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Orchid diversity of makum coal field of Assam: A case study from jagun range

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Abstract
Orchids are prized for their incredible range of floricultural excellence, beautiful foliage and fragrant, that has exploited the group for commercial purpose or as a royal race of hobby. Destruction, opencast mining, anthropogenic pressures and other developmental activities has created heavy shrinkage of forest areas which leads regular threat of survival of entire orchid group. Many spectacular and economically important orchid species of Assam were facing danger of extinction. Open cast coal mining was one of the major menaces for the orchid flora of the Makum Coal field region. Majority of the orchids are found as epiphytes on tree and destruction of tree species due to mining created permanent elimination of the group. The present study was enumeration of natural diversity of orchids in Tinkopani, Kotha, Namphai and Namphuk Reserve Forest of Jagun range located Tinsukia district of Assam under Assam Valley Tropical Wet Evergreen forest belonging to the buffer zone of NE Coal field. Based on floristic survey of orchids, all together 76 species were recorded from the sites. A total of 68 species were epiphytic in nature and 8 species were terrestrial habit. Among them 2 species were placed under critically endangered, 12 were endangered, 14 were vulnerable and 14 were in rare category. Study highlighted the distribution of the species, their host range and ecological status.

Keywords: ecological status, host range, kotha RF, namphai RF, namphuk RF, tinkopani RF, orchid flora, makum coal fields

Introduction
Orchids are the most admired group of plants attracted for their great floral ornamentation and extended blooming phase. They are prized for their incredible range of floricultural excellence, beautiful foliage and fragrant that has exploited the group commercially or as a royal race of hobby. However, heavy shrinkage of forest areas owing to destruction, opencast mining, anthropogenic pressures and other developmental activities has created constant threat of survival of entire orchid group and considered under the APPENDIX-I&II of the CITES [15]. Some species of orchid have vanished from the Indian localities due to such activities [18]. North East India is endowed a wide range of eco-climatic suitability for specific micro- environment requirement of orchids and estimated as nearly 151 genera with 876 species, about 73% of the total orchid species of India. Among them a total of 186 endemic species were reported and 37 species as endemic to Assam region only [6]. The North Eastern Coal field covers forest areas within Digboi Forest Division and at present confined to only Makum Coal field in Tinsukia district of Assam. The Makum Coal fields cover an area of 2688.16 hectares and the study sites included under the coal field. The process of open-cast coal mining leads removal of top overlying soil layer and total elimination of forest cover. On the OBDs of coal mine areas hardly, a few species grow naturally, but the process is extremely slow and the pioneer primary vegetation is totally altered. Orchids have high specificity about pollution free environment and protection of the habitat for their shelter is desired. Majority of the orchids are epiphytes and removal of supporting tree species created permanent elimination of the epiphytes. Many spectacular and economically important orchid species of Assam are facing danger of extinction owing to destruction of habitat due to mining. A number of work on orchid diversity of Assam has been done [3, 2, 7, 9, 10, 11, 12, 13, 8] and but merely reported the status of orchids in coal field affected areas [1]. The present study was planned for taxonomic exploration of orchid flora of four reserve forest (RF) in Jagun Range of Digboi forest division, especially in buffer zone of NEcoal mine, Assam for evaluation of habitat ecology, their host specificity and reorganization of their occurrence.

Study area
The current survey was primarily confined to Tinkopani RF, Kotha RF, Namphai RF and Namphuk RF areas of North Eastern coalfield located in Makum Coal field areas of Digboi forest division, Tinsukia District, Assam under Dihing-Patkai WLS. Tinkopani RF lies between 27° 19′ 49.96” N to 27° 24 ′38.65” N and 95° 55′36.76" E to 96° 00′ 16.29" E, with altitudinal range from 156 m to 221m MSL, Namphuk RF lies between $27^0$25′9.00" N to $27^0$26′6.5" N and $95^0$55′15.30" E to $95^0$56′ 11.84" E, with altitudinal range from 156m to 221m MSL, Namphai RF lies between $27^0$23′7.93" N to $27^0$26′1.10" N and $95^0$53′43.36" E to $95^0$59′15.11" E, with altitudinal range from 156m. to 221m MSL, Kotha RF lies between $27^0$22′26.48" N to $27^0$25′52.67" N and $95^0$50′45.53" E to $95^0$53′15.64" E, with altitudinal range from 156m to 221m MSL (Figure 1).

