in June and ends in July. The species is extremely rare in Nokrek, only three localities were recorded while surveying both the core and buffer zones of the biosphere reserve. Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim), Myanmar, and Nepal.

Specimen studied: Sisubibra, VNS & BS 116705 (ASSAM); other localities are Nokrek Peak, VNS & BS 116613 (ASSAM) and Daribokgre, VNS & BS 114816 (ASSAM).

8.5. *Bulbophyllum reptans* (Lindl.) Lindl. ex Wall. in Numer. List. No. 1988. 1829. *Tribrachia reptans* Lindl. in Coll. Bot. t. 41. 1826.

Note: Epiphytic or lithophytic plant yellowish-green with purple streaks flower and lip yellowish with red margin, recorded growing on tree trunks and on moss-covered rocks near stream or rivers in subtropical forests. The plant flowers in October and can be seen flowering till mid-November. Although this species is recorded

from Shillong Peak of Meghalaya it is a new record for the Garo districts. This species is extremely rare in Nokrek and only recorded from the core zone near Nokrek Peak. Distribution of the species reported from India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Sikkim), Myanmar, and Thailand.

Specimen studied: Nokrek Peak, BS, VNS & BKS118501 (ASSAM).

8.6. *Bulbophyllum rolfei* (Kuntze) Seidenf. in Dansk Bot. Ark. 33: 149. 1979. *Phyllorkis rolfei* Kuntze in Revis. Gen. Pl. 2: 676. 1891.

Note: Epiphytic plant of reddish-purple flower with yellow blotched recorded growing on tree trunks in the tropical and subtropical forests. Flowering was recorded in August to October. Widely reported from Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Sikkim), and Nepal.

Specimen studied: Daribokgre near Simsang river, 114661 (ASSAM).

8.7. *Bulbophyllum roseopictum* J.J.Verm., Schuit. & de Vogel in Phytotaxa 166. 105. 2014.

Note: Epiphytic plant of white flowers with purple veined grows on the moss-laden stems, barks, and on tree trunks of subtropical forests at 900–1,450 m elevation in the study area. Its phenology period is between October and December. Distribution widely reported from China, India (Arunachal Pradesh, Meghalaya, Sikkim, Assam, Nagaland), Myanmar, and Thailand.

Specimen studied: Nokrek hills, GK Deka 35682 (ASSAM).

8.8. *Bulbophyllum sarcophyllum* (King & Pantl.) J.J.Sm. in Bull. Jard. Bot. Buitenzong, ser. 2, 8: 27. 1912. *Cirrhopetalum sarcophyllum* King & Pantl. in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 64: 335. 1896.

Note: Epiphytic or lithophytic plant of flower reddish-brown, mottled with yellow and lip purple, recorded growing in shade on tree trunks in tropical and subtropical forests. The plant flowers in June. It is recorded rare in Meghalaya, and after the collection of Panigrahi from NBR. This species is not yet reported from other parts of the state. The species is reported from Bhutan, India (Arunachal Pradesh, Meghalaya, Sikkim), and Nepal.

Specimen studied: Tura Peak, GP22411 (ASSAM).

9. *Calanthe* R.Br.

The genus is represented by 214 species (<http://www.plantsoftheworldonline.org/>) widely distributed from tropical & subtropical Asia to the Pacific islands, tropical



Image 5. *Aerides odorata*.



Image 6. *Aerides rosea*.



Image 7. *Bulbophyllum crassipes*.

and southern Africa, Madagascar, Mexico, Panama, and northern South America (Zhai et al. 2013), 11 species in Meghalaya (Kataki 1986), and one species in NBR.

9.1. *Calanthe biloba* Lindl. in *Fol. Orchid.* 6: 3. 1855.

Note: Plant terrestrial of yellow flower spotted with purple brown, and lip pale violet, white at the base, grows in a shady area of subtropical forests. It flowers in September and in some other places of Meghalaya, it is recorded till November. The species is rare and threatened in the NBR. The distribution of the species is reported from Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Sikkim), Myanmar, and Thailand.

Specimen studied: Sisubibra, ARKS 40557 (ASSAM); other locality is RF, MKVR 53311 (ASSAM).

10. *Ceratostylis* Blume

The genus comprises 153 species (<http://www.plantsoftheworldonline.org/>) distributed in Southern and

southeastern Asia to Indonesia and New Guinea (Pearce & Cribb 2002), three species from India, two species from Meghalaya (Kataki 1986), and one species in NBR.

10.1. *Ceratostylis himalaica* Hook.f. in Fl. Brit. India 5: 826. 1890.

Note: Epiphytes plant of pinkish-yellow flowers grows in the primary forests between the elevation ranges of 1,000–1,480 m in the study area. Flowering was recorded in May. Distribution of the species widely recorded from Bhutan, China, India (Meghalaya, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Sikkim), Nepal, Thailand, and Myanmar.

Specimen studied: Nokrek peak, MKVR 64007 (ASSAM).

11. *Cheirostylis* Blume

The genus is represented by 55 species (<http://www.plantsoftheworldonline.org/>) distributed in tropical Africa, Southern & southeastern Asia, Japan, and Pacific Island to Australia (Bhattacharjee 2012), one species from Meghalaya, and one species in NBR.

11.1. *Cheirostylis griffithii* Lindl. in J. Proc. Linn. Soc., Bot. 1: 188. 1857.

Note: Terrestrial plant of white flowers found growing in the subtropical forests at 900–1,400 m elevation in the study area. Its flowering was recorded between May and August. Distribution reported from Bhutan, India (Meghalaya, Arunachal Pradesh, Assam, Nagaland), Nepal, Myanmar, and Thailand.

Specimen studied: Nokrek, PK Hajra 51876 (ASSAM).

12. *Cleisostoma* Blume

The genus comprises 96 species (<http://www.plantsoftheworldonline.org/>) distributed across the world in tropical and subtropical climate (Bose et al. 1999), 35 species in tropical Asia (Kataki 1986), 19 species in India (Gogoi et al. 2009), 10 species in Meghalaya, and three species in NBR.

Key to species

- 1a. Leave flat; pollinia with simple stipes 3. *C. subulatum*
- 1b. Leaves terete; pollia with complex strip 2
- 2a. Plant with dorsiventral leaves (sometimes V-shaped in section); inflorescence many-flowered long raceme; sepals and petals chocolate brown 2. *C. filiforme*
- 2b. Plant with terete leaves; inflorescence few-flowered short raceme; sepals and petals yellow with

brown veins, spur narrow veins

..... 1. *C. appendiculatum*

12.1. *Cleisostoma appendiculatum* (Lindl.) Benth. & Hook.f. ex B.D. Jacks. in Index Kew. 1: 555. 1893. *Aerides appendiculata* Lindl. in Gen. Sp. Orchid. Pl. 242. 1833.

Note: Epiphytic plant of yellow flower, growing on moss-covered tree trunks in the subtropical forests between the altitude ranges of 1,000–1,417 m. It flowers in July and ends in August. Rare in Nokrek hills of Meghalaya. India (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim), Myanmar, and Thailand.

Specimen studied: Nokrek Hills, S Phukan 113011 (ASSAM); other locality is Danagiri, DB Deb 29295.

12.2. *Cleisostoma filiforme* (Lindl.) Garay in Bot. Mus. Leafl. 23: 171. 1972. *Sarcanthus filiformis* Lindl. Edmards's Bot. Reg. 28 (Misc.): 61. 1842.

Note: Epiphytic plant of purple flower with a yellow stripe at the centre, found to be growing on tree trunks in shady places in the tropical and subtropical forests. The plant flowers in April and continues till June. It is rare in the Nokrek, and recorded for the first time from the Garo districts, and is one of the most threatened plants of the state. After a repeated search in the study area, we could only locate two populations: one at the Sabokgre (subtropical area), and one at the Rongrenggre (tropical forests). Bhutan, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim), Nepal, Myanmar, and Thailand.

Specimen studied: Way to Sabokgre (1,026 m), VNS & BS118278 (ASSAM); other localities include Rongrenggre (295 m), VNS & BS 116760 (ASSAM).

12.3. *Cleisostoma subulatum* Blume in Bijdr. Fl. Ned. Ind. 363. 1825.

Note: Epiphytic plants of yellow to brown flowers, growing on tree trunks in the tropical and subtropical forests between the altitude ranges of 450–1,050 m. Flowering was recorded from May to June. During the scrutiny of ASSAM herbarium, the authors come across two unidentified sheets of MKV Rao, and after identification, it is a new record for Garo district. India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Sikkim), Myanmar, and Thailand.

Specimen studied: Nokrek Peak, MKVR 64609 (ASSAM).

13. *Coelogyne* Lindl.

The genus comprises of 210 species (<http://www.>

plantsoftheworldonline.org/), 34 species in India (Das & Jain 1980), 22 species in Meghalaya (Kataki 1986), and eight species in NBR.

Key to species

- 1a. Inflorescence with imbricate sterile bracts 2
- 1b. Inflorescence bare to the first flower, or rarely with 1 or a few sterile bracts; flowers opening simultaneously 4
- 2a. Rachis extending with new imbricate bracts to produce further annual sets of flowers 3
- 2b. Rachis producing a single set of flowers 1. *C. barbata*
- 3a. Lip mid-lobe nearly broadly oblong, 2 lamellae faint near the base of lip, elevated and prominent on mid-lobe 8. *C. schultesii*
- 3b. Lip mid-lobe nearly elliptic, 2 lamellae terminating 2/3 onto mid-lobe 5. *C. prolifera*
- 4a. Dorsal sepal forming a hood over the column, larger than lateral sepals and petals; lateral sepals and petals not widespread away from the column .. 4. *C. fuscescens*
- 4b. Dorsal sepal erect, away from the column; lateral sepals and petals widespread away from the column; sepals and petals of ca. equal length 5
- 5a. Dorsal sepal and lateral sepals of ca. equal width, petals narrower 6
- 5b. Dorsal sepal, lateral sepals, and petals of ca. equal width; sepals, petals, and lip tending toward being fleshy 7
- 6a. Lip with mid-lobe large in relation to the overall size of flower, sometimes clawed; lip with margin tending toward being membranous 7. *C. suaveolens*
- 6b. Lip with mid-lobe not large relative to the overall size of flower; lip without evident claw; lip with margin tending toward being fleshy 3. *C. flaccida*
- 7a. Inflorescence hysteranthous 6. *C. punctulata*
- 7b. Inflorescence proteranthous or synanthous 2. *C. corymbosa*

13.1. *Coelogyne barbata* Lindl. ex Griff. in Itin. Pl. Khasyah Mts. 72. 1848.

Note: Epiphytic or lithophytic plant of pure white flower grows on tree trunks in the tropical and subtropical forests. It flowers in September and continues flowering till December. Singh & Singh (2002) reported this species from Nokrek and treated under rare and endangered category. The plant is reported from Bhutan, India

(Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, Mizoram), and Myanmar.

Specimen studied: Sisubibra, VNS & BS116706 (ASSAM).

13.2. *Coelogyne corymbosa* Lindl. in Fol. Orchid. 5: 7. 1854.

Note: Plant epiphytic or lithophytic plant of white flower bordered with orangish-red lip grows on tree trunks in the subtropical forests. The flowering of the plant was recorded in October–November. A sheet of vouchers is housed in ASSAM, but to date not reported from Garo hills, hence, is a new record for the Garo district. Widely reported from Bhutan, India (Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Sikkim), Nepal, and Myanmar.

Specimen studied: Nokrek, GVSR 28188 (ASSAM).

13.3. *Coelogyne flaccida* Lindl. in Gen. Sp. Orchid. Pl. 39. 1830. (Image 8)

Note: Generally epiphytic plants on tree trunks, occasionally growing on moss-covered rocks (lithophytic) in dense places of tropical and subtropical forests at 700–1,400 m. It flowers from early March to the end of April. This species of plant is extremely rare, and threatened in the Nokrek due to illicit collection for ornamental purposes. Distributed in Bhutan, China, India (Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Sikkim), Myanmar, and Thailand.

Specimen studied: Simsanggre to 15 km, VNS & BS 116786 (ASSAM).

13.4. *Coelogyne fuscescens* Lindl. in Gen. Sp. Orchid. Pl. 41. 1830.

Note: Epiphytic plant of yellow flowers found to be growing in dense primary subtropical forests at 1,000–1,400 m. Flowering was recorded in November and January. It is extremely rare in Nokrek, as authors could locate only two localities after repeated searches in the BR. It is reported from Bhutan, India (Arunachal Pradesh, Meghalaya, Mizoram, Sikkim), Nepal, and Myanmar.

Specimen studied: Daribokgre, VNS & BS114817 (ASSAM).

13.5. *Coelogyne prolifera* Lindl. in Gen. Sp. Orchid. Pl. 40. 1830.

