

Orchid flora of Manas National Park, India

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(Received: August 18, 2019; Revised: September 06, 2019; Accepted: September 21, 2019)

ABSTRACT

The present study deals with the diversity of orchids occurring in Manas National Park (MNP) which includes a total of 45 species belonging to 28 genera, among which 14 species are reported as an addition to the Manas National Park.

Key words: Manas National Park; diversity; Orchid

INTRODUCTION

The Orchidaceae with about 880 genera and 25,000 species is one of the largest families of flowering plants and is cosmopolitan in distribution (Cribb *et al.*, 2003). Most of the members of the family are either rare, endangered and threaten or endemic to specific regions (Ahmedullah and Nayar, 1987). In India the family is represented by about 186 genera and 1331 and of which about 850 species are reported from Northeast India (De and Medhi, 2014). In Assam, it is represented by about 100 genera and 328 species (Barooah and Ahmed, 2014).

In spite of having many economic values in orchids, cultivation of orchids in Assam is yet to be started widely. Many of the orchids have been collected from wild for their aesthetic beauty of the flowers resulting in depletion of their population in natural habitats (Medhi *et al.*, 2012). Several studies have however been carried out on conservation of orchids in natural habitats (Nayar and Sastry, 1987, 1988, 1990; Das and Deori, 1983; Ahmedullah and Nayar, 1999).

Manas National Park (MNP) with an area of 500 sq. km, located in the foothills of Eastern Himalaya adjoining Bhutan is an UNESCO Natural World Heritage site, a Project Tiger reserve, an elephant reserve and a Biosphere Reserve in Assam. It lies in between 26.6594° N Latitude and 91.0011° E Longitude with average elevation of 85 m MSL. The combination of Sub-Himalayan Bhabar Terai formation with riverine succession leading to the Himalayan subtropical broad-leaf forests makes it one of the richest biodiversity areas in the world with a large diversity of wildlife, including many endangered, rare and endemic species of flora and fauna. In general the vegetation of MNP comprises of Semi Evergreen Forest, Moist Mixed Deciduous Forest (Dense), Moist Mixed Deciduous Forest (Open), Scrub Forest and Grassland. Jain and Hajra (1996) floristically explored for the first time and documented a total of 474 plants. Thereafter only a few fragmentary reports appeared (Dey *et al.*, 2007; Sarmah and Borthakur, 2009;

Baro and Borthakur, 2017). Although the area has a rich diversity of flora and fauna, the biodiversity is yet to be explored and documented scientifically to a great extent. The region has been witnessing continuous natural and anthropogenic disturbances leading to the degradation of natural habitats (Rabha, 2001). Considering the importance of the area from conservation point of view an assessment has been made on the orchid flora of Park area by scrutinising the previous works and by exploring the area a fresh.

MATERIALS AND METHODS

The present work was undertaken during 2016-18 as a part of the floristic exploration of the MNP. Extensive field work was carried out in different parts of the area in different seasons.

Plants were collected, made in to herbarium specimens following standard herbarium techniques (Jain and Rao, 1977) and the voucher specimens have been deposited in the Herbarium of the Office of the Director, Manas National Park at Barpeta Road, Assam. Specimens were identified with the help of relevant literature (Chowdhery, 1998, 2009; Barua, 2001; Lucksom, 2007; Barooah and Ahmed, 2014; Rao and Singh, 2015) and by consulting the herbarium specimens deposited in Herbarium of Botanical Survey of India, Shillong (ASSAM). Previous works were scrutinized to find out any record of occurrence of one or the other species from the area. Conservation statuses of the taxa were worked out with the help of relevant literature (Barooah and Ahmed, 2014) along with IUCN status of Taxa.