Geology, Rock and Soil
The Study area is located on in the foothills of Patkai range on the south west border with Arunachal Pradesh consists of

upper tertiary rocks with deposition of coal. The area is at the connection of the Palaearctic, Indo-Chinese, and Indo-Malayan Bio-geographic regions that making great floral diversity. The alluvial deposits of the Dihing River are characterized by its coarse nature, reddish colour and sandy clay. The hilly terrain of the study site predominates with moderate to steep slopes with a number of streams pass throughout. Soil is acidic with pH

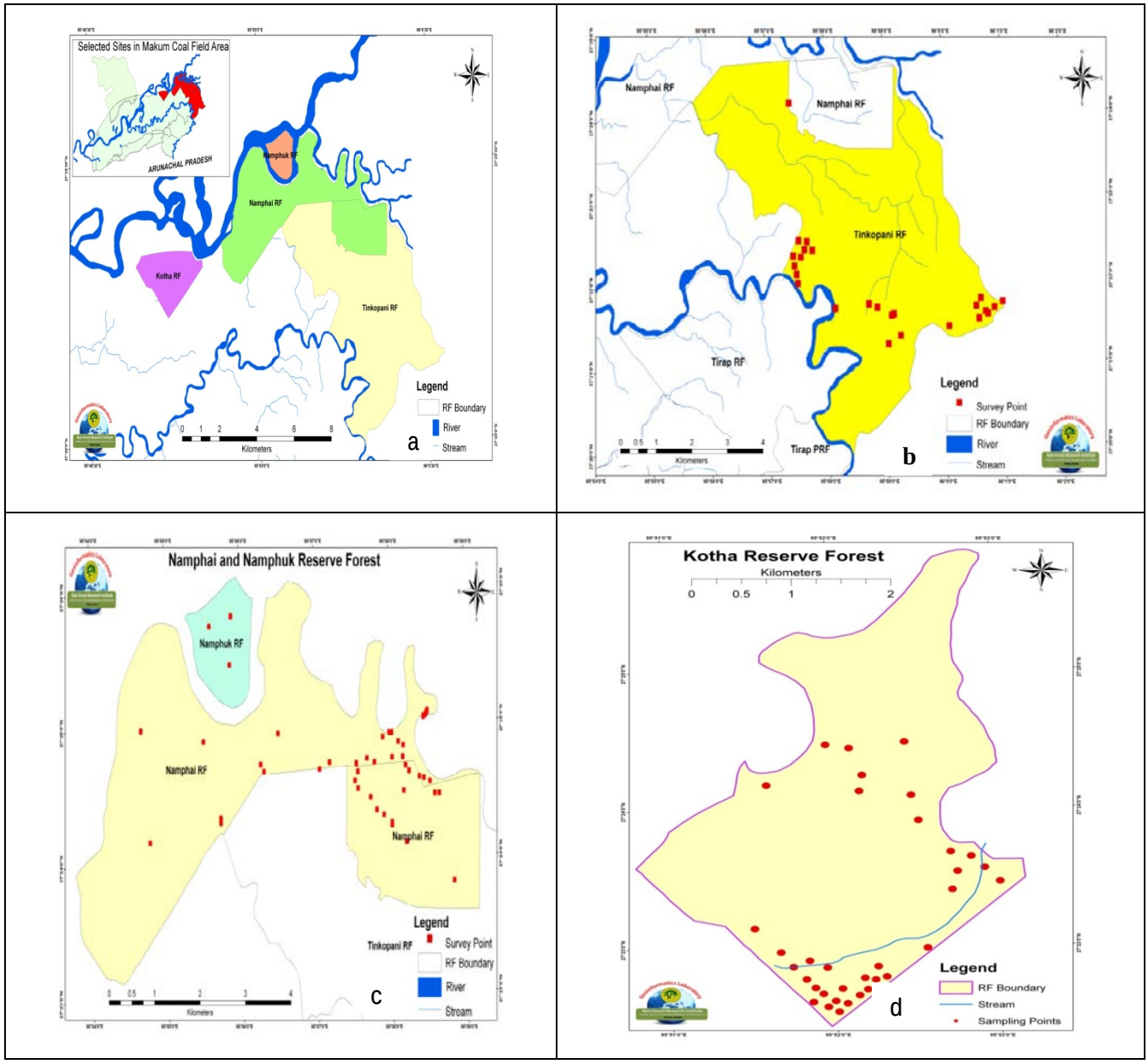

Fig 1: A-Selected forest sites of Makum Coal Field area B- Tinkopani RF C- Namphai & Namphuk RF D- Kotha RF

4.55, 4.21 and 4.48 in Nmphai, Kotha and Tinkopani RF respectively. Likewise, moisture content % was 24.88, 25.42 and 27.31 at 0-15 cm depth.