Note: Epiphytic plant of yellow flower with lip brown-veined recorded growing on tree trunks of lofty trees in the subtropical forests. The plant flowers in early May and continues till June. It is rare in Nokrek forests and recorded for the first time from Garo hills. Bhutan, China,



India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Sikkim), Nepal, and Myanmar.

Specimen studied: Darugiri, MKVR 61442 (ASSAM).

13.6. *Coelogyne punctulata* Lindl. in Coll. Bot. t. 33. 1824. (Image 9)

Note: Epiphytic plant of white flower, and lip with two bright orangish-yellow spots on each lateral lobe. It is recorded growing on tree trunks in the subtropical forests between elevation ranges of 1,000–1,400 m, and flowering usually in February. It is rare and records for the first time from the Garo district. Bhutan, India (Arunachal Pradesh, Meghalaya, Manipur, Sikkim), Myanmar, and Nepal.

Specimen studied: Sellengiri, SDS 60130 (ASSAM).

13.7. *Coelogyne suaveolens* (Lindl.) Hook.f. in Fl. Brit. India 5: 832. 1890. *Pholidota suaveolens* Lindl. in Gard. Chron. 1856: 312. 1856.

Note: Epiphytic plant of white flower and lip with yellow spots, growing in shady places on tree trunks in the tropical and subtropical forests between the altitudinal gradient of 400–1,250 m. Flowering usually in May, and also occasionally recorded in June. Wide distribution of this species reported from India (Assam, Meghalaya, Arunachal Pradesh), Myanmar, and Thailand.

Specimen studied: Way to Khalakgre, VNS & BS 116716 (ASSAM); other localities include Rongrengiri, MKVR 59453 (ASSAM).

13.8. *Coelogyne schultesii* S.K.Jain & S.Das in Proc. Indian Acad. Sci., B 87(5): 121. 1978. (Image 10)

Note: Plant epiphytic plant of flower brownish-yellow or greenish to dark brown, and lip dark brown, on lofty trees, sometimes lithophytic on moss-covered rocks in the shady area of the tropical and subtropical forests between the elevations of 500–1,000 m. Its flowering period was recorded in January and continued till the end of March. The plant is rare and threatened in Nokrek. Distribution of the species recorded from Bhutan, India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Nagaland, Sikkim), Myanmar, and Thailand.

Specimen studied: Sisubibra, VNS & BS116695 (ASSAM).

14. *Corybas* Salisb.

The genus of terrestrial orchids that comprised about 147 species (<http://www.plantsoftheworldonline.org/>) found from southern China and India to Australia, New Zealand, and western Pacific Islands (Chung & Hsu 2008), one species from Meghalaya, and one species in NBR.

***Corybas himalaicus* (King & Pantl.) Schltr. in Repert. Spec. Nov. Regni Veg. 19: 19. 1923. *Corysanthes himalaica* King & Pantl. in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 128. 1896.**

Note: A terrestrial plant having white flowers grows along with grasses in subtropical vegetation at 1,000–1,480 m elevations in the study area. Flowering was recorded between June and July. The species is recorded from China and India (Sikkim, Meghalaya).

Specimen studied: Nokrek hills, Joseph 84079 (ASSAM).

15. *Corymborkis* Thouars

The genus is comprised of eight species (<http://www.plantsoftheworldonline.org/>) distributed across the world in tropic and subtropics, one species from Meghalaya, and one species in NBR.

15.1. *Corymborkis veratrifolia* (Reinw.) Blume in Coll. Orchid. 125. 1859. *Hysteria veratrifolia* Reinw. in Syll. Pl. Nov. 2: 5. 1825.

Note: Clump-forming terrestrial plant tubular fragrant white flowers, growing in the subtropical forests. It flowers usually in July. The plant is rare in Nokrek as well as in the state. The distribution of the species is recorded from China, India (Sikkim, Arunachal Pradesh, Assam, Meghalaya), Japan, Malaysia, Myanmar, and Thailand.

Specimen studied: Tura Hills, RND 22179 (ASSAM).

16. *Crepidium* Blume

The genus is represented by 291 species (<http://www.plantsoftheworldonline.org/>) throughout the world mostly in tropical and subtropical regions of Asia to the Pacific, six species from Meghalaya, and one species in NBR.

16.1. *Crepidium acuminatum* (D.Don) Szlach. in Fragm. Florist. Geobot., Suppl. 3: 123. 1995. *Malaxis acuminata* D.Don in Prodr. Fl. Nepal. 29. 1825.

Note: Terrestrial plant of greenish-yellow or slightly purple flowers grows in the primary forests in shaded moist places, often nearby streams and rivers at 200–1,300 m elevations in the study area. Its flowering starts in June and can be seen till the third week of August. Distribution in Bhutan, China, India (Arunachal Pradesh, Meghalaya, Sikkim, Assam, Nagaland, Manipur), Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, and Vietnam.

Specimen studied: Sasatgiri, MKVR 53322 (ASSAM); other locaty include Nokrek range, MKVR 64415 (ASSAM).

17. *Cryptochilus* Wall.

The genus is represented by a total of eight species (<http://www.plantsoftheworldonline.org/>) distributed mostly in the southeastern Asian regions, two species from Meghalaya, and two species in NBR.

Key to species

- 1a. Red flowers 1. *C. sanguineus*
 1b. White flowers 2. *C. strictus*

17.1. *Cryptochilus sanguineus* Wall. in Tent. Fl. Nepal. 36. 1824.

Note: Epiphytic plant of a red flower, usually growing in the primary forests on tree trunks of the subtropical belt in shady places. Usually, they plant flowers in June and continues flowering till September in some places. The distribution of the species was widely reported from Bhutan, India (Arunachal Pradesh, Sikkim, Meghalaya, Nagaland, Mizoram), and Nepal.

Specimen studied: Nokrek, GKD 10156 (ASSAM).

17.2. *Cryptochilus strictus* (Lindl.) Schuit., Y.P.Ng & H.A.Pedersen in Bot. J. Linn. Soc. 186: 195. 2018. *Eria stricta* Lindl. in Coll. Bot. t. 41 B. 1826.

Note: Epiphytic plant of flower densely woolly-externally, white, flushed with pink and lips streaked with yellow, recorded growing on the tree trunks of tropical and subtropical forests between the elevation ranges of 700–1,400 m. This species is extremely rare in NBR. Its flowering can be seen between March and April. Distribution of the species recorded from Bhutan, India (Arunachal Pradesh, Nagaland, Meghalaya, Mizoram, Sikkim), and Thailand.

Specimen studied: Nokrek Peak (1,375 m), VNS & BS 114676 (ASSAM).

18. *Cylindrolobus* Blume

The genus is represented by 75 species (<http://www.plantsoftheworldonline.org/>) in its native range of southern China to tropical Asia and one species in NBR.

18.1. *Cylindrolobus clavicaulis* (Wall. ex Lindl.) Rauschert in Feddes Repert. 94: 445. 1983. *Eria clavicaulis* Wall. ex Lindl. in Edwards's Bot. Reg. 26(Misc.): 90. 1840.

Note: Epiphytic plant of white flowers, lips edged with pink, grows on tree trunks in the subtropical forests of the study area. Flowering of this plant species recorded in January. Occasional in the Nokrek hill range, however, its worldwide distribution recorded from China, India (Assam, Arunachal Pradesh, Meghalaya), Myanmar, Thailand, and Vietnam. (Note: This species can be distinguished from the inflorescence with 2 pedicelled

flowers, and 2 yellow bracts. It can be separated from *E. marginatus* by their rachis pedicel, ovary, glabrous sepals, and lateral lobes bigger than the mid-lobe.).

Specimen studied: Sabokgre, VNS & BS 118275 (ASSAM).

19. *Cymbidium* Sw.

The genus is comprises 74 species (<http://www.plantsoftheworldonline.org/>) distributed in tropical and subtropical regions of Asia and Australia (Long et al. 2003), 18 species in India (Bora & Kumar 2003), 13 species in Meghalaya (Kataki 1986), and five species in NBR.

Key to species

- 1a. Pseudobulbs ovoid, bilaterally flattened; leaves 4–6, oblong, obtuse, unequal bilobed at apex, thick, rigid, erect 1. *C. aloifolium*
 1b. Pseudobulbs ovoid or fusiform; leaves 2–17, linear-elliptic, narrowly oblong, acute to mucronate, sessile, rigid 2
 2a. Leaves 2–4, with long channeled petiole; inflorescence pendulous 2. *C. devonianum*
 2b. Leaves more than 5, petioles not channeled; inflorescence otherwise 3
 3a. Leaves 5–9, linear-oblong, tapering to a fine tip; flowers spreading; margin ciliate 4. *C. iridoides*
 3b. Leaves more than 6, narrowly oblong to ovoid; flowers not spreading; margins not ciliate 4
 4a. Pseudobulbs ovoid to fusiform; leaves 6–17, narrowly oblong, mucronate; flowers white, not spreading 3. *C. eburneum*
 4b. Pseudobulbs small, ovoid to narrowly ovoid; leaves many, linear to linear-elliptic; flowers campanulate, pendent, pale lemon yellow
 5. *C. longifolium*

19.1. *Cymbidium aloifolium* (L.) Sw. in Nova Acta Regiae Soc. Sci. Upsal. 6: 73. 1799. *Epidendrum aloifolium* L. Sp. Pl. 953. 1753.

Note: Epiphytic plant of flower yellow with purple mid-nerve on trunks of lofty trees usually recorded growing in the tropical and subtropical forests between the altitudinal ranges of 250–1,417 m. Flowering from May to July. Although this species is rare in the state, it is recorded very commonly in Nokrek. Distribution of this species reported from Bhutan, China, India (Arunachal Pradesh, Assam, Sikkim, Meghalaya, Nagaland, Mizoram), Myanmar, Nepal, Sri Lanka, and Thailand.

Specimen studied: Nokrek Peak (1,378 m), VNS & BS 116709 (ASSAM), others recorded localities include Rongrengiri, GP22626 (ASSAM) and Tura Hills, DBD29058 (ASSAM).



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Image 8. *Coelogyne flaccida*.



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Image 9. *Coelogyne punctulata*



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Image 10. *Coelogyne schultesii*.



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Image 11. *Cymbidium iridioides*.



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Image 12. *Dendrobium anceps*.



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Image 13. *Dendrobium aphyllum*.

19.2. *Cymbidium devonianum* Paxton. in Paxton's Mag. Bot. 10: 97. 1843.

Note: Epiphytic plant of flowers green with purple dots on tree trunks, occasionally lithophytic on moss-covered big rocks in dense under canopy layer in the subtropical forests above 1,000 m. Its flowering period was recorded from May to July. This plant species is again extremely rare in Nokrek as well as in the state because after long surveys, only two localities, Tura Hills and Cherrepunjee, are recorded so far from Meghalaya. It's a new record for the Garo districts. The species is reported from Bhutan, China, India (Arunachal Pradesh, Sikkim, Meghalaya, Manipur, Mizoram, Nagaland), Myanmar, Nepal, and Thailand.

Specimen studied: Tura Hills, DBD22629 (ASSAM).

19.3. *Cymbidium eburneum* Lindl. in Edwards's Bot. Reg. 33: t. 67. 1847.

Note: Plant epiphytic plant of pure white flower and midlobe has a yellow blotch, growing on tree trunks in the dense primary subtropical forests above 1050m. Its flowering period was recorded from March to May. It is very rare in Nokrek as well as in the state. The scrutiny of Herbarium recorded only two sheets: One of MKV Rao from Nokrek, and the other of T.M. Hynniewta from Jaintia hills housed in the ASSAM herbarium at Botanical Survey of India, recorded its rare location in Meghalaya. Widely distributed recorded from Bhutan, China, India (Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Sikkim), Nepal, and Myanmar.

Specimen studied: Nokrek hills, MKVR51864 (ASSAM).

19.4. *Cymbidium iridioides* D.Don in Prodr. Fl. Nepal. 36. 1825. (Image 11)

Note: Epiphytic plant of flowers yellow and lip red-spotted on tree trunks, sometimes occasionally recorded as lithophytic on moss-covered rocks under dense canopy layer in the subtropical forests. Flowering starts in early October and lasts till middle December. It is rare in Nokrek, and recorded for the first time from the state, and hence a new extended distribution of the species from Meghalaya. Bhutan, India (Arunachal Pradesh, Meghalaya (Present study), Mizoram, Nagaland, Sikkim), Myanmar, Nepal, and Thailand.

Specimen studied: Nokrek Peak, VNS & BS 116710 (ASSAM).

19.5. *Cymbidium longifolium* D.Don in Prodr. Fl. Nepal. 36. 1825.