RESULTS AND DISCUSSION

In the present study a total of 45 species under 28 genera has been recorded and out of which 14 species viz., *Arundina graminifolia*, *Bulbophyllum crassipes*, *Calanthe odora*, *C. vaginata*, *Dendrobium anceps*, *D. chrysanthum*, *Eria tomentosa*, *Eulophia bicallosa*,

Table 1. Comparison of species recorded in the present study with previous works.

| Sl. no. | Scientific Name | Habit | Conservation Status | Previous Record | Present work | Distribution in Assam |
|---------|--|----------------------|--|--|--------------|--|
| 1 | <i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann | Epiphytic | DD ^y /EN ^t /P ^o | Dey et al (2007), Hajra & Jain (1996) | Recorded | Joypur Reserve Forest, MNP |
| 2 | <i>Aerides multiflorum</i> Roxb. | Epiphytic | DD ^y /EN ^t /P ^o | Sarmah & Borthakur (2009) | Recorded | Barak Valley, Eastern Assam, Western Assam, Karbi Anglong, MNP. |
| 3 | <i>A. odorata</i> Lour. | Epiphytic | DD ^y /EN ^t /P ^o | Dey et al. (2007), Hajra & Jain (1996) | Not recorded | Barak Valley, Eastern Assam, Western Assam, MNP. |
| 4 | <i>Arundina graminifolia</i> Hochr. | Terrestrial | O ^y /VU ^t /P ^o | Not reported earlier | Recorded | Barak Valley, Darrang, Golaghat, Sivasagar, Lakhimpur, MNP. |
| 5 | <i>Biermannia bimaculata</i> (King & Pantl.) King & Pantl. | Epiphytic | R ^y /VU ^t /P ^o | Hajra & Jain (1996) | Not recorded | Kamrup, Golaghat, MNP. |
| 6 | <i>Bulbophyllum careyanum</i> (Hook.) Spreng. | Epiphytic | DD ^y /EN ^t /P ^o | Dey et al (2007) | Recorded | Barak Valley, Kamrup, Golaghat, Bongaigaon, Dibru –Saikhowa MNP, Reserve, Goalpara, Lakhimpur, |
| 7 | <i>B. crassipes</i> Hook.f. | Epiphytic | DD ^y /EN ^t /P ^o | Not reported earlier | Recorded | Bongaigaon, MNP. |
| 8 | <i>Calanthe odora</i> Griff. | Terrestrial | DD ^y /EN ^t /P ^o | Sarmah & Borthakur (2009), Dey et al (2007), | Recorded | MNP. |
| 9 | <i>C. triplicata</i> (Willemet al.) Ames | Terrestrial | DD ^y /VU ^t /P ^o | Sarmah & Borthakur (2009) | Not recorded | MNP. |
| 10 | <i>C. vaginata</i> Lindl. | Terrestrial | DD ^y /EN ^t /P ^o / Endemic | Not reported earlier | Recorded | MNP, Sadiya. |
| 11 | <i>Chiloschista parishii</i> Seidenf. | Epiphytic | DD ^y /EN ^t /P ^o / Endemic | Dey et al (2007) | Not recorded | MNP. |
| 12 | <i>Cymbidium aloifolium</i> (L.) Sw. | Epiphytic | DI ^y /EN ^t /P ^o / | Dey et al (2007), Hajra & Jain (1996) | Recorded | Throughout Assam |
| 13 | <i>Dendrobium acinaciforme</i> Roxb. | Epiphytic | R ^y /EN ^t /P ^o | Hajra & Jain (1996) | Not recorded | Darrang, Dibrugarh, Lakhimpur, Golaghat, Kazringa National Park, Kamrup, MNPark, Panigrahi, Sivasagar, Upper Assam |
| 14 | <i>D. anceps</i> Swartz. | Epiphytic | DD ^y /EN ^t /P ^o / | Not reported earlier | Recorded | Barak valley, Kamrup, Goalpara, Golaghat, Kaziraaga, MNP. |
| 15 | <i>D. aphyllum</i> (Roxb.) Fischer | Epiphytic | DD ^y /EN ^t /P ^o / | Dey et al (2007), Hajra & Jain (1996) | Recorded | Throughout Assam |
| 16 | <i>D. chrysanthum</i> Wall. ex Lindl. | Epiphytic | DD ^y /EN ^t /P ^o / | Not reported earlier | Recorded | Throughout Assam |
| 17 | <i>D. densiflorum</i> Lindl. | Epiphytic/Lithophyte | R ^y /EN ^t /P ^o / | Dey et al (2007) | Recorded | Kamrup, Barpeta, Golaghat, MNP. |
| 18 | <i>D. jenkinsii</i> Wall. ex Lindl. | Epiphytic | DD ^y /EN ^t /P ^o / | Dey et al (2007) | Recorded | Barak Valley, Bongaigaon, Darrang, Goalpara, Golaghat, Kamrup, MNP. |

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Table 1 Continued.