Climate

The area is characterized by humid climate varying from 87% to 91 % with prolonged rainy season and fairly cold winter. High humidity and precipitation are significant features of evergreen forests in this region. The period from November to February was the dry season. Monsoon is falls from April to September and the temperature during summer is as high as 36° C and in winter as low as 6 ° C. For the period of December & January month heavy dewfall is seen. The average rain fall recorded from 2018-19 to 2020-21 showed that highest rainfall occurs during the month of June-July whereas the lowest average rainfall was recorded during January (Figure 2)

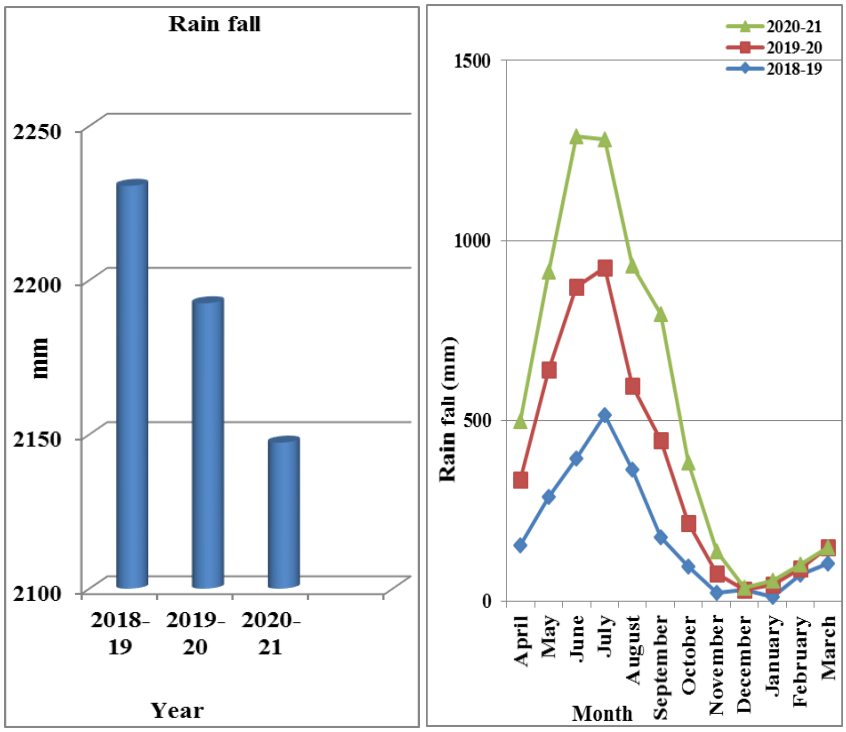

Fig 2: Average annual and monthly rain fall of study site

Vegetation

Bio-geographically the study area falls under the North-East Brahmaputra Valley province 9 (A). According to Forest classification the vegetation was Type IB/C1 Assam Valley Wet Evergreen Forest or identified as Upper Assam *Dipterocarpus –Mesua* formation [4]. The forest was characterized by multistoried canopy, top tier consists of tall, evergreen or deciduous trees grow to a height of around 46 meters (*Dipterocarpus retusus*, *Artocarpus chama*, *Shorea assamica*, *Tetramelia nudiflora*, *Altingia excelsa*, *Ailanthu grandis* and *Teminalia myriocarpa* etc*)* intermingled with climbers and lianas. The middle tier consists of several medium sized trees growing up to a height of about 25 meters (*Mesua ferra*, *Cinnamomum glanduliferum*, *Duabanga sonneratioides*). The ground vegetation consists of shrubs, herbs and ferns.

Materials and Methods

Extensive field survey was carried out in Tinkopani RF, Namphai RF, Namphuk RF and Kotha RF during the period of 2019-2021. Walked transects were done seasonally throughout the forest to explored the orchid species, their phonological information, population status and host ranges. All the necessary visual documents were recorded in field book and properly maintained for future study. Identification of the species was done with the help of published local floras and consulting herbaria of Botanical survey of India, Shillong (ASSAM). Nomenclature of the species was confirmed with the World Checklist of Monocotyledons [14], data bases like The Plant List, Tropicos.

Results and Discussion

The studied forest areas were bears a unique ecosystem and specific agro climatic condition that favors abundant growth of orchids (Plate 1). Coal reserves are found underneath of the studied hilly natural forests. A total of 76 orchid species (Table 1) with 33 genera have been recorded from the sites mostly of sub-tropical habitat. Among them 68 species with 25 genera were epiphytic in nature. Only 8 species namely *Calanthe sylvatica*, *Dienia ophrydis*, *Geodorum densiflorum*, *Goodyera procera*, *Phaius tankervilleae*, *Peristylus goodyeroides*, *Hetaeria affinis*, *Zeoxine glandulosa* were in terrestrial habit. *P. tankervilleae*, the most spectacular orchid was now in critically endangered status, found extremely sparse and observed mainly in cultivated condition. Another terrestrial orchid *H. affinis* was belonged to endangered category and *Geodorum densiflorum* was in vulnerable status. Solitary species of *Zeoxine*, *Z. glandulosa* was reported from Tinkopani RF only. Among the epiphytes, *Dendrobium* was the second largest position occupied the maximum number with 15 species under 5 sections out of 56 species in Assam. It was earlier reported [13] all together 95 orchid species from Tinsukia district of Assam and contributed with 13 species of *Dendrobium* where studied forest were located. Among the reported species, *D. Nobile* and *D. sulcatum* were critically endangered category. *D.aduncum*, *D. cumulatum*, *D. lituiflorum*, *D. terminale* were endangered, whereas *D. densiflorum*, *D. transparens* and *D. jenkinsii* were in threatened category [17]. Sectional distribution of *Dendrobium* [16] in study areas were specified in table 2. Five species of *Cleisostoma* recorded during the present study and *C. filiforme* and *C. linearilobatum* were placed under endangered category. As concern the genus *Cleisocentron*, only six species were recognized and *C. pallens* was known only in Himalayan region that reported in Namphai RF during the study. Three species of *Eria* viz. *E. lasiopetala*, *E. paniculata* and *E. tomentosa* were documented and *E. lasiopetala* was very common in all the forests as well as *E. paniculata* was in vulnerable category. Three species of earlier *Eria* presently placed in the genus *Pinalia* namely *P. acervata*. *P.amica* and *P.pumila* and all are in the position of vulnerable state. Among the four reported species of *Micropera* [5], two species namely *M. pallida* and *M. rostrata* were found in Tinkopani and