Note: Epiphytic plant of purplish-brown flower with slightly yellowish lip, growing on tree trunks in the primary

tropical and subtropical forests between the elevations range of 400–1,400 m. Flowering was recorded from October to November. Although this species is common in the state, it was rarely recorded in Nokrek, also a new record for the Garo district. Distribution of the species reported from Bhutan, China, India (Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim), Myanmar, and Nepal.

Specimen studied: Tura Hills, DBD 22694 (ASSAM).

20. *Dendrobium* Sw.

This genus is the second-largest number of species in the Orchidaceae family and comprises 1,536 species (<http://www.plantsoftheworldonline.org/>) distributed in tropical and subtropical Asia to Oceania (Liu & Chen 2011), about 102 species in India (Gogoi 2011), 47 species in Meghalaya, and 20 species in NBR.

Key to species

- 1a. Plant with fusiform to clavate stems or pseudobulbs, often angled, sometimes compressed; leaves 1– 5, thick, nearly sheath-less, more or less, clustered at apex; leaf-sheaths insignificant 2
- 1b. Plant otherwise; leaves with distinct sheaths, often covering most of the internodes 6
- 2a. Pseudobulbs 1-leaved 3
- 2b. Pseudobulbs 2–5-leaved 4
- 3a. Pseudobulbs 7–10 cm long; inflorescence in many-flowered racemes; upper surface of the lip pubescent at base and centre only 14. *D. lindleyi*
- 3b. Pseudobulbs 3–5 cm long; inflorescence 1 to 2 flowered; whole upper surface of lip pubescent 13. *D. jenkinsii*
- 4a. Leaves close together on the many-angled stem 5
- 4b. Leaves lax on few angled stems 6. *D. chrysotoxum*
- 5a. Flowers pale yellow 7. *D. densiflorum*
- 5b. Flowers pale-mauve, turning into pure white on maturity 9. *D. farmeri*
- 6a. Stems with at least some of the internodes either fleshy or swollen 7
- 6b. Stems compressed or wiry, without fleshy or swollen internodes 16
- 7a. Plant tufted, smaller 8. *D. eriiflorum*
- 7b. Plant not tufted, larger 8
- 8a. Flowers 0.7–4.5 cm across 20. *D. transparens*
- 8b. Flowers more than 4.5 cm across 9
- 9a. Sepals and petals bright yellow to copper or

- coral red 10
 9b. Sepals and petals purple or white, cream or primrose yellow 11
 10a. Operculum with warty surface
 5. *D. chrysanthum*
 10b. Operculum glabrous 16. *D. ochreatum*
 11a. Basal callus on lip splitting up in 3 keels entering about one-third into the disc 3. *D. aphyllum*
 11b. Basal callus on lip if any, fading into the disc without splitting up in keels 12
 12a. Lip distinctly longer than dorsal sepal; one-flowered inflorescence 17. *D. polyanthum*
 12b. Lip not distinctly longer than dorsal sepal. Inflorescence more than one flower 13
 13a. Flowers white, petals white; disk dark purple or yellow patch 14
 13b. Petals light pink to purple; disk otherwise
 19. *D. tortile*
 14a. Disk dark purple patches 15. *D. nobile*
 14b. Disk yellow or brown patches 15
 15a. Flowers large, single, disk yellow patch
 11. *D. formosum*
 15b. Flowers small, arise in the bunch, disk brown patch 10. *D. fimbriatum*
 16a. Leaves laterally compressed 17
 16b. Leaves dorsiventral 18. *D. salaccense*
 17a. Flowers axillary 2 *D. anceps*
 17b. Flowers terminal or subterminal 18
 18a. Inflorescence lateral from pseudobulb base ..
 1. *D. acinaciforme*
 18b. Inflorescence subterminal on the pseudobulb 19
 19a. Inflorescence always abaxial; flowers pale yellow; midlobe of lip orange 4. *D. calocephalum*
 19b. Inflorescence abaxial or adaxial; flowers white; the tip of lip white 12. *D. fugax*

20.1. *Dendrobium acinaciforme* Roxb. in Fl. Ind. ed. 1832, 3: 487. 1832.

Note: Epiphytic plant of pale yellow flowers with pink dots in the middle shortly clawed lip grows in the primary dense subtropical forests. The plant flowers usually in July and continues flowering till November. It is rare in the Nokrek and recorded for the first time from the Garo Hills. Widely distributed, reported from Bhutan, Cambodia, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland), Laos, Myanmar, and Thailand.

Specimen studied: Danagiri, DBD 29242 (ASSAM).

20.2. *Dendrobium anceps* Sw. in Kongl. Vetensk. Acad. Nya Handl. 21: 246. 1800. (Image 12)

Note: Epiphytic plant of yellow flower with purple or pink-lined lip generally grows on tree trunks in the primary tropical and subtropical forests between the altitude gradient ranges of 300–1,400 m. Flowering is recorded usually from January to March. It is rare in Nokrek and recorded the first time from the Garo district. Distribution of this species reported from Bhutan, India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim, Tripura), Myanmar, Thailand, and Nepal.

Specimen studied: Bansamgiri, VNS & BS 118223 (ASSAM).

20.3. *Dendrobium aphyllum* (Roxb.) C.E.C.Fisch. in J.S.Gamble, Fl. Madras 1416. 1928. *Limodorum aphyllum* Roxb. in Pl. Coromandel 1: 34. 1795. (Image 13)

Note: Epiphytic plant, flowers white to pale purple, lip base with purple lines found to be growing on trunks of *Lagerstromia parviflora*, *Schima wallichii* in the tropical and subtropical forests. It flowers in early April also recorded flowering in September. Commonly found in the state, also recorded frequently in Nokrek. Distribution reported from Bangladesh, Bhutan, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim), Laos, Nepal, Malaysia, Myanmar, Thailand, and Vietnam. (Note: Only 1 plant recorded in flowering condition, pure white flowers, from Rongrengre (312 m), and is the alba form of *Dendrobium aphyllum*.)

Specimen studied: Sisubibra, VNS & BS 116703 (ASSAM).

20.4. *Dendrobium calocephalum* (Z.H.Tsi & S.C.Chen) Schuit. & Peter B.Adams in Muelleria 29: 66. 2011. *Flickingeria calocephala* Z.H.Tsi & S.C.Chen in Acta Phytotax. Sin. 33. 203. 1995.

Note: Epiphytic plant of creamy to pale yellow flowers without any spots growing on tree trunks in tropical and subtropical forests at 400–1,480 m elevation; rare in NBR. Flowering recorded in June. The species is endemic to Indian regions and quite common in the northeastern states of India.

Specimen studied: Sisubibra, VNS & BS 116696 (ASSAM).

20.5. *Dendrobium chrysanthum* Wall. ex Lindl. in Edwards's Bot. Reg. 15: t. 1299. 1830.

Note: Epiphytic plant of golden yellow flowers having two maroon blotches on the lip, recorded growing on tree trunks in the tropical and subtropical forests



Image 14. *Dendrobium densiflorum*.



Image 16. *Dendrobium nobile*.

between the elevation ranges of 750–1,500 m. The plant flowers in September occasionally fruits in February. It is recorded for the first time from the Garo district of Meghalaya, hence a new record for the Garo hills. Distribution of the species reported from Bhutan, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim), Laos, India, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Sisubibra, VNS & BS 116704 (ASSAM).

20.6. *Dendrobium chrysotoxum* Lindl. In Edmards's Bot. Reg. 33: t. 19. 1847.

Note: Epiphytic plant species are recorded growing on tree trunks in the tropical and subtropical forests. The species is rare in the Nokrek (Singh & Singh 2002). Wide distribution reported from Cambodia, India (Arunachal Pradesh, Meghalaya), Java, Laos, Myanmar, and Vietnam.

Specimen studied: Nokrek hills, RN De 17152 (ASSAM).



Image 15. *Dendrobium jenkinsii*.



Image 17. *Dendrolirium lasiopetalum*.

20.7. *Dendrobium densiflorum* Lindl. in N.Wallich, Pl. Asiat. Rar. 1: 34. 1830.(Image 14)

Note: Epiphytic plants of orange to yellow flowering, twigs usually recorded growing on tree trunks in the tropical and subtropical forests between the elevation ranges of 300–1,417 m. Flowering was recorded in March and continued till April. The plant is very common in all parts of the state, also the most threatened plant because of its ornamental use. Distribution widely reported from Bhutan Cambodia, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim), Java, Myanmar, Laos, Nepal, Thailand, and Vietnam.

Specimen studied: Sisubibra, VNS & BS 116701 (ASSAM).

Note: Popularly known as 'Pineapple Orchid' for its

many compact yellow flowers on drooping racemes.

20.8. *Dendrobium eriiflorum* Griff. in Ic. Pl. Asiat. 3: 316. 1851.

Note: Epiphytic plant of flower yellow with purple streaks on lip grows on tree trunks of *Quercus griffithii*, *Castanopsis indica* in the tropical and subtropical forests at 500–1,400 m. It flowers in October and continues flowering till December, fruiting also recorded occasionally till to March. The plant is rare in the state, also recorded very rare in the Nokrek. The species is recorded for the first time from Garo hills and is a new record for the Garo district. The distribution of the species reported from Bhutan, India (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Sikkim), India, Nepal, Myanmar, and Thailand.

Specimen studied: Nokrek hills, NPB 49922 (ASSAM).

20.9. *Dendrobium farmeri* Paxton in Paxton's Mag. Bot. 15: 241. 1849.

Note: Large epiphytic plant of white flowers with a yellow blotch at the centre of lip bordered by white, growing on tree trunks in the dense tropical and subtropical forests between the altitude gradients of 300–1,250 m. It flowers in April, sometimes the fruiting has been recorded in September and October. The plant is rare in the state, as well as in the Nokrek; it is recorded as new for the Garo districts. Distribution of the species reported from Bhutan, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim), Malaysia, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Nokrek hills, MMS 23530 (ASSAM).

20.10. *Dendrobium fimbriatum* Hook. in Exot. Fl. 1: t. 71. 1823.

Note: Pendant epiphytic plant with 3.5–5 cm across golden yellow flowers; growing on branches on big trees in the subtropical forests at elevations of 1,300–1,417 m. Its flowering can be seen from April to September. Wide distribution recorded from India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim), and Myanmar.

Specimen studied: Nokrek Hills, C Deori 101135 (ASSAM).

20.11. *Dendrobium formosum* Roxb. ex Lindl. in N. Wallich, Pl. Asiat. Rar. 1: 34. 1830.

Note: Epiphytic plant of big white flowers of 6.5–11.5 cm diameter with a centre lip changes from yellow to orange after opening for about a week, delicately fragrant, grows on tree trunks in the open as well as in

the dense forests of tropical and subtropical regions. Its flowering starts in October–December, fruiting in April–May. The plant is rare in Nokrek hills, recorded for the first time from Garo district. The distribution of the species is native to Indian regions, although recorded from Bhutan, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura), Malaysia, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Nokrek hills, on the way to Tura peak, DBD 29139 (ASSAM).

20.12. *Dendrobium fugax* Rchb.f. in Gard. Chron. 1257. 1871. *Flickingeria fugax* (Rchb.f.) Seidenf. in Dansk Bot. Ark. 34: 46. 1980.

Note: Epiphytic plant with creeping rhizome and white flowers recorded growing on tree trunks of subtropical forests at 500–1,400 m elevation in the study area. Its flowering can be seen between July and August. Distribution of the species recorded from India (throughout northeastern states), Myanmar, Thailand, Java, Ceylon.

Specimen studied: Nokrek Peak, VNS & BS 118587 (ASSAM)

Note: The flowers last one to two days only.

20.13. *Dendrobium jenkinsii* Wall. ex Lindl. in Edwards's Bot. Reg. 25: t. 37. 1839. (Image 15)

Note: Miniature epiphytic plant with bright sulphur yellow flowers of about 1.5 cm diameter, growing on tree trunks in tropical and subtropical forests at 200–1,000 m. It usually starts flowering in February and continues flowering till the end of May in the study area. The plant is common in the Nokrek biosphere reserve. Distribution widely reported from Bhutan, China, India (Meghalaya, Sikkim), Myanmar, Thailand. Note: A very dwarf species among *Dendrobium* group.

Specimen studied: Rongrengre (298 m), VNS & BS 116768 (ASSAM).

20.14. *Dendrobium lindleyi* Steud. in Nomencl. Bot., ed. 2, 1: 490. 1840.

Note: Epiphytic plant of bright yellow flowers of faint, honey-like fragrance on pendent racemes, grows on tree trunks in the tropical and deciduous forests. Its flowering period is between April–June. The species is rare in the Nokrek hills, reported being a native species of southern and southeastern Asia. Distribution widely from China, India (Assam, Meghalaya, Sikkim), Myanmar, and Thailand. Note: the flower colour of the species is very similar to *Dendrobium jenkinsii* Wall. ex Lindl. but differs in mostly having an inflorescence with many flowers.