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|----|--|-------------|--|--|--------------|--|
| 19 | <i>D. lindleyi</i> Steud. | Epiphytic | DD ^y /EN ^c /P [∞] / | Dey etal(2007) | Recorded | Barak Valley, Golaghat, Kaziranga National Park, Kamrup, MNP, Sivasagar. |
| 20 | <i>D. moschatum</i> (Buch.-Ham.) Sw. | Epiphytic | O ^y /EN ^c /P [∞] / | Dey etal(2007), Hajra & Jain (1996) | Recorded | Barak Valley, Darrang, Dibru –Saikhowa Biosphere Reserve, Joypur Reserve Forest, Kamrup, Golaghat, Goalpara, Lakhimpur, Sivasagar, MN P. |
| 21 | <i>Eria tomentosa</i> (J.König) Hook.f. | Epiphytic | R ^y /EN ^c /P [∞] | Not reported earlier | Recorded | Barak valley, Kamrup, MNP. |
| 22 | <i>Eulophia andamanensis</i> Rchb.f. | Terrestrial | NE ^c | Gogoi (2018) | Not recorded | MNP. |
| 23 | <i>E. bicallosa</i> (D.Don) P.F.Hunt & Summerh. | Terrestrial | R ^y /EN ^c /P [∞] | Not reported earlier | Recorded | Darrang, MNP. |
| 24 | <i>E. dabia</i> (D.Don) Hochr. | Terrestrial | DD ^y /EN ^c /P [∞] | Not reported earlier | Recorded | Orang Wildlife Sanctuary, MNP. |
| 25 | <i>E. manni</i> (Rchb.f.) Hook.f. | Terrestrial | R ^y /EN ^c /P [∞] / Endemic | Dey etal(2007), Hajra & Jain (1996) | Recorded | Kamrup, MNP. |
| 26 | <i>Eulophia obtusa</i> (Lindl.) Hook.f. | Terrestrial | CR ^c | Sarmah & Borthakur (2009) | Recorded | MNP. |
| 27 | <i>Flickingeria fimbriata</i> (Bl.) A.D.Hawkes | Epiphytic | NE ^c | Hajra & Jain (1996) | Recorded | MNP. |
| 28 | <i>F. fugax</i> (Rchb.f.) Seidenf. | Epiphytic | O ^y /EN ^c /P [∞] | Sarmah & Borthakur (2009) | Recorded | Joypur Reserve Forest, Kamrup, MNP, Nalbari |
| 29 | <i>F. macraei</i> (Lindl.) Seidenf. | Epiphytic | O ^y /EN ^c /P [∞] | Dey etal(2007) | Recorded | Darrang, Dibru-Saikhowa, Kamrup, MNP. |
| 30 | <i>Gastrochilus dasypogon</i> (Sm.) Kuntze | Epiphytic | DD ^y /EN ^c /P [∞] | Hajra & Jain (1996) | Recorded | MNP. |
| 31 | <i>G. inconspicuus</i> (Hook.f.) Kuntze | Epiphytic | DD ^y /EN ^c /P [∞] / Endemic | Dey etal(2007), Hajra & Jain (1996) | Recorded | Barak Valley, Joypur MNP, Reserve Forest, Kamrup, Golaghat, |
| 32 | <i>Geodorum densiflorum</i> (Lam.) Schltr. | Terrestrial | DD ^y /EN ^c /P [∞] | Sarmah & Borthakur (2009), Hajra & Jain (1996) | Recorded | Throughout Assam |
| 33 | <i>Nervilia aragoana</i> Gaudich. | Terrestrial | R ^y /EN ^c /P [∞] | Not reported earlier | Recorded | Kamrup, MNP. |
| 34 | <i>N. infundibulifolia</i> Blatt. & McCann | Terrestrial | DD ^y /VU ^c /P [∞] | Not reported earlier | Recorded | MNP. |
| 35 | <i>Papilionanthe teres</i> (Roxb.) Schltr. | Epiphytic | DD ^y /VU ^c /P [∞] | Sarmah & Borthakur (2009), Hajra & Jain (1996) | Recorded | Throughout Assam. |
| 36 | <i>Pelatantheria insectifera</i> (Rchb.f.) Ridl. | Epiphytic | DD ^y /EN ^c /P [∞] | Not reported earlier | Recorded | Barak valley, MNP. |

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Table 1 Continued.