Namphai RF but it was very restricted distribution. *Vandas* were incredibly rewarding orchid with unique floral architecture now have in the position of rarity. Present observation two species, *V. bicolor* and *V. testacea* were evidence from Tinkopani and Namphai RF. During the present inventory fourteen species were very sparse in distribution in the sites viz. *Bulbophyllum pteroglossum, Cleisostoma linearilobatum, Dendrobium cumulatum, D. jenkinsii, D. spatella, Eria paniculata, E.tomentosa Gastrochilus obliquus var.suavis, Micropera pallida, Peristylus goodyeroides, Phalaenopsis lobbii, Pholidota pallida, Thelasis pygmaea* and *Vanda bicolor* and found only in the boarder of Arunachal Pradesh. Orchid genera and species distributed in India, Assam and the studied four forest sites were incorporated in table 3.

Among the documented species17.1% of the total species were in the position of rare, 18.18 % vulnerable, 14.28 % endangered and 5.19 % in critically endangered category those makings the area as a significant orchid habitat and was an alarming indication for the areas. Plate 2 highlighted pictorial view of some rare orchids of the study site. Abundance rating and status of the orchid flora was given in figure 3. Regular forest destruction, drastic depletion of forest areas and illegal mining activity has detrimentally affected the population of the orchids and numerous species were in a verge of extinction in the wild.

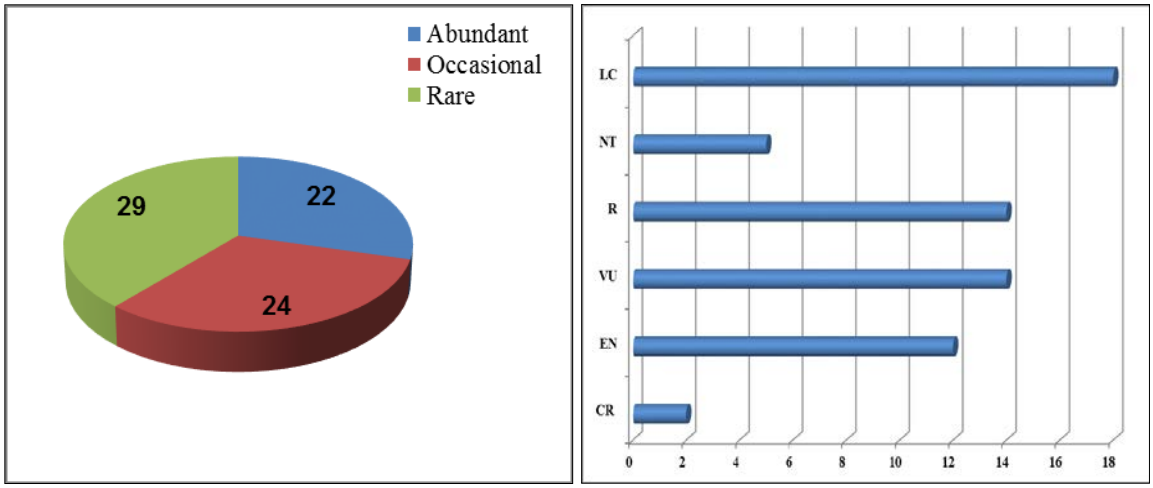

Fig 3: Abundance rating and status of the orchid flora * LC-Least concern NT-Near threatened R-Rare VU-Vulnerable EN-Endangered CR-Critically Endangered

Conclusion

Anthropogenic disturbance was the frequent scenario in the entire four studied forests site. Large scale deforestation of host trees of epiphytic orchid creates threat for their existence. Besides this, illegal coal mining in Namphai and Tinkopani RF was one of the major pressures to the terrestrial orchids. Hence, reorganization and conservation of supporting trees is of outmost importance to protect these valuable resources. Conservation of orchids through *in vitro* seed propagation is the best methods for preserving the rare species. *In vitro* seed propagation and *ex situ* conservation of some rare orchids of the studied forests has been initiated by the authors as future challenges of the study.