Specimen studied: Northern range of Nokrek hills, UK 6942 (ASSAM).

20.15. *Dendrobium nobile* Lindl. in Gen. Sp. Orchid. Pl. 79. 1830. (Image 16)

Note: Epiphytic as well as lithophytic plant, fragrant, waxy flowers, colour variable; the base of the petals is pale pink or white, grading into a stronger amethyst-purple towards the tip; the lip is velvety with a rich maroon-purple basal part, surrounded by a pale yellowish-white portion. The species were recorded from tropical deciduous and subtropical forests at 750–1,500 m at the foothills of Nokrek and surrounding areas. The flowering of this plant species could be seen continuing throughout the year. This plant species is rare in Nokrek (Singh & Singh 2002), and after repeated search in wild; the species could not be the location in the study area. Distribution of the species recorded from Bhutan, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim), Nepal, Myanmar, Nepal, Laos, Thailand, and Vietnam.

Specimen studied: Rongrengre, DBD 29127 (ASSAM).

20.16. *Dendrobium ochreatum* Wall. ex Lindl. in Edwards's Bot. Reg. 21: t. 1756. 1835.

Note: Epiphytic plant of flowers bright golden yellow, the lip has a dark red spot in the throat, long-lasting and fragrant, grows on tree trunks at high elevations above 1,000 m in the tropical and subtropical area. It flowers in April and May. The species is rare in Nokrek and collected after 50 years from the state of Meghalaya. The species is a native of northeastern India, also recorded from Myanmar, Thailand, and Vietnam.

Specimen studied: Daribokgre, VNS & BS 116702 (ASSAM).

20.17. *Dendrobium polyanthum* Wall. ex Lindl. in Gen. Sp. Orchid. Pl. 81. 1830. *Dendrobium cretaceum* Lindl. in Edwards's Bot. Reg. 33: t. 62. 1847.

Note: Pendulous epiphytic plant, white flowers with ciliate margin, grows on tree trunks in the subtropical forests between the elevations of 1,200–1,400 m. The flowering of the species was recorded in May and continued flowering till July. The plant is rare in the state, recorded for the first time from the Garo district of Meghalaya. India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, and Sikkim), Myanmar, and Thailand.

Specimen studied: Near Daribokgre (1,050 m), VNS & BS 114818B (ASSAM).

20.18. *Dendrobium salaccense* (Blume) Lindl. in Gen. Sp. Orchid. Pl. 86. 1830. *Grastidium salaccense* Blume in Bijdr. Fl. Ned. Ind. 333. 1825.

Note: Epiphytic plant of golden yellow flowers with lip purple, usually growing in shady places on tree trunks in the tropical and subtropical forests at 300–1,400 m. The plant flowers in March occasionally fruits in September. The distribution of the species reported from Bhutan, China, India (Assam, Arunachal Pradesh, Meghalaya, Mizoram, Sikkim, Tripura), and Nepal.

Specimen studied: Patalgiri to Todi river (596 m), VNS & BS 116834 (ASSAM); other localities includes Nabokgre, VNS & BS 118271 (ASSAM); Tura top, GP 225247 (ASSAM).

20.19. *Dendrobium tortile* A.Cunn. in Gard. Chron. 797. 1847.

Note: Epiphytic plant of flowers pink to mauve, scented, lips usually white with a delicate lining of the basic flower, petals and sepal twisted, recorded growing on moss-covered tree trunks in tropical forests. It flowers in May. The species are rare in the Nokrek biosphere reserve (Deori et al. 2009). Distribution mainly recorded from Bangladesh, India (Andaman Islands, Meghalaya), Malaysia, Myanmar, Thailand, Laos, and Vietnam. [The *D. tortile* reported as extinct because of its collection from Andamans in 1890 (Balakrishnana 1976), and no more collection after that, but reported by Deori (2009) after a gap of century from the Nokrek hills in Meghalaya. The growth of the species is similar to *D. nobile*, but differs in having petals and sepals twisted].

Specimen studied: Western range of Nokrek hills, Deori 116269 (ASSAM).

20.20. *Dendrobium transparens* Wall. ex Lindl. in Gen. Sp. Orchid. Pl. 79. 1830.

Note: Epiphytic plant species having white flowers tinged purplish-rose towards the tip, two to three in number, fragrant, recorded on tree trunks in tropical and subtropical forests at 600–1,300 m. It flowers in April–June, and the fruiting period is July–August. The species is rare in Nokrek as well as in Meghalaya and recorded for the first time from Garo district. Distribution widely recorded from Bhutan, Bangladesh, India (Arunachal Pradesh, Assam, Manipur, Mizoram, Meghalaya, Nagaland, Sikkim), Myanmar, and Nepal.

Specimen studied: Beyond Sisubibra, VNS & BS 116706 (ASSAM).

21. *Dendrolirium* Blume

The genus is represented by 12 species (<http://www.>

plantsoftheworldonline.org/) distributed from southern China to tropical Asia and three species in NBR.

Key to species

- 1a. Epiphytic plants with creeping rhizomes 1. *D. ferrugineum*
- 1b. Epiphytic or lithophytic plants without creeping rhizomes 2
- 2a. Flowering twigs including pedicels, sepals and ovary densely tomentose 2. *D. lasiopetalum*
- 2b. Flowering twigs not densely tomentose, flowers bright orange 3. *D. ornatum*

21.1. *Dendrobium ferrugineum* (Lindl.) A.N.Rao in Bull. Arunachal Forest Res. 26: 103. 2010. *Eria ferruginea* Lindl. in Edwards's Bot. Reg. 25: t. 35. 1839.

Note: Epiphytic plant with creeping rhizome and pale white flower with a pink lip, grows on tree trunks in tropical and subtropical forests at 700–1,200 m. The flowering of the plant has been recorded in May–June. The species is rare in Nokrek as well as in Meghalaya state. Distribution of the species recorded from Bhutan, India (Assam, Arunachal Pradesh, Meghalaya), Myanmar.

Specimen studied: Sabogre, VNS & BS 118275 (ASSAM).

21.2. *Dendrolirium lasiopetalum* (Willd.) S.C.Chen & J.J.Wood. in Fl. China 25: 351. 2009. *Eria lasiopetala* (Willd.) Ormerod. in Opera Bot. 124: 22. 1995. *Aerides lasiopetala* Willd. in Sp. Pl., ed. 4, 4: 130. 1805. (Image 17)

Note: Epiphytic, occasionally, lithophytic species of plant found to be having white to yellow cottony hairy flowering twigs. The plant recorded growing on tree trunks along the riverside and moss-laden rocks in subtropical forests. The flowering period is between April and May, however fruiting recorded in August. This species is rare in the study area, common in the state of Meghalaya. Distribution widely recorded from Bhutan, Cambodia, China, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim), Laos, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Rongrengiri, VNS & BS 118280 (ASSAM).

21.3. *Dendrolirium ornatum* Blume in Bijdr. Fl. Ned. Ind. 345. 1825. *Eria ornata* (Blume) Lindl. in Gen. Sp. Orchid. Pl. 66. 1830.

Note: Epiphytic plant of bright orange flowers grows on tree trunks in shady places as well as in open areas of subtropical forests. It flowers in March–April. The species is rare in Nokrek hills, and its wide distribution is

recorded from Borneo, India (Assam, Meghalaya, Sikkim), Malaysia, Sumatra, and Thailand.

Specimen studied: Way to Nabogre, VNS & BS 118277 (ASSAM).

22. *Dienia* Lindl.

The genus comprises six species (<http://www.plantsoftheworldonline.org/>) distributed in tropical and subtropical belts of southeastern Asian countries, one species in Meghalaya, and one species in NBR.

22.1. *Dienia ophrydis* (J.Köenig) Seidenf. & Ormerod in Contr. Orchid Fl. Thailand 13: 18. 1997. *Epidendrum ophrydis* J.Köenig in A.J.Retzius, Observ. Bot. 6: 46. 1791.

Note: Usually terrestrial plants of purplish-red to greenish-yellow flowers growing in moist places along streamsides, sometimes epiphytic on tree trunks. Its flowering period is between June–August and fruiting in September–December. The species is recorded rarely in Nokrek hills, although common in the state of Meghalaya, but recorded for the first time from the Garo district. The wide distribution of this plant species is recorded from Australia, Bhutan, Cambodia, China, India (Meghalaya, Mizoram), Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, and Vietnam.

Note: The species can be easily identified based on unique flowers, which are always facing downwards, tepals curving inwards and lip with a typically large and deep lamina cavity.

Specimen studied: Way to Tura Peak, MKVR 63974 (ASSAM).

23. *Diplomeris* D.Don

The genus comprises of three species (<http://www.plantsoftheworldonline.org/>) distributed in southeastern Asian countries; one species from Meghalaya, and one species in NBR.

23.1. *Diplomeris pulchella* D.Don in Prodr. Fl. Nepal. 26. 1825.

Note: Terrestrial plant species were recorded growing in the primary forest in shaded humus-covered soil between the elevations of 200–800 m in the study area. Flowering was recorded between August and November. Distribution widely recorded from India (Arunachal Pradesh, Meghalaya), Nepal, Myanmar.

Specimen studied: Tura forest, RND 17145 (ASSAM).

24. *Eria* Lindl.

The genus is represented by 51 species (<http://www.plantsoftheworldonline.org/>)

plantsoftheworldonline.org/) distributed in tropical to the alpine climate in the world and one species in NBR.

24.1. *Eria javanica* (Sw.) Blume in Rumphia 2: 23. 1836. *Dendrobium javanicum* Sw. in Neues J. Bot. 1(1): 96. 1805.

Note: Lithophytic as well as epiphytic plants of fragrant white flowers growing on tree trunks in shady places as well as in open areas at 300–1,200 m. The flowering of the plant has been recorded in September–October. The species is rare in the Nokrek biosphere reserve. Distribution widely recorded from Bhutan, China, India (Assam, Meghalaya, Sikkim), Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, and Thailand.

Specimen studied: NBR, near Rongrengiri (265 m), VNS & BS 118222 (ASSAM).

25. *Eriodes* Rolfe

The genus is represented by one species (<http://www.theplantlist.org/>) distributed and endemic to Southern and southeastern Asia, one species from Meghalaya, and one species in NBR.

25.1. *Eriodes barbata* (Lindl.) Rolfe in Orchid Rev. 23: 326. 1915. *Tainia barbata* Lindl. in Gard. Chron. 68. 1857.

Note: Terrestrial plant of fragrant yellow flowers with red stripes grows along with grasses in tropical as well as in the subtropical forests at 600–1,200 m elevation in the study area. Distribution of the species recorded from China, India (Meghalaya, Mizoram), Myanmar, Thailand, and Vietnam.

Specimen studied: Nokrek hills, VNS & BS 114654 (ASSAM).

26. *Eulophia* R.Br. ex Lindl.

The genus is represented by 207 species (<http://www.theplantlist.org/>) distributed in tropical and subtropical regions of Asia and Africa (Srivastava 2004), 22 species reported from India (Bhattacharjee 1984), five species from Meghalaya.

26.1. *Eulophia graminea* Lindl. in Gen. Sp. Orchid. Pl. 182. 1833.

Note: Terrestrial plant of greenish flowers and veins dark green, white lips with purplish-red lamellae, growing in grassy places in open areas in the subtropical forests at 900–1,400 m. Flowering starts in April and continues till May, and the fruiting period is between May and June. Distribution of the species recorded from Bhutan, China, India (Assam, Arunachal Pradesh, Meghalaya), Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Singapore, Sri

Lanka, Thailand, and Vietnam.

Specimen studied: Nokrek hills, SDS 53021 (ASSAM).

27. *Gastrochilus* D. Don

The genus is represented by 64 species (<http://www.plantsoftheworldonline.org/>) distributed in the World, 12 species in India (Gogoi et al. 2009), nine species in Meghalaya (Kataki 1986), and two species in NBR.

Key to species

- 1a. The upper surface of epichile papillose; sepals and petals yellow with reddish-brown blotches 1. *G. calceolaris*
- 1b. The upper surface of epichile glabrous; sepals and petals light yellow with purplish-brown blotches a purple line around the sac 2. *G. obliquus*

27.1. *Gastrochilus calceolaris* (Buch.-Ham ex Sm.) D. Don in Prodr. Fl. Nepal. 32. 1825. *Aerides calceolaris* Buch.-Ham. ex Sm. in A. Rees, Cycl. 39(1): No. 11. 1818.

Note: Epiphytic plant of pale green flowers having large reddish-brown spots grows on tree trunks in dense forests of tropical and subtropical regions between the elevations of 350–1,000 m. This species of the plant usually flowers in March and continues to have flowers till the end of April. The status in the study area is occasional and the distribution of the species reported from Bhutan, China, India (Arunachal Pradesh, Meghalaya, Sikkim), Nepal, Myanmar, and Thailand.