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|----|---|-------------|--|--------------------------------------|----------|---|
| 37 | <i>Peristylus constrictus</i> (Lindl.) Lindl. | Terrestrial | R [‡] /VU [€] /P [∞] | Not reported earlier | Recorded | Kamrup, MNP. |
| 38 | <i>P.godyeroides</i> (D. Don) Lindl. | Terrestrial | DD [‡] /VU [€] /P [∞] | Dey et al(2007), Hajra & Jain (1996) | Recorded | Barak valley, Darrang, Kamrup, MNP, Nogaon. |
| 39 | <i>Phaius tankervilleae</i> (Banks) Bl. | Terrestrial | O [‡] /EN [€] /P [∞] | Dey et al(2007) | Recorded | Bongaigaon, Darrang, Dhemaji, Golaghat, MNP, Sanitpur |
| 40 | <i>Pholidota pal-lida</i> Lindl. | Epiphytic | DD [‡] /VU [€] /P [∞] | Hajra & Jain (1996) | Recorded | Barak Valley Darrang, Kamrup, MNP. |
| 41 | <i>Pomatocalpa spicata</i> Breda | Epiphytic | DD [‡] /EN [€] /P [∞] | Not reported earlier | Recorded | MNP. |
| 42 | <i>Rhynchostylis retusa</i> (L.) Bl. | Epiphytic | R [‡] /VU [€] /P [∞] | Dey et al(2007), Hajra & Jain (1996) | Recorded | Throughout Assam. |
| 43 | <i>Smitinandia micrantha</i> (Lindl.) Holttum | Epiphytic | DD [‡] /VU [€] /P [∞] | Hajra & Jain (1996) | Recorded | Kamrup, MNP. |
| 44 | <i>Tropidia angulosa</i> (Lindl.) Bl. | Terrestrial | DD [‡] /VU [€] /P [∞] | Not reported earlier | Recorded | Manas National Park |
| 45 | <i>Zeuxine strateumatica</i> (L.) Schlechter | Terrestrial | DD [‡] /EN [€] /P [∞] | Sarmah & Borthakur (2009) | Recorded | Barpeta, Bongaigaon, Darrang, Golaghat, Jorhat, Kamrup, MNP, Nalbari. |

NB: CR- Critically endangered, EN- Endangered, R-Rare, VU- Vulnerable, NE-Not Evaluated, DD- Data Deficient
[‡] - Conservation status of plants of Assam recorded from sources other than IUCN, [€]- Conservation status of plants of Assam according to IUCN, P[∞]- Plants prohibited for trade by Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

E.phiadabia, *Nervilia aragoana*, *N. infundibulifolia*, *Pelatantheria insectifera*, *Peristylus constrictus* and *Tropidia angulosa* were not reported by earlier workers (Table 1, Plate 1). These 45 species includes 39 species collected during the field work in the present study and the rest six species were recorded to be occurring in MNP by previous workers. Out of the 45 species, 17 were terrestrial, 28 were epiphytic and one species viz. *Dendrobium densiflorum* found to grow either as epiphyte or as lithophyte. Of the 25 genera recorded from the area *Dendrobium* was represented by 8 species, followed by *Eulophia* and *Calanthe* with 5 species and *Flickingeria* with 3 species. Hajra and Jain (1975) recorded 15 species under 13 genera from MNP. However, Dey et al (2007) reported 21 species and Sarmah and Borthakur (2009) reported 15 species in their works from the area. Gogoi (2018) reported *Eulophia andamanensis* from MNP, as addition to the flora of mainland India. Table 1 provides a comparison of species recorded in the present study with earlier works and their conservation status and Table 2 provides information on occurrence of species in different forest types.

CONCLUSION

Recording of occurrence of 45 species under 28 genera of orchids within the 500 sq. km. area of MNP can be considered significant. Out of these 45 species, 4 species are endemic and eight rare species listed by IUCN. Although several anthropogenic and natural factors operating in the area yet the park still provides a suitable habitats for orchids.