Acknowledgement

Authors are highly grateful to the Director, Rain Forest Research Institute, Jorhat whose advice and encouragement were vital. Appreciation was given to the State Forest Department of Assam, Divisional Forest Officer of Tinsukia and the staff for permits to work in the Reserve as well as their support and co-operation. Authors expressed deep sense of gratitude to Central Mine and Planning & Design Institute Limited (CMPDI), Ranchi for providing financial support.

Table 1: Orchid species of Makum Coal Field areas of Jagun Forest Range and their host

Sl. No.	Name of species	Habit/Flowering	Abundance	Host plant	Tinkopani RF	Namphai RF	Namphuk RF	Kotha RF
1	*Acampe ochracea* (Lindl.) Hochr.	Epiphyte/ December-February	Abundant/Least concern	*Tectona grandis* *Lagerstroemia specios* *Terminalia myriocarpa*	*	*	*	*
2	*Acampe praemorsa* (Roxb.) Blatt. &Mc Cann	Epiphyte/ November-January	Occasional/vulnerable	*Tectona grandis* *Lagerstroemia specios* *Bischofia javanica* *Terminalia myriocarpa*	*	*	*	*
3	*Acampe rigida* (Buch.-Ham.ex Sm..) P.F.Hunt	Epiphyte/ June-July	Occasional/vulnerable	*Lagerstroemia speciosa* *Tectona grandis*	*	*	-	-
4	*Aerides multiflora* Roxb.	Epiphyte/ May-June	Abundant/Least concern	*Chukrasia tabularis* *Lagerstroemia speciosa* *Teectona grandis* *Dipterocarpus retusus* *Magnolia hodgsonii*	*	*	-	*

5	*Aerides odorata* Lour.	Epiphyte/ April-May	Occasional/vulnerable	*Magnolia hodgsonii* *Balakata baccata* *Stereospermum chelonoides* *Castanopsis indica* *Bischofia javanica* *Chukrasia tabularis* *Terminalia bellirica* *Canarium resiniferum*	*	*	*	*
6	*Aerides roseum* Lodd. Ex Lindl. & Paxton	Epiphyte/ May	Occasional/vulnerable	*Lagerstroemia speciosa*	*	*	-	*
7	*Agrostophyllum planicaule* (Wall. ex Lindl.) Rchb.f.	Epiphyte/ August-September	Abundant/ Near Threatened	*Bischofia javanica* *Lagerstroemia speciosa*	*	*	*	*
8	*Bryobium pudicum* (Ridl.) Y.P.Ng& Cribb.	Epiphyte/ April-June	Abundant/Least concern	*Lagerstroemia speciosa* *Duabanga grandiflora*	*	*	*	*
9	*Bulbophyllum affine* Lindl.	Epiphyte/ June-July	Occasional/vulnerable	*Lagerstroemia speciosa* *Terminalia myriocarpa*	*	*	*	*
10	*Bulbophyllum andersonii* (Hook.f.) J.J.Sm.	Epiphyte/ September-October	Rare	*Altingia excelsa* *Lagerstroemia speciosa*	*	*	-	*
11	*Bulbophyllum careyanum* (Hook.) Spreng	Epiphyte/ November-January	Rare	*Balakata baccata* *Lagerstroemia speciosa*	*	*	*	*
12	*Bulbophyllum odoratissimum* (J.E.Sm.) Lindl.var. *odoratissimum*	Epiphyte/ May	Occasional/vulnerable	*Lagerstroemia speciosa* *Terminalia myriocarpa*	-	*	-	-
13	*Bulbophyllum pteroglossum* Schltr.	Epiphyte/ April	Rare	*Terminalia myriocarpa*	*	*	-	*
14	*Bulbophyllum roxburghii* (Lindl.) Rchb.f.	Epiphyte/ April-May	Occasional	*Terminalia myriocarpa* *Altingia excelsa* *Lagerstroemia speciosa* *Dipterocarpus retusus*	*	*	-	*
15	*Bulbophyllum spathulatum (*Rolfe ex Cooper*)* Seidenf.	Epiphyte/ March	Occasional/Endangered	*Lagerstroemia speciosa* *Duabanga grandiflora* *Castanopsis indica* *Dipterocarpus retusus*	*	*	-	*
16	*Calanthe sylvatica* (Thouars) Lindl	Terrestrial Sandy, humus rich soil/ JulySeptember	Abundant/ Least concern	*Lagerstroemia speciosa* *Terminalia myriocarpa*	*	*	-	-
17	*Cleisocentron pallens* (Cathcart ex Lindl.) Pearce & Cribb	Epiphyte/ June-July	Abundant/ Least concern	*Lagerstroemia speciosa*	-	*	-	-
18	*Cleisostoma appendiculatum* (Lindl.) Benth. & Hook.f. ex B.D.Jacks.	Epiphyte/ September-November	Rare/vulnerable	*Lagerstroemia specios* *Bischofia javanica* *Terminalia bellirica* *Schima wallichii*	*	*	*	*
19	*Cleisostoma filiforme* (Lindl.)Garay	Epiphyte/ August-September	Rare/Endangered	*Duabanga grandiflora* *Lagerstroemia speciosa*	*	*	-	*
20	*Cleisostoma linearilobatum* (Seidenf.& Smitind.)Garay	Epiphyte/ June-July	Occasional /Endangered	*Bischofia javanica* *Terminalia bellirica* *Lagerstroemia speciosa*	*	*	*	*
21	*Cleisostoma subulatum Blume*	Epiphyte/ April-May	Abundant/ Least concern	*Terminalia bellirica* *Schima wallichii* *Dipterocarpus retusus* *Lagerstroemia speciosa*	*	*	-	-
22	*Cleisostoma tenuifolium (L.) Garay*	Epiphyte/ May	Rare	*Terminalia bellirica* *Mangifera indica*	-	*	-	-
23	*Coelogyne flavida* Hook.f. ex.Lindl.	Epiphyte/ May-June	Abundant/ Least concern	*Castanopsis indica* *Chukrasia tabularis* *Dipterocarpus retusus* *Lagerstroemia speciosa*	*	*	-	-
24	*Coelogyne ovalis* Lindl.	Epiphyte/ October-December	Rare/ Endangered	*Vatica lanceifolia* *Castanopsis indica*	-	*	-	-
25	*Cymbidium aloifolium* (L.) Sw.	Epiphyte/ May-June	Abundant/ Least concern	*Stereospermum tetragonum* *Vatica lanceifolia* *Castanopsis indica* *Schima wallichii* *Mangifera sylvatica* *Chukrasia tabularis* *Dipterocarpus retusus* *Lagerstroemia speciosa*	*	*	*	*
26	*Cymbidium dayanum* Rchb.f.	Epiphyte/ October-November	Rare/ Endangered	*Lagerstroemia speciosa*	-	*	-	-