Specimen studied: Patalgiri, VNS & BS118273A (ASSAM).

27.2. *Gastrochilus obliquus* (Lindl.) Kuntze in Revis. Gen. Pl. 2:661. 1891. *Saccolabium obliquum* Lindl. in Gen. Sp. Orchid. Pl. 223. 1833.

Key to Varieties

- 1a. Sepals and petals densely spotted with bright red 2a. var. *suavis*
- 1b. Sepals and petals with brownish-purple dots 2b. var. *obliquus*

27.2a. *Gastrochilus obliquus* var. *obliquus* in Wu & Hong. Fl. China 25: 1–570. 2009. (Image 18).

Note: A pendent epiphytic plant having a yellow flower with brownish-purple spots, and lip white with a patch of yellow with brown spots at the apex and column pink, grows in the tropical region of the study area. It flowers from October to December. Distribution recorded from northeastern India.

27.2b. *Gastrochilus obliquus* var. *suavis* (Seidenf.) Z.H.Tsi. in Guihaia 16: 141. 1996. *Gastrochilus suavis* Seidenf. in Opera Bot. 95. 298. 1988.



Image 18. *Gastrochilus obliquus* var *obliquus*.



Image 19. *Goodyera procera*.

Note: A pendent epiphytic plant having white flowers spotted with reddish-purple, pale yellow on the outer side, and lip white with a purple edge, and column purple, grows in both the tropical and subtropical region of the study area. It flowers October–December. The plant is rare in the study area and recorded only from the Sabogre region having a small population. Distribution recorded from northeastern India.

28. *Geodorum* Jackson

The genus comprises 12 species (<http://www.theplantlist.org>) distributed in tropical and subtropical environment (Gogoi et al. 2012), one species from Meghalaya, and one species in NBR.

28.1. *Geodorum densiflorum* (Lam.) Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4. 259. 1919. *Limodorum densiflorum* Lam. in Encycl. 3. 516. 1792.

Note: Terrestrial plant species enclosed by scarious sheaths having a white flower with yellow and purple marking, grows in dense as well as in open places of forest margins in tropical and subtropical forests at 450–1,100 m elevations. The flowering of the plant can be seen from

April to May, however, fruiting can be seen from June to July. The species is widely distributed in Bhutan, China, India (Arunachal Pradesh, Meghalaya, Sikkim), Java, India, Myanmar, Nepal, and Thailand.

Specimen studied: Nokrek core forest, GK Deka 20423 (ASSAM).

29. *Goodyera* R.Br.

The genus comprises 99 species (<http://www.theplantlist.org>) widely distributed in the tropical and subtropical environment across the world, six species from Meghalaya, and one species in NBR.

29.1. *Goodyera procera* (Ker Gawl.) Hook. in Exot. Fl. 1: t. 39. 1823. *Neottia procera* Ker Gawl. in Bot. Reg. 8. t. 639. 1822. (Image 19).

Note: Terrestrial plants with white flowers recorded growing along the forest borders in shaded moist soil especially near streams and rivers at 800–1,200 m elevation in the study area. Flowering can be seen in August, fruiting starts in September, and continues till the end of November. Distribution reported from Bhutan,

China, India (Arunachal Pradesh, Meghalaya, Sikkim, Assam, Nagaland, Mizoram, Tripura), India, Myanmar, Nepal, and Thailand.

Specimen studied: Nabokgre forest, VNS & BS 118276 (ASSAM); other localities includes Mandalgiri, BS, VNS & BKS 118544 (ASSAM); Nokrek Reserve, GK Deka 10115 (ASSAM).

30. *Habenaria* Willd.

The genus is comprised of 844 species (<http://www.theplantlist.org>) in the world, eight species from Meghalaya (Kataki 1986), and three species in NBR.

Key to species

- 1a. Lateral lobes of lip broad, rhombic or suborbicular, apical; margin serrate 1 *H. dentata*
- 1b. Lateral lobes of lip narrow, not as above; margin never serrate 2
- 2a. Leaves 2–5, crowded above the base of stem, bright-green, conspicuously pale yellow margins ..
..... 3. *H. marginata*
- 2b. Leaves 2 or 3, pale-green, not pale yellow at the margin 2. *H. khasiana*

30.1. *Habenaria dentata* (Sw.) Schltr. in *Repert. Spec. Nov. Regni Veg. Beih.* 4. 125. 1919. *Orchis dentata* Sw. in Kongl. Vetensk. Acad. Nya Handl. 21. 207. 1800.

Note: Terrestrial plant of three leaves with white flowers having green veins; plant populations grows along the forest borders in shaded moist soil especially near streams and rivers at 800–1,200 m elevation. It flowers in September and bears fruit till October. Distribution reported from Bhutan, India (Arunachal Pradesh, Meghalaya, Sikkim, Assam, Nagaland, Mizoram, Tripura), Nepal, Bhutan, Myanmar, and Thailand.

Specimen studied: Nokrek Peak, MKVR 63928 (ASSAM).

30.2. *Habenaria khasiana* Hook.f. in *Brit. India.* 6. 151. 1890.

Note: Terrestrial plants with yellow flowers growing along the forest borders in shaded moist soil especially near streams and rivers at 1,000–1,400 m elevations. Flowering was recorded from July till August. It is rare in Nokrek, and distribution is widely reported from India (Meghalaya, Manipur, Mizoram) and Thailand.

Specimen studied: Way to Balphakram, MKV Rao 64082 (ASSAM); other locality include Tura forests, Balakrishnan 42761 (ASSAM).

30.3. *Habenaria marginata* Colebr. in W.J. Hooker, *Exot. Fl. t.* 136. 1824.

Note: Terrestrial plants with yellow flowers growing along the forest borders in shaded moist soil especially near streams and rivers at 800–1,100 m elevations. It flowers between October and December. Distribution of the species recorded from India (throughout northeastern states), Bhutan, China, Myanmar, Nepal, and Thailand.

Specimen studied: Way to Baghmara from Tura, DB Deb 29138 (ASSAM).

31. *Herminium* R.Br.

The genus is comprised of 22 species (<http://www.theplantlist.org>) distributed in Europe and Asia, five species in Indian Himalaya, one species in Meghalaya, and one species in NBR.

31.1. *Herminium lanceum* (Thunb. ex Sw.) Vuijk in *Blumea* 11. 228. 1961. *Ophrys lancea* Thunb. ex Sw. in Kongl. Vetensk. Acad. Nya Handl. 21. 223. 1800.

Note: Terrestrial erect plant with pale green flowers grows along with the grasses in slopes at 900–1,450 m elevation in the study area. The plant starts flowering in June till August, and fruits start in August till November. The distribution has been reported from China, India (Arunachal Pradesh, Meghalaya, Sikkim, Assam, Nagaland, Mizoram, Tripura), Myanmar, Nepal, and Thailand.

Specimen studied: Nokrek hills, MKV Rao 63928A (ASSAM).

32. *Herpysma* Lindl.

The genus is represented by 1 species (<http://www.theplantlist.org>) endemic to Asia, one species from Meghalaya, and one species in NBR.

32.1. *Herpysma longicaulis* Lindl. in *Gen. Sp. Orchid. Pl.* 506. 1840.

Note: Terrestrial plant of white flowers tinged with orangish-red to pink grows along with the grasses in slopes at 900–1,450 m elevation. Flowering can be seen in April, however, fruiting can be recorded from September to November. It is rare in the biosphere reserve. Widely distributed in China, India (Meghalaya, Sikkim), Myanmar, and Thailand.

Specimen studied: Niengamandalgiri, VNS & BS 116896A (ASSAM).

33. *Liparis* L.C. Rich.

The genus comprises about 431 species (<http://www.theplantlist.org>) widely distributed in the tropical,

subtropical and temperate environment across the World; 260 species in tropical Asia (Singh 2015); 45 species in India (Gogoi et al. 2012); 17 species in Meghalaya (Kataki 1986), and seven species in NBR.

Key to species

- 1a. Leaves of the plant coriaceous and conduplicate; rachis not flattened 1
- 1b. Leaves otherwise; laterally flattened spike-like rachis, subtended by distichously arranged and basally imbricate bracts 4
- 2a. Plant with 1 leaf 2. *L. cespitosa*
- 2b. Plant with 2 or more leaves 2
- 3a. Plant tiny, pseudobulbs 1–1.5 cm 3. *L. delicatula*
- 3b. Plant with pseudobulbs more than 1.5 cm long 5. *L. nervosa*
- 4a. Plant with densely tufted tiny pseudobulbs; inflorescence laxly few flowered 4. *L. luteola*
- 4b. Plant with long pseudobulbs; inflorescence densely many flowered 5
- 5a. Lip broader than long; scape broadly winged 6. *L. stricklandia*
- 5b. Lip longer than broad; scape not winged 6
- 6a. Plant with 1 leaf 1. *L. bootanensis*
- 6b. Plant with 2 or more leaves 7. *L. viridiflora*

33.1. *Liparis bootanensis* Griff. In Not. Pl. Asiat. 3. 278. 1851.

Note: An epiphytic species grows on tree trunks in tropical and subtropical forests at 450–1,400 m elevation in shady areas. Flowering and fruiting can be seen between July and November. This plant species is rare in the study area. The distribution of the species is widely reported from Bhutan, China, India (throughout the regions), Nepal, Myanmar, Thailand, and India.

Specimen studied: Way to Baghmara, MKV Rao 53394 (ASSAM).

33.2. *Liparis cespitosa* (Lam.) Lindl. Bot. Reg. 11. t. 882. 1825. *Epidendrum caespitosum* Lam. in Encyl. 1. 187. 1783.

Note: Small epiphytic plant one-leaved with yellow flowers, grows on tree trunks in tropical and subtropical forests at 300–1,000 m elevation in the study area. Flowering has been recorded in August. Its occurrence in Nokrek is rare, however, the distribution of the species is reported from Bhutan, China, India (throughout the regions), Nepal, and India.

Specimen studied: Way to Sasatgiri, MKV Rao 53322A (ASSAM).

33.3. *Liparis delicatula* Hook.f. in Fl. Brit. India. 5. 705. 1890.

Note: Plant epiphytic with two leaves and greenish-white flowers grows on tree trunks in tropical and subtropical forests at 700–1,200 m. It flowers in August till the end of September. The plant is rare in the Nokrek hills. Distribution of the species is reported from Bhutan, China, India (Arunachal Pradesh, Meghalaya, Sikkim), and Nepal.

Specimen studied: Way to Sasatgiri, MKV Rao 53329 (ASSAM).

33.4. *Liparis luteola* Lindl. in Gen. Sp. Orchid. Pl. 32. 1830.

Note: Plant epiphytic with white flowers having ochre yellow. This species grows on tree trunks in tropical and subtropical forests at 700–1,200 m elevations. Flowering was recorded in September, and fruiting was seen between October and November. The plant is rare in the Nokrek range. Wide distribution reported from India (Arunachal Pradesh, Assam, Meghalaya, Sikkim), Myanmar, and Thailand.

Specimen studied: Nabokgre area, VNS & BS 118272; other locality include Simsangre to 15 km inside biosphere, VNS & BS 116790 (ASSAM).

33.5. *Liparis nervosa* (Thunb.) Lindl. in Gen. Sp. Orchid. Pl. 26. 1830. *Ophrys nervosa* Thunb. in J.A. Murray, Syst. Veg. ed. 14. 814. 1784.

Note: Terrestrial as well as epiphytic plant with purple flowers usually growing on tree trunks as well as in moist places on tree trunks in tropical and subtropical forests at 300–1,000 m. Its flowering was recorded in June–July. The population of this species is very low in Nokrek hills. Wide distribution of the species is reported from Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, and Sikkim), Malaysia, and Thailand. Collected voucher: Way to Baghmara, MKVR 53324.

33.6. *Liparis stricklandiana* Rchb.f. in Gard. Chron. n.s., 13. 232. 1880.

Note: Epiphytic plant of two leaves and ovoid clustered pseudobulbs. The plant bears yellowish flowers in September and can flower till December. This species grows on tree trunks in tropical and subtropical forests at 200–1,100 m and its occurrence in Nokrek hills is rare. Distribution of this species reported from Bhutan, China, and India (Assam, Meghalaya, Arunachal Pradesh).

Specimen studied: Way to Chandigre, VNS & BS114798 (ASSAM).

33.7. *Liparis viridiflora* (Blume) Lindl. in Gen Sp. Orchid. Pl. 31. 1830. *Malaxis viridiflora* Blume in Bijdr. Fl. Ned. Ind. 392. 1825.