Grazing by domestic animals from fringe villages in buffer zone, encroachment for human habitations, extension of arable land for cultivation of tea, rubber and other crops, collection of timber, firewood and other forest products like medicinal plants, orchids, etc. for sale by the people of nearby areas of the park are regular feature. Periodic flood, forest fire and invasion of some alien species like *Lantna camara* *Mimosa diplotricha*, *Mikania micrantha*, *Chromolaena odorata*, etc. and extensive increase of population of the indigenous species *Dillenia pentagyna* in recent times are some of the threats prevailing in MNP. This has adversely affected the biodiversity of MNP in general and the orchid flora and their habitat in particular.

ACKNOWLEDGEMENT

The Authors are thankful to Forest Department, Bodo-land Territorial Council and Field Director of Manas National Park for their help and support during field survey and collections.

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Table 2. Occurrences of species in different Forest types.

| Sl. No. | Forest type | Species |
|---------|--------------------------------------|---|
| 1 | Semi Evergreen Forest | <i>Aerides multiflorum</i> , <i>A. odorata</i> , <i>Acampe papillosa</i> , <i>Bulbophyllum careyanum</i> , <i>B. crassipes</i> , <i>Cymbidium aloifolium</i> , <i>Dendrobium acinaciforme</i> , <i>D. anceps</i> , <i>D. densiflorum</i> , <i>Gastrochilus dasypogon</i> , <i>Flickingeria macraei</i> , <i>Geodorum densiflorum</i> , <i>Phaius tankervilleae</i> , <i>Pelatantheria insectifera</i> , <i>Pomatocalpa spicata</i> , <i>Smitinandia</i> |
| 2 | Moist Mixed Deciduous Forest (Dense) | <i>Bulbophyllum careyanum</i> , <i>Biermannia bimaculata</i> , <i>Cymbidium aloifolium</i> , <i>Dendrobium acinaciforme</i> , <i>D. anceps</i> , <i>D. aphyllum</i> , <i>D. chrysanthum</i> , <i>D. lindleyi</i> , <i>D. moschatum</i> , <i>Gastrochilus inconspicuus</i> , <i>Geodorum densiflorum</i> , <i>Pelatantheria insectifera</i> , <i>Pomatocalpa spicata</i> , <i>Tropidia angulosa</i> , |
| 3 | Moist Mixed Deciduous Forest (Open) | <i>Aerides multiflorum</i> , <i>Cymbidium aloifolium</i> , <i>Dendrobium aphyllum</i> , <i>D. chrysanthum</i> , <i>D. jenkinsii</i> , <i>D. lindleyi</i> , <i>Eria tomentosa</i> , <i>Flickingeria fimbriata</i> , <i>F. fugax</i> , <i>Gastrochilus inconspicuus</i> , <i>Papilionanthe teres</i> , <i>Pholidota pallida</i> , <i>Rhynchostylis retusa</i> . |
| 4 | Scrub Forest | <i>Acampe papillosa</i> , <i>Biermannia bimaculata</i> , <i>Chiloschista parishii</i> , <i>Cymbidium aloifolium</i> , <i>Dendrobium aphyllum</i> , <i>D. jenkinsii</i> , <i>D. lindleyi</i> , <i>Flickingeria fugax</i> , <i>F. macraei</i> , <i>Papilionanthe teres</i> , <i>Pholidota pallida</i> , <i>Rhynchostylis retusa</i> , <i>Smitinandia micrantha</i> , <i>Zeuxine strateumatica</i> . |
| 5 | Grassland | <i>Arundina graminifolia</i> , <i>Calanthe odora</i> , <i>C. triplicate</i> , <i>C. vaginata</i> , <i>Eulophia andamanensis</i> , <i>E. bicallosa</i> , <i>E. dabia</i> , <i>E. mannii</i> , <i>E. obtusa</i> , <i>Peristylus constrictus</i> , <i>P. goodyeroides</i> , <i>Phaius tankervilleae</i> , <i>Nervilia aragoana</i> , <i>N. infundibulifolia</i> , <i>Zeuxine strateumatica</i> . |