27	*Dendrobium acinaciforme* Roxb.	Epiphyte/ November	Occasional	*Terminalia chebula* *Lagerstroemia speciosa*	*	*	-	-
28	*Dendrobium aduncum* Lindl.	Epiphyte/ April	Occasional/Endangered	*Lagerstroemia speciosa* *Dipterocarpus retusus* *Castanopsis indica*	*	*	-	-
29	*Dendrobium aphyllum* (Roxb.) C.E.C.Fisch	Epiphyte/ March-April	Abundant/ Least concern	*Balakata baccata* *Lagerstroemia speciosaTectona grandis* *Bischofia javanica* *Canarium resiniferum* *Terminalia bellirica*	*	*	*	*
30	*Dendrobium chrysanthum* Lindl.	Epiphyte/ September-October	Rare	*Lagerstroemia speciosa* *Dipterocarpus retusus*	-	*	-	-
31	*Dendrobium cumulatum* Lindl.	Epiphyte/ April-May	Rare/ Endangered	*Lagerstroemia speciosa* *Dipterocarpus retusus*	*	*	-	-
32	*Dendrobium densiflorum* Lindl.	Epiphyte/ April	Rare/Near Threatened	*Lagerstroemia speciosa*	-	*	-	-
33	*Dendrobium fimbriatum* Hook var.*oculatum* Hook	Epiphyte March-April	Abundant/vulnerable	*Lagerstroemia speciosa* *Ailanthus integrifolia* *Terminalia chebula* *Mangifera indica*	*	*	-	*
34	*Dendrobium jenkinsii* Wall ex. Lindl.	Epiphyte/ March-April	Rare/ Near Threatened	*Ailanthus excelsa* *Lagerstroemia specios*	*	*	-	*
35	*Dendrobium lituiflorum* Lindl.	Epiphyte/ March-April	Occasional/Endangered	*Ailanthus integrifolia* *Bischofia javanica* *Lagerstroemia specios* *Mangifera indica*	*	*	-	*
36	*Dendrobium moschatum* (Buch.-Ham.) Sw.	Epiphyte/ May-June	Occasional/vulnerable	*Altingia excelsa* *Castanopsis indica* *Lagerstroemia speciosa*	*	*	*	*
37	*Dendrobium nobile* Lindl.	Epiphyte/ March-April	Rare/Critically endangered	*Balakata baccata* *Lagerstroemia speciosa* *Tectona grandis* *Bischofia javanica* *Terminalia bellirica* *Canarium resiniferum*	*	*	-	-
38	*Dendrobium spatella* Rchb.f.	Epiphyte/ May	Abundant/ Least concern	*Castanopsis indica* *Lagerstroemia speciosa* *Dipterocarpus retusus*	*	*	-	-
39	*Dendrobium sulcatum* Lindl.	Epiphyte/ April	Rare/ Critically endangered	*Balakata baccata* *Lagerstroemia speciosa* *Canarium resiniferum*	-	*	-	-
40	*Dendrobium terminale* Parishn& Rchb.f.	Epiphyte/ September-October	Rare/Endangered	*Lagerstroemia specios* *Mangifera indica*	*	*	-	-
41	*Dendrobium transparens* Wall. ex Lindl.	Epiphyte/ April-May	Occasional/ Near Threatened	*Gmelina arborea* *Lagerstroemia specios* *Vatica lanceifolia* *Magnolia hodgsonii* *Balakata baccata* *Castanopsis indica* *Dipterocarpus retusus* *Melia azedarach* *Tectona grandis*	*	*	-	*
42	*Dienia ophrydis* (J.Konig) Seidenf.	Terrestrial Sandy and humus rich soil/ May-June	Occasional	-	*	*	*	*
43	*Eria lasiopetala* (Willd.) Ormerod	Epiphyte/ February-April	Abundant /Least concern	*Bischofia javanica* *Chukrasia tabularis* *Mangifera sylvatica*	*	*	*	*
44	*Eria paniculata* Lindl.	Epiphyte/ April-May	Rare/Vulnerable	*Lagerstroemia speciosa* *Terminalia myriocarpa*	*	*	-	-
45	*Eria tomentosa* (J.Koenig) Hook.f.	Epiphyte/ August-September	Rare	*Bischofia javanica* *Chukrasia tabularis* *Terminalia bellirica*	*	*	-	-
46	*Gastrochilus dasypogon* (Sm.)Kuntze	Epiphyte/ October-November	Rare	*Lagerstroemia speciosa* *Terminalia myriocarpa*	-	*	-	-
47	*Gastrochilus obliquus var.suavis* (Seidenf.) Z.H.Tsi	Epiphyte/ October-November	Rare	*Bischofia javanica* *Lagerstroemia speciosa* *Terminalia myriocarpa*	-	*	-	-