Note: Epiphytic or lithophytic plant, greenish yellow flowers recorded growing in tropical and subtropical forests at 400–1,200 m. It usually flowers from September till November and is very common in NBR. Wide distribution reported from Bhutan, China, India (throughout northeastern states), Java, Sri Lanka, and Vietnam.

Specimen studied: Niengmandalgiri, VNS & BS118211 (ASSAM); other localities include Patalgiri, VNS & BS118274 (ASSAM); along Simsanggi, VNS & BS 114647 (ASSAM).

34. *Luisia* Gaud.

The genus is represented by 40 species (<http://www.theplantlist.org>) widely distributed in Asia and Australia, 16 species in India (Gogoi et al. 2012), five species in Meghalaya (Kataki 1986), and one species in NBR.

34.1. *Luisia tristis* (G.Forst.) Hook.f. in Fl. Brit. India, 6. 25. 1890. *Epidendrum triste* G.Forst. in Fl. Ins. Austr. 60. 1786.

Note: Epiphytic plant with yellowish-brown tinge and petals deeply purple growing on tree trunks in tropical and subtropical forests at 250–1,400 m elevation in the study area. The plant flowers from April to the end of June and the population is scarce in the Nokrek biosphere reserve. Wide distribution of the species recorded from Bangladesh, India (Arunachal Pradesh, Meghalaya, Sikkim, West Bengal), Malaysia, Sri Lanka, and Vietnam.

Specimen studied: Way to Sabokgre, VNS & BS 118278 (ASSAM).

35. *Micropera* Lindl.

The genus comprises of 21 species (<http://www.theplantlist.org>) widely distributed in tropical and subtropical environment across the world (Luckson 2007), five species in India (Kataki 1986), three species in Meghalaya, and three species in NBR.

Key to species

- 1a. Inflorescence peduncle very short, flowers pale pink 2
- 1b. Inflorescence peduncle not very short, flowers brightly pink 3. *M. rostrata*
- 2a. Stem pendent; flowers less than 1 cm across ..
..... 1. *M. mannii*
- 2b. Stems erect; flowers more than 1 cm across
..... 2. *M. obtusa*

35.1. *Micropera mannii* (Hook.f.) T.Tang & Wang in Acta Phytotax. Sin. 1. 94. 1951. *Sarochilus mannii* Hook.f. in Fl. Brit. India 6: 36. 1890.

Note: Epiphytic plant clothed with sheaths of fallen leaves and inflorescence with pale purple to white flowers grows on tree trunks in tropical and subtropical forests at 350–1,450 m elevation in the study area. Flowering occurs in June–July and the plant is rare in Nokrek and Tura hills. Distribution reported from Bhutan, India (Assam, Meghalaya, Sikkim), and Thailand.

Specimen studied: Ningmandalgre to Simsangre, VNS & BS116887 (ASSAM).

35.2. *Micropera obtusa* (Lindl.) T.Tang & Wang in Acta Phytotax. Sin. 1. 94. 1951. *Camarotis obtusa* Lindl. in Edward's Bot. Reg. 30 (Misc.). 73. 1844.

Note: Epiphytic creeping plant of pale purple to white flowers, found on trunks of trees in tropical and subtropical forests at 500–1,200 m elevation in the study area. Its flowering starts in June and ends in August. The population study revealed its occurrence is rare in the NBR. The wide distribution of the species is recorded from China, India (Arunachal Pradesh, Sikkim and Meghalaya), Myanmar, and Thailand.

Specimen studied: Nokrek range, MKVR 64112 (ASSAM).

35.3. *Micropera rostrata* (Roxb.) N.P.Balakr. in J. Bombay Nat. Hist. Soc. 67. 66. 1970. *Aerides rostrata* Roxb. in Fl. Ind. ed. 1832, 3. 474. 1832.

Note: A plant epiphytic with pale purple or pink flowers grows on tree trunks in tropical and subtropical forests at 500–1,400 m elevation in the study area. This species flowers between May and June. The species is distributed occasionally in the Nokrek hills, however, wide distribution of the plant population is reported from China, India (Arunachal Pradesh, Meghalaya, Sikkim), and Thailand.

Specimen studied: Niengmandalgiri, VNS & BS 116887 (ASSAM).

36. *Mycaranthes* Blume

The genus is represented by 36 species (<http://www.plantsoftheworldonline.org/>) distributed from southcentral China to tropical Asia and one species in NBR.

36.1. *Mycaranthes floribunda* (D.Don) S.C.Chen & J.J.Wood in Fl. China 25: 348. 2009. *Dendrobium floribundum* D.Don in Prodr. Fl. Nepal. 34. 1825. *Eria paniculata* Lindl. in N.Wall., Pl. Asiat. Rar. 1: 32. 1830.

Note: Epiphytic as well as lithophytic plant recorded to have pale yellowish-green flowers with brownish-purple blotches on column and lip callus white. The plant recorded growing on tree trunks in shady places of tropical and subtropical forests at 750–1,250 m elevation in the study area. It flowers between June and July. It is rare in the NBR and reported as new for the Garo Mountains of Meghalaya. Distribution widely recorded from Bhutan, India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim), Cambodia, Laos, Myanmar, Nepal, and Thailand.

Specimen studied: Daribokgre, VNS & BS 114814 (ASSAM).

37. *Neogyna* Rchb.f.

The genus is represented by one species (<http://www.theplantlist.org>) endemic to Asia, one species from Meghalaya, and one species in NBR.

37.1. *Neogyna gardneriana* (Lindl.) Rchb.f. in *Bot. Zeitung (Berlin)* 10. 931. 1852. *Coelogyne gardneria* Lindl. N.Wallich, Pl. Asiat. Rar. 1. 33. 1830. (Image 20).

Note: Epiphytic plant of two leaves and yellow keeled white flowers usually grows on tree trunks in tropical and subtropical forests between the elevations of 500–1,400 m in the study area. It flowers between June and September. The population status is rare and endangered in the Nokrek hills. Wide distribution of the species reported from China, India (Arunachal Pradesh, Assam, Meghalaya, Sikkim), and Thailand.

Specimen studied: Nokrek hills, RN De s. n. (ASSAM).

38. *Oberonia* Lindl.

This genus is represented by 298 species (<http://www.plantsoftheworldonline.org>) widely distributed in tropical Asia and Australia (Bose et al. 1999), 50 species in India (Gogoi et al. 2012), 15 species in Meghalaya, and two species in NBR.

Key to species

- 1a. Lips distinctly 3-lobed 1. *O. acaulis*
- 1b. Lips 2-lobed 2. *rufilabris*

38.1. *Oberonia acaulis* Griff. Not. Pl. Asiat. 3. 275. 1851. (Image 21)

Note: Plant epiphyte of yellowish flowers rusty brown at the centre, grows on moss-laden tree trunks in tropical and subtropical forests at 600–1,200 m elevation in the study area. The flowering of the plant can be seen in July to August. It is rare in the Nokrek hills. Distribution of the species recorded from Cambodia, China, India (Arunachal Pradesh, Assam, Meghalaya, Sikkim), and Vietnam.

Specimen studied: Tura peak, MKV Rao 22530 (ASSAM).

38.2. *Oberonia rufilabris* Lindl. in *Sert. Orchid.* t. 8.A. 1838.

Note: Epiphytic plant of reddish-brown flowers found on huge tall trees in shady places in tropical and subtropical forests at 700–1,200 m elevation in the study area. The plant flowers in September and October. It is rare in the Nokrek hills. Distribution of this species reported from Cambodia, China, India (Sikkim, Meghalaya), Nepal, Thailand, and Vietnam.

Specimen studied: Tura hilltop, G Panigrahi 22537 (ASSAM).

39. *Odontochilus* Blume

The genus is represented by 56 species (<http://www.plantsoftheworldonline.org>) widely distributed in southern and southeastern Asia, seven species in India (Misra 2007), one species in Meghalaya, and one species in NBR.

39.1. *Odontochilus lanceolatus* (Lindl.) Blume in *Coll. Orchid.* 80. 1859. *Anoectochilus lanceolatus* Lindl. in *Gen. Sp. Orchid.* Pl. 499. 1840.

Note: Terrestrial plant of flowers pale green tinged with brown and lip yellow, recorded growing in the primary forests in shaded humus soil, often on rotting wood between 1000 and 1400m elevations in the study area. Distribution recorded from India (Arunachal Pradesh, Assam, Sikkim, Meghalaya, Nagaland, Manipur, Mizoram, Sikkim) and Thailand.

Specimen studied: Nokrek hills, RN De 17142 (ASSAM).

40. *Otochilus* Lindl.

This genus is represented by five species (<http://www.theplantlist.org>) widely distributed throughout the world, four species in Meghalaya (Kataki 1986), and one species in NBR.

40.1. *Otochilus albus* Lindl. in *Gen. Sp. Orchid.* Pl. 35. 1830.

Note: Terrestrial plants with white flowers were recorded growing in the subtropical forests along forest margins at 1,000–1,480 m elevation in the study area. The flowering of this plant species could be seen between December and February. The wide distribution of the species reported from Bhutan, China, India (Sikkim, Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram, Tripura), Nepal, Myanmar, Thailand,

and Malaysia.

Specimen studied: Nokrek hills, RN De 17193 (ASSAM).

41. *Paphiopedilum* Pfitzer

The genus commonly referred to as Lady's or Venus Slipper Orchid' comprised of 109 species (<http://www.plantsoftheworldonline.org/>) widely distributed in southern and southeastern Asia, and Philippines, nine species in India (Parveen et al. 2012), three species from Meghalaya (Kataki 1986), and three species in NBR.

Key to species

- 1a. Leaves elliptic-oblong, green with dark green mottling on the ventral; dorsal sepal broadly ovate, greenish-white; petals with black warts; staminode semilunate 3. *P. venustum*
- 1b. Leaves oblong, uniformly green; dorsal sepal orbicular, greenish-purple with blotches or dots; petals smooth, lacking wart; staminode quadrate or sub-quadrate 2
- 2a. Bracts half or more than the length of the pedicelled ovary; dorsal sepal purple blotched; petals not crisped 2. *P. insigne*
- 2b. Bracts quarter or less than the length of the pedicelled ovary; dorsal sepal purple-spotted; petals crisped 1. *P. hirsutissimum*

41.1. *Paphiopedilum hirsutissimum* (Lindl. ex Hook.) Stein in *Orchid.- Buch.* 470. 1892. *Cypripedium hirsutissimum* Lindl. ex Hook. in *Bot. Mag.* 83. t. 4990. 1857.

Note: Terrestrial plant with greenish-purple flowers growing in the tropical and subtropical forests along forest margins and the well-drained area at 750–1,400 m elevations. Flowering was recorded in April and May. The wide distribution of the species recorded from India (Sikkim, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland), Bhutan, China, Laos, Thailand, and Vietnam.

41.2. *Paphiopedilum insigne* (Wall. ex Lindl.) Pfitzer in *Jahrb. Wiss. Bot.* 19. 159. 1888. *Cypripedium insigne* Wall. ex Lindl. in *Coll. Bot.* t. 32. 1824. (Image 22)

Note: Terrestrial plant with a purplish white flowers growing in the tropical and subtropical forests along forest margins at 750–1,400 m elevation. It flowers between November and February. Wide distribution of the species recorded from India (Sikkim, Meghalaya), Bhutan, and China.

Specimen studied: Nokrek hills, RN De 17199 (ASSAM).

41.3. *Paphiopedilum venustum* (Wall. ex Sims) Pfitzer in *Jahrb. Wiss. Bot.* 19. 165. *Cypripedium venustum* Wall. ex Sims. in *Bot. Mag.* 47. t. 2129. 1820.

Note: Terrestrial plant with white flowers having maroon-black warts and yellow lip growing in primary forests, in marshy or wet streamsides in shaded places at 700–1,400 m elevations. Flowering was recorded between March and May. Wide distribution of the species recorded from India (Sikkim, Arunachal Pradesh, Meghalaya), Bhutan, China, Nepal, and Sri Lanka.

Specimen studied: Nokrek hills, RN De 17169 (ASSAM).

42. *Papilionanthe* Schltr.

The genus is represented by 10 species (<http://www.plantsoftheworldonline.org/>) widely distributed in the tropical, subtropical and temperate environments throughout the world, four species in India (Gogoi et al. 2009); three species in Meghalaya (Kataki 1986), and one species in NBR.

42.1. *Papilionanthe teres* (Roxb.) Schltr. in *Orchis* 9. 78. 1915. *Dendrobium teres* Roxb. in *Fl. Ind.* ed. 1832. 3. 485. (Image 23)

Note: Climbing epiphytic plant with white flowers tinged with pink and yellowish to brown spur, inflorescence 2–5 flowers, grows primarily on tree trunks at 500–1,000 m elevations in tropical and subtropical forests. The flowering of this plant species is usually seen between May and June. This species found to be rare and threatened in Nokrek forests due to human ornamental needs. Wide distribution of the species recorded from India (throughout northeastern states), Bangladesh, Bhutan, Laos, Myanmar, Nepal, Thailand, and Vietnam.