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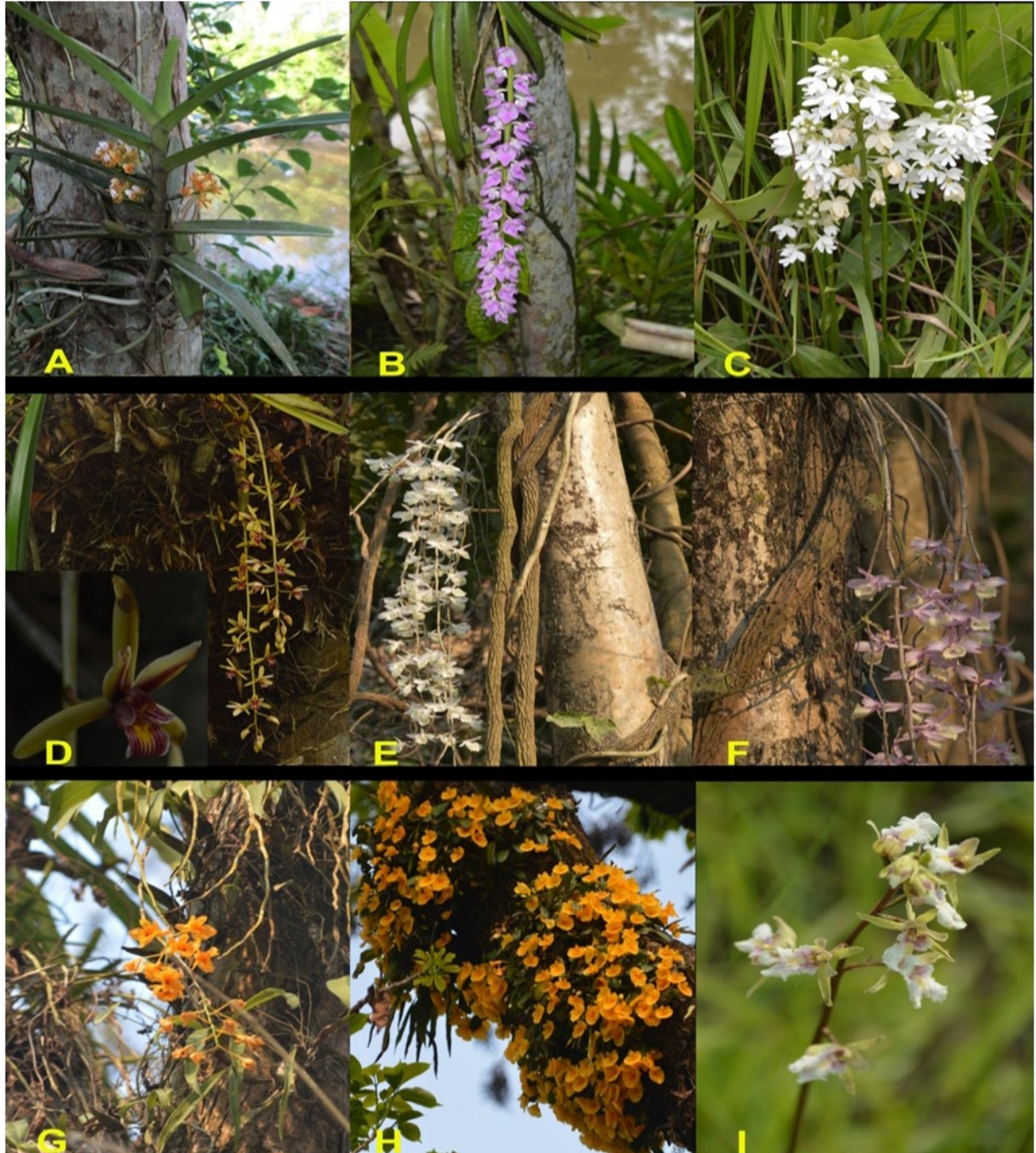


Plate-1. A. *Acampe praemorsa* B. *Aerides multiflorum*, C. *Calanthe odora*, D. *Cymbidium aloifolium*, E & F. *Dendrobium aphyllum*, G. *Dendrobium chrysanthum*, H. *Dendrobium jenkinsii*, I. *Eulophia bicalllosa*.