48	*Geodorum densiflorum* (Lamk.)Schltr.	Terrestrial, humus rich forest soil/ May-June	Occasional/ Vulnerable	-	-	*	-	-
49	*Goodyera procera* (Ker Gawl.) Hook.	Terrestrial, humus rich forest soil, near stream bank or rock/ February-March	Occasional	-	*	*	-	-
50	*Hetaeria affinis* (Griff.) Seidenf.& Ormerod	Terrestrial, near stream / January	Occasional /Endangered	-	*	*	-	*
51	*Liparis mannii* Rchb.f.	Epiphyte/ November-December	Rare/Endangered	*Lagerstroemia speciosa Dipterocarpus retusus*	-	*	-	-
52	*Liparis viridiflora* (Bl.) Lindl.	Epiphyte/ November-January	Abundant/ Least concern	*Terminalia myriocarpa Lagerstroemia speciosa Tectona grandis*	*	*	-	-
53	*Luisia trichorrhiza* (Hook.) Bl. Var. *trichorrhiza*	Epiphyte/ March	Abundant/ Least concern	*Lagerstroemia speciosa Dipterocarpus retusus Terminalia myriocarpa Tectona grandis Chukrasia tabularis*	*	*	*	*
54	*Luisia tristis* (G.Forst.) Hook.f.	Epiphyte/ March-April	Abundant/ Least concern	*Lagerstroemia speciosa Bischofia javanica Terminalia bellirica Canarium resiniferum*	*	*	*	*
55	*Micropera pallida* (Roxb.) Lindl.	Epiphyte/ April-May	Rare	*Terminalia myriocarp Lagerstroemia speciosa*	*	*	-	-
56	*Micropera rostrata* (Roxb.) Balakr.	Epiphyte/ April-May	Rare/Vulnerable	*Terminalia myriocarp Tectona grandis*	*	-	-	-
57	*Mycaranthes pannea* (Lindl.) S.C.Chen & J.J.Wood	Epiphyte/ May	Occasional	*Terminalia myriocarp Tectona grandis Lagerstroemia speciosa Vatica lanceifolia*	*	*	-	-
58	*Oberonia mucronata* (D.Don) Ormerod & Seidenf.	Epiphyte/ October-December	Abundant/ Least concern	*Lagerstroemia speciosa Bischofia javanica Terminalia bellirica Canarium resiniferum*	*	*	-	*
59	*Papilionanthe teres* (Roxb.) Schltr.	Epiphyte/ March-May	Abundant/ Least concern	*Melia azedarach Dipterocarpus retusus Castanopsis indica Chukrasia tabularis Terminalia myriocarpa Tectona grandis*	*	*	*	*
60	*Peristylus goodyeroides* (D.Don) Lindl.	Terrestrial Sandy soil with small pebbles/ June-August	Rare	-	*	*	-	-
61	*Phaius tankervilleae* Blume	Terrestrial on damp forest/ March-April	Rare in natural habit, cultivated/ Critically endangered	-	*	-	-	-
62	*Phalaenopsis mannii* Rchb.f.	Epiphyte/ April-May	Rare//Critically endangered	*Lagerstroemia speciosa*	*	*	-	-
63	*Phalaenopsis deliciosa* Rchb.f	Epiphyte/ May	Occasional	*Lagerstroemia speciosa*	-	*	-	-
64	*Phalaenopsis lobbii* (Rchb.f.) H.R.Sweet	Epiphyte/ March	Occasional		-	*	-	-
65	*Pholidota articulata* Lindl.	Epiphyte/ June-August	Abundant/ Least concern	*Dipterocarpus retusus Macaranga denticulata Balakata baccata 6Vatica lanceifolia Teectona grandis Bischofia javanica Chukrasia tabularis Lagerstroemia specios*	*	*	-	*