43. *Peristylus* Benth. & Hook.f.

The genus comprises 103 species (<http://www.plantsoftheworldonline.org/>) widely distributed in Indo-Malesian regions (Goaverts 2008), 29 species in India (Tiwari et al. 2009), seven species from Meghalaya, and two species in NBR.

Key to species

- 1a. In flowering twigs, petal and lip are pure white 1. *P. constrictus*
- 1b. In flowering twigs, petals and lip are yellowish-green, or creamy white 2. *P. goodyroides*

43.1. *Peristylus constrictus* (Lindl.) Lindl. in *Gen. Sp. Orchid. Pl.* 300. 1835. *Herminium constrictum* Lindl. in *Edwards Bot. Reg.* 18. t. 1499. 1832.

Note: Terrestrial plant species with brown petals and

Image 20. *Neogyna gardneriana*.Image 21. *Oberonia acaulis*.Image 22. *Paphiopedilum insigne*.Image 23. *Papilionanthe teres*.

white flowering twigs usually found to be growing in the subtropical forest between the elevations range of 1,200–1,500 m. The flowering season starts in June and ends in August. Wide distribution of species recorded from India (Assam, Meghalaya, Arunachal Pradesh, Sikkim), Bhutan, Cambodia, China, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Tura near Chithokgre-Chandmari, MKVR 64464 (ASSAM).

43.2. *Peristylus goodyeroides* (D.Don) Lindl. in *Gen. Sp. Orchid. Pl.* 299. 1835. *Habenaria goodyroides* D.Don in *Prodr. Fl. Nepal.* 25. 1825.

Note: Terrestrial plants with brown petals and white

flowers usually growing in the subtropical forest of 1,200–1,500 m elevation. The flowering season starts in June and ends in September. Wide distribution of species recorded from India (Assam, Meghalaya, Arunachal Pradesh, Sikkim), Bhutan, Cambodia, China, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Tura Peak, DB Deb 29220 (ASSAM).

44. *Phalaenopsis* Blume

The genus comprises 75 species (<http://www.plantsoftheworldonline.org/>) in the World, one species from Meghalaya, and two species in NBR.

Key to species

- 1a. Mid-lobe of lip anchor-shaped; lateral lobes of lip producing a raised tooth along the leading edge; petals conspicuously narrower than sepals; callus triseriate; sepals and petals pale yellow with dark brown spots and bars; lip slightly saccate at base created by folding 2. *P. mannii*
- 1b. Mid-lobe of lip not anchor-shaped; lateral lobes of lip and petals not as above; callus biseriate; yellow flowers with dark maroon lip; lip not as above 1. *P. difformis*

44.1. *Phalaenopsis difformis* (Wall. ex Lindl.) Kocyan & Schuit. in *Phytotaxa* 161. 67. 2014. *Aerides difformis* Wall. ex Lindl. in *Gen. Sp. Orchid. Pl.* 242. 1833.

Note: Epiphytic plant with stem covered by leaf sheaths and yellow flowers with dark maroon lip. It grows on tree trunks in tropical and subtropical forests at 350–1,400 m elevation in the study area and rare in the Nokrek hills. The flowering of the plant occurs in June–July. Wide distribution of the species reported from China, India (Assam, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Tripura), Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Nangalbibra, MKVR 64564 (ASSAM).

44.2. *Phalaenopsis mannii* Rchb.f. in *Gard. Chron.* 1871. 902. 1871. *Phalaenopsis boxallii* Rchb.f. in *Gard. Chron.* n.s. 19. 274. 1883. *Polychilos mannii* (Rchb.f.) in *Malayan Nat. J.* 36. 24. 1982.

Note: Epiphytic plants with many-flowered habitat on tree trunks of *Quercus* and *Castanopsis* trees; flowers yellowish with dark spots, growing in subtropical environment at 950–1,500 m elevations. The flowering of this species is usually seen in April and May. The species have been recorded wild from India (Assam, Meghalaya, West Bengal), China, Bhutan, Myanmar, Nepal, and Vietnam. This species is critically endangering at a faster

rate in Nokrek BR.

Specimen studied: Darungiri RF, MKVR 61429 (ASSAM).

45. *Pholidota* Lindl. ex Hook.

The genus consists of 41 species (<http://www.plantsoftheworldonline.org/>) across the World, 10 species in India (Gogoi et al. 2009), seven species and two varieties in Meghalaya (Kataki 1986), and three species in NBR.

Key to species

- 1a. Pseudobulbs superposed; leaves linear-lanceolate; inflorescence few-flowered.. 1. *P. articulata*
- 1b. Pseudobulbs caespitose, leaves oblong-lanceolate, inflorescence long, densely flowered 2
- 2a. Mature leaves thick textured, coriaceous; floral bracts with many, dense fine veins 2. *P. imbricata*
- 2b. Mature leaves thin textured, coriaceous; floral bracts with few coarse veins 3. *P. pallida*

45.1. *Pholidota articulata* Lindl. in *Gen. Sp. Orchid. Pl.* 38. 1830. (Image 24).

Note: Epiphytic herbaceous plants with pseudobulbs, leaves usually two, and inflorescence always arise from new pseudobulb at the apex. Flowers white, slightly tinged with red, usually seen flowering in May to June and fruiting appears in December. Plants are seen growing on tree trunks of *Litsea* species in tropical and subtropical forests of Nokrek hills at 700–1,400 m. Wide distribution of this species is reported from India (Arunachal Pradesh, Assam, Meghalaya, Mizoram, Sikkim), Bhutan, Cambodia, China, Indonesia, Malaysia, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Daribokgre along Simsang river, VNS & BS 116698 (ASSAM); other localities include Rongrengiri, MKVR 59475 (ASSAM); Rongrengiri, DB Deb 29222 (ASSAM); Darugiri Tura road, MKVR 61363 (ASSAM).

45.2. *Pholidota imbricata* Lindl. in *Exot. Fl.* 2. t. 138. 1825. (Image 25)

Note: Epiphytic plants with creeping rhizomes and densely flowered inflorescence. Flowers usually white or slightly red-tinged, seen blooming in August and fruits start appearing in November. The luxuriant population of this species is found between the elevation range of 1,000–2,500 m in tropical and subtropical forests. Wide distribution of this species is reported from India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram, Tripura), Australia, Bhutan,

Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand, and Vietnam.

Specimen studied: Rongrenggiri, MKVR 59456 (ASSAM).

45.3. *Pholidota pallida* Lindl. In Edward's Bot. Reg. 21. t. 1777. 1835.

Note: Epiphytic, occasionally lithophytes herbaceous plant species having papery leaflets and white flowering twigs. This species usually grows on tree trunks of *Terminallia bellerica*, *Lithocarpus dealbatus* and *Prunus* species between the elevation ranges of 800–2,000 m in tropical and subtropical forests. Flowers appear on tree trunks in May and June. This species is endangering in Nokrek hills at a faster rate due to illicit extraction for medicinal and ornamental purposes, however, a wide distribution of this species is reported from India (throughout northeastern states), Bhutan, China, Laos, Nepal, Thailand, and Vietnam.

Specimen studied: Nienga-Mandalgiri, VNS & BS 116891 (ASSAM); other locality include Rongrenggiri, MKVR 53307.

46. *Pinalia* Lindl.

The genus is represented by 173 species (<http://www.plantsoftheworldonline.org/>) distributed in tropical and subtropical Asia to south-west Pacific and four species in NBR.

Key to species

- 1a. Pseudobulbs narrowly cylindric 2. *P. bractescens*
- 1b. Pseudobulbs ovoid, oblong or somewhat flattened or stem-like 2
- 2a. Inflorescence globose, capitate, 0.4–1 cm across 3. *P. pumila*
- 2b. Inflorescence otherwise 3
- 3a. Inflorescence dense spike; flowers white to straw coloured with a slight purple tinge 4. *P. spicata*
- 3b. Inflorescence lax spike; flowers yellowish green 1. *P. apertiflora*

46.1. *Pinalia apertiflora* (Summerh.) A.N.Rao in Bull. Arunachal Forest Res. 26: 103. 2010. *Eria apertiflora* Summerh. in Bull. Misc. Inform. Kew 9. 1929.

Note: Tufted epiphytic plant of yellowish-green flowers growing on moss-covered branches of large trees in wet mixed subtropical forests at an elevation of 1000 m. Its initial flowering starts in January and continues till August. The species is rare in Nokrek and is first recorded from the Garo district of the Meghalaya. Distribution widely recorded from Bhutan, India (Assam, Arunachal

Pradesh, Meghalaya), Myanmar, Thailand, and Vietnam.

Specimen studied: Nokrek Peak, VNS & BS 116610 (ASSAM).

Note: The species is allied to *E. bipunctata* Lindl., but can be distinguished by larger yellowish flower than that of smaller white flower.

46.2. *Pinalia bractescens* (Lindl.) Kuntze in Revis. Gen. Pl. 2: 679. 1891. *Eria bractescens* Lindl. in Edwards's Bot. Reg. 27 (Misc.): 18. 1841. (Image 26)

Note: Plant epiphytic on tree trunks as well as lithophytic of white flowers on moss-covered rocks. The phenology period of the plant is between July and August. The species is common in Nokrek hills as well as in Meghalaya. The plant is native to Java and the Indian Peninsula, also extends its distribution in India (Arunachal Pradesh, Meghalaya, Sikkim), Nepal, and Thailand.

Specimen studied: Nokrek Peak, VNS & BS 116713 (ASSAM); other locality include Rongrenggiri, GKD 35704 (ASSAM).

46.3. *Pinalia pumila* (Lindl.) Kuntze in Revis. Gen. Pl. 2: 679. 1891. *Eria pumila* Lindl. in Gen. Sp. Orchid. Pl. 68. 1830.

Note: Epiphytic plant species having minute flowers grows on tree trunks in tropical and subtropical forests at 700–1,400 m elevation in the study area. Flowering recorded in August. Distribution of the species reported from tropical India.

Specimen studied: Sabokgre, VNS & BS 118279 (ASSAM).

46.4. *Pinalia spicata* (D.Don) S.C.Chen & J.J.Wood in Fl. China 25: 354. 2009. *Octomeria spicata* D.Don in Prodr. Fl. Nepal. 31. 1825. *Eria spicata* (D.Don) Hand.-Mazz. in Symb. Sin. 7: 1353. 1936.

Note: Epiphytic plant recorded to have white to straw coloured flowers, with a slight purple tinge, grows on tree trunks in tropical and subtropical forests at 300–1,200 m elevation in the study area. Its flowering recorded between June and August. Distribution recorded from Bhutan, India (Meghalaya, Sikkim), Myanmar.

Specimen studied: Nokrek Peak, VNS & BS 116712 (ASSAM).

Note the species is similar to *Pinalia bractescens*. The major difference between the two is that the *P. bractescens* has two leaves at the apex of the pseudobulb, larger more open acute flowers with no fragrance, while, the *E. spicata* has four near the apex, sheathed leaves, and smaller, cupped flowers with fragrance.

47. *Pleione* D. Don

The genus is comprised of 24 species (<http://www.plantsoftheworldonline.org>) widely distributed in southern and southeast Asia, five species from Meghalaya (Kataki 1986), and two species in NBR.

Key to species

- 1a. Sheaths on pseudobulb warty; pseudobulb green, mottled purplish-brown; column 3.5–4.5 cm...
..... 2. *P. praecox*
1b. Sheaths on pseudobulb smooth; pseudobulb green; column 1.5–2 cm 1. *P. maculata*

47.1. *Pleione maculata* (Lindl.) Lindl. & Paxton in Paxton's Fl. Gard. 2. 5. 1851. *Coelogyne maculata* Gen. Sp. Orchid. Pl. 43. 1830.

Note: Epiphytic herbs with pyriform pseudobulbs, and inflorescence appears without leaves. Flowers are solitary, fragrant, and white with a slightly purplish lip and a yellow blotch at the center. Plant populations are found on tree trunks and mossy rocks in a subtropical environment between the elevation ranges of 1,200–1,400 m. Distribution of this species reported from India (Assam, Arunachal Pradesh, Meghalaya), Bhutan, China, Myanmar, Nepal, and Thailand.

Specimen studied: On way to Nienga-Mandalgiri, MKVR 53323 (ASSAM).

47.2. *Pleione praecox* (Sm.) D. Don in Prodr. Fl. Nepal. 37. 1825. *Epidendrum praecox* Sm. in Exot. Bot. 2. 73. 1806.

Note: Epiphytic plants with purple-brown pseudobulbs and pink flowers with a yellow callus. This species can be seen in a subtropical environment between the elevation range of 1,200–1,500 m. This plant species was located in one place only in Nokrek hill and was not collected for samples considering the conservation of species. Therefore, plant photographs were taken as a record of the occurrence of this species in Nokrek biosphere reserve. The wide distribution of this species is recorded from India (Assam, Arunachal Pradesh, Meghalaya, Sikkim), Bangladesh, Bhutan, China, Laos, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Tura range, MKVR 53339 (ASSAM).

48. *Porpax* Lindl.

The genus is represented by 53 species (<http://www.plantsoftheworldonline.org/>) distributed mainly in tropical Africa, tropical and subtropical Asia to the south-west Pacific, one species in Meghalaya, and one species in NBR.

48.1 *Porpax muscicola* (Lindl.) Schuit., Y.P. Ng & H.A. Pedersen in Bot. J. Linn. Soc. 186: 200. 2018. *Dendrobium muscicola* Lindl. in Gen. Sp. Orchid. Pl. 75. 1830. *Conchidium muscicola* (Lindl.) Rauschert in Feddes Repert. 94: 444. 1983. *Eria muscicola* (Lindl.) Lindl. in J. Proc. Linn. Soc. Bot. 3: 47. 1858.

Note: Epiphytic plant species found to be growing on trees or lithophytic on rocks in evergreen broad-leaved forests in subtropical forests. Flowering can be seen between July–August and fruiting in October. This species is again extremely rare in the study area and recorded for the first time from the Garo district of Meghalaya. The distribution of the species is widely reported from Bangladesh, Bhutan, China, India (Arunachal Pradesh, Assam, Meghalaya, Sikkim), Laos, Nepal, Myanmar, and Vietnam.

Specimen studied: On way to Balphakram near Chokpot, MKVR 53838 (ASSAM).

49. *Pteroceras* Hasselt ex Hassk.

The genus is comprised of 22 species (<http://www.plantsoftheworldonline.org>) widely distributed in tropical Asia, five species in India (Gogoi et al. 2012), one species in Meghalaya (Kataki 1986), and one species in NBR.

49.1 *Pteroceras teres* (Blume) Holttum in Kew Bull. 14. 271. 1960. *Dendrocolla teres* Blume in Bijdr. Fl. Ned. Ind. 289. 1825.

Note: Scandent epiphytic plants with light yellowish flower having several dark brown spots on petals, and also lip slightly bluish-pink with spots. This species is found flowering in June on tree trunks in tropical and subtropical forests. The altitudinal distribution of this species varies at 800–1,400 m in NBR, however, broad geographical distribution includes India (Arunachal Pradesh, Meghalaya, Sikkim), Myanmar, and Thailand. Field observation indicates the populations of this species are in the stage of critical endangerment in Nokrek due to medicinal importance and the Garos are extracting and selling in the local market as a source of income.

Specimen studied: Daribokgre along Simsang river, VNS & BS 116694 (ASSAM).

50. *Rhynchostylis* Blume

This genus is comprised of five species (<http://www.plantsoftheworldonline.org>) widely distributed in the Indo-Malayan regions to the Philippines (Bora & Kumar 2003), two species in India (Gogoi et al. 2009), one species in Meghalaya (Kataki 1986), and one species in NBR.

Image 24. *Pholidota articulata*.Image 25. *Pholidota imbricata*.Image 26. *Rhynchostylis retusa*.Image 27. *Spathoglottis pubescens*.

50.1 *Rhynchostylis retusa* (L.) Blume in Bijdr. Fl. Ned. Ind. 286. 1825. *Epidendrum retusum* L. in Sp. Pl. 953. 1753. (Image 26)

Note: Epiphytic herbs with densely flowered pendulous inflorescence growing on tree trunks. Flowers white with pink spots and purplish lip. This species prefers tropical and subtropical environments for its luxuriant

growth and mostly occurs between the elevations of 500–1,500 m throughout Nokrek forest belts. The flowering of this species is usually recorded in April and May. This species is very common in NBR and its distribution from India (throughout the region, West Bengal, Jammu & Kashmir, Himachal Pradesh, Uttarakhand), is reported from throughout Asian countries.

Specimen studied: Sisubibra, VNS & BS 116697 (ASSAM); other locality include Rongrengiri, MKV Rao 59455 (ASSAM).

51. *Satyrium* Sw.

The genus is represented by 90 species (<http://www.plantsoftheworldonline.org>) widely distributed in tropical to alpine climate across the world, four species in India, one species from Meghalaya (Kataki 1986), and one species in NBR.

51.1. *Satyrium nepalense* D.Don in Prodr. Fl. Nepal. 26. 1825.

Note: Terrestrial herbs with tubers and purplish-rose flowers were found to be growing along forest margins between the elevation ranges of 1,000–3,000 m. The flowering of the plants can be seen in September and October. This species is endemic to Asia and wide distribution of this species reported from India (Arunachal Pradesh, Meghalaya, Sikkim), Bhutan, China, Myanmar, Nepal, and Sri Lanka.

Specimen studied: Tura Peak, DB Deb 4894 (ASSAM).

52. *Schoenorchis* Blume

The genus comprises 28 species (<http://www.plantsoftheworldonline.org>) across the world, 10 species in Himalaya regions (Kataki 1986), one species in Meghalaya (Kataki 1986), and one species in NBR.

52.1. *Schoenorchis gemmata* (Lindl.) J.J.Sm. in Natuork. Tijdschr. Ned. Indie 72.100.1912. *Saccolabium gemmatum* Lindl. in Edward's Bot. Reg. 24(Misc.). 50. 1838.

Note: Pendulous epiphytic plants with conduplicate leaves and purplish-red flowers with white apices prefer to grow on moss deposited trees in tropical and subtropical environments at 100–1,500 m. Flowering can be seen between April and June. This species is rare in Nokrek hills, however, wide distribution of this plant species is reported from India (Assam, Arunachal Pradesh, Meghalaya, Sikkim, West Bengal), Bhutan, China, Cambodia, Laos, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: Daribokgre along Simsang river, VNS & BS 116693 (ASSAM).

53. *Spathoglottis* Blume

The genus is comprised of 41 species (<http://www.plantsoftheworldonline.org>) distributed in the diverse habitat of India, Philippines, southeastern Asia, New Guinea, New Caledonia, Solomon Islands, Borneo,

and Australia (Singh 2015), two species from Meghalaya, and two species in NBR.

Key to species

- 1a. Flowers purplish, drooping, 2.5–3.5 cm across ...
..... 1. *S. plicata*
- 1b. Flowers golden yellow, erect, 2–2.5 cm across ...
..... 2. *S. pubescens*

53.1. *Spathoglottis plicata* Blume in Bijdr. Fl. Ned. Ind. 401.1825.

Note: Terrestrial herbs with ovoid pseudobulbs and purplish flowers were found to be growing in grasslands and along forest margins between the elevation ranges of 800–1,800 m. The flowering of the plants can be seen in August in Nokrek hills and is very rare in occurrence. Wide distribution of this species is reported from India (Arunachal Pradesh, Meghalaya), Australia, China, Indonesia, Japan, Malaysia, Pacific Islands, New Guinea, Philippines, Sri Lanka, Thailand, and Vietnam.

Specimen studied: Daribokgre vill. On way towards Khalakgre forest area, VNS & BS s.n. (ASSAM).

53.2. *Spathoglottis pubescens* Lindl. in Gen. Sp. Orchid. Pl. 120. 1831. (Image 27)

Note: Terrestrial herbs with dorsoventrally compressed pseudobulbs and yellow flowers with violet spotted lips. Flowers of this species can be seen in August and September. This species grows on hill slopes in the subtropical forest at 1,000–1,400 m in the study area of Nokrek forests. Wide distribution reported from India (Assam, Arunachal Pradesh, Meghalaya, Sikkim), Cambodia, China, Laos, Myanmar, Thailand, and Vietnam.

Specimen studied: On way to Balphakram, MKVR s.n. (ASSAM 53320).

This genus is represented by 24 species (<http://www.theplantlist.org>) widely distributed in the tropical and subtropical regions.

54. *Thelasis* Blume

The genus is comprised of 27 species (<http://www.plantsoftheworldonline.org>) distributed in tropical Asia and islands of Pacific Ocean (Singh 2015), four species in India (Gogoi et al. 2009), four species in Meghalaya (Gogoi et al. 2012), and one species in NBR.

54.1. *Thelasis longifolia* Hook.f. in Fl. Brit. India 6.87. 1890.

Note: Small epiphytic plants having conical-shaped pseudobulb and white coloured many flowered inflorescences. Flowering in plants appears in early summer and can also be seen till November. It prefers

to grow on tree trunks in tropical and subtropical forests between the elevation range of 500–1,400 m. It is rare in Nokrek Hills. Distribution of this species is reported from India (Assam, Meghalaya, Sikkim, West Bengal) and Bhutan.

Specimen studied: Rongrengiri, DB Deb 29220 (ASSAM).

55. *Thunia* Rchb.f.

This genus is represented by five species (<http://www.plantsoftheworldonline.org>) widely distributed in southern and southeastern Asian countries, four species in India (Katak 1986), one species in Meghalaya (Katak 1986), and one species in NBR.

55.1. *Thunia alba* (Lindl.) Rchb.f. in Bot. Zeitung (Berlin) 10:764. 1852. (Image 28)

Note: Plant epiphytic as well as terrestrial having large white flowers and yellow or orange dotted leaves. Flowers appear between March and May. It grows on tree trunks of *Mangifera indica* and *Schima wallichii* in tropical and subtropical forests. This species is occasionally found in the Nokrek biosphere reserve, but its wide distribution is reported from India (Assam, Arunachal Pradesh, Meghalaya), Bhutan, China, Nepal, Indonesia, Malaysia, Myanmar, Nepal, Thailand, and Vietnam.

Specimen studied: On way to Tura Peak, MKVR 53312 (ASSAM).

56. *Vanda* W.Jones ex R.Br.

The genus is comprised of 81 species (<http://www.plantsoftheworldonline.org>) widely distributed in tropical Asia to New Guinea and Australia, 14 species in India, six species in Meghalaya, and two species in NBR.

Key to species

- 1a. Inflorescence longer than the leaves, many-flowered; flowers blue 1. *V. coerulea*
- 1b. Inflorescence shorter than leaves, few-flowered; flowers greenish-purple 2. *V. cristata*

56.1. *Vanda coerulea* Griff. ex Lindl. in Edward's Bot. Reg. 33. t. 30. 1847. (Image 29)

Note: Epiphytic plants with many-flowered inflorescences. Flowering appears from September to October and flower size ranges 6–9 cm across with sepals and petals tessellated. This plant species is growing between the elevation ranges 750–1,400 m in Nokrek hills and usually appears on trunks of tall trees in humid places of tropical and subtropical forests. The wide distribution of this species is reported from India (Assam, Meghalaya, Arunachal Pradesh), Myanmar, and Thailand.



Image 28. *Thunia alba*.



Image 29. *Vanda caerulea*.

Specimen studied: Way to Chandigiri, BS 114797 (ASSAM).

56.2. *Vanda cristata* Lindl. in Gen. Sp. Orchid. Pl. 216. 1833.

Note: Epiphytic plants with creamy yellow coloured flowers. Lip usually found with spur. Flowers appear in May–June and grow on tree trunks of moist forest places. This species is rare in the NBR, however, its wide distribution is reported from India (Assam, Meghalaya, Sikkim; Orissa), Bhutan, Nepal, and Vietnam.

Specimen studied: Tura top, G Panigrahi 22523 (ASSAM).

CONCLUSION

Nokrek Biosphere Reserves exhibit a great diversity of both epiphytic and terrestrial orchids. A total of 56 genera having 127 species of orchids recorded from the tropical, subtropical and temperate forest ecosystems of locally called 'Achik land', which represents a remnant habitat of a unique class of Garo communities. While studying and scrutiny of published literature from Meghalaya on orchids, it has been observed that several species such as *Stereochilus hirtus* Lindl., *Smitianandia micrantha* (Lindl.) Holtt., *Taeniophyllum retrospiculatum* (King & Pantl.) King & Pantl., *Tainia minor* Hook.f., *Thrixspermum musiflorum* A.S.Rao & J. Joseph, *Trichotosia pulvinata* (Lindl.) Kranzlin, *Uncifera acuminata* Lindl., and *Vandopsis undulata* (Lindl.) J.J. Smith reported in the literature could not be located from the Nokrek hills after repeated search, nor could their herbarium samples be traced in renowned herbarium of India. Most of the orchids are indigenous to Nokrek hill which is now becoming threatened due to their application in the local traditional system of herbal medicine, therefore, there is an urgent need for conservation of this unique group of plant species to safeguard their existence in nature.

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