66	*Pholidota imbricata* Lindl.	Epiphyte/ June-August	Abundant/ Least concern	*Macaranga denticulata Magnolia hodgsonii Castanopsis indica Chukrasia tabularis Lagerstroemia speciosa Canarium resiniferum Dipterocarpus retusus*	*	*	*	*
67	*Pholidota pallida* Lindl.	Epiphyte/ June-August	Occasional	*Lagerstroemia speciosa Canarium resiniferum*	*	*	*	*
68	*Pinalia acervata* (Lindl.) Kuntze	Epiphyte/ April-May	Rare/ Vulnerable	*Lagerstroemia speciosa Dipterocarpus retusus Castanopsis indica*	*	-	-	-
69	*Pinalia amica* (Rchb.f.) Kuntze	Epiphyte/ March	Occasional/ Near Threatened	*Lagerstroemia speciosa Dipterocarpus retusus*	*	*	-	-
70	*Pinalia pumila* (Lindl.) Kuntze	Epiphyte/ February-March	Rare/Vulnerable	*Lagerstroemia speciosa Dipterocarpus retusus Castanopsis indica Tectona grandis*	*	*	-	*
71	*Rhynchostylis retusa* (L.) Blume	Epiphyte/ March-April	Abundant/ Least concern	*Canarium resiniferum Lagerstroemia speciosa Tectona grandis Bischofia javanica Mangifera sylvatica Terminalia bellirica Dipterocarpus retusus Canarium resiniferum*	*	*	*	*
72	*Robiquetia spatulata* (Bl.)J.J.Sm.	Epiphyte/ April-May	Occasional/Vulnerable	*Lagerstroemia speciosa Canarium resiniferum*	*	*	*	*
73	*Thelasis pygmaea* (Griff.) Lindl.	Epiphyte/ July	Abundant/ Least concern	*Lagerstroemia speciosaDipterocarpus retusus Duabanga grandiflora*	*	*	-	-
74	*Vanda bicolor* Griff.	Epiphyte/ February-March	Rare	*Canarium resiniferum Terminalia bellirica Dipterocarpus retusus*	-	*	-	-
75	*Vanda testacea* (Lindl.) Rchb.f.	Epiphyte/ May	Rare	*Canarium resiniferum Terminalia bellirica Dipterocarpus retusus*	*	*	-	-
76	*Zeoxine glandulosa* King & Pantl.	Terrestrial in dense shady forest floor/ March	Rare	-	*	-	-	-

Table 2: Sectional distribution of *Dendrobium*

Section	Species
Callista (Lour.)Schltr.	*D. densiflorum, D jenkinsii, D.salcatum*
Dendrobium Sw.	*D. fimbriatum, D. moschatum, D. chrysanthum, D. aphyllum, D. lituiflorum, D. nobile, D. transparens*
Breviflores Hk.f.	*D. aduncum*
Aporum(Bl.)Lindl.	*D. acinaciforme, D. terminale,D. spatella*
Pedilonum (Bl.) Lindl.	*D. cumulatum*

Table 3: Strength wise number of orchid genera and species found in studied Reserve Forest

Sl No.	Name of the species	India	Assam	Tinkopani RF	Namphai RF	Namphuk RF	Kotha RF
1	*Acampe* Lindl.	5	4**	3	3	2	2
2	*Aerides* Lour.	8	4**	3	3	1	3
3	*Agrostophyllum* Bl.	5	2**	1	1	1	1
4	*Bryobium* Lindl.	-	1*	1	1	1	1
5	*Bulbophyllum* Thou.	97	35*	6	7	2	6
6	*Calanthe* R.Br.	23	11	1	1	-	-
7	*Cleisocentron* Bruhl.	1	1*	-	1	-	-
8	*Cleisostoma* Bl.	19	11*	4	5	2	3
9	*Coelogyne*	46	15*	1	2	-	-
10	*Cymbidium* Sw.	22	15*	1	2	1	1
11	*Dendrobium Sw.*	102	56*	12	15	2	6
12	*Dienia* Lindl.	3	1*	1	1	1	1
13	*Eria* Lindl.	53	15***	3	3	1	1
14	*Gastrochilus* D.Don	15	4*	-	2	-	-
15	*Geodorum*	6	4*	-	1	-	-
16	*Goodyera*	19	5*	1	1	-	-
17	*Hetaeria*	5	1*	1	1	-	1
18	*Liparis*	45	10*	1	2	-	-

19	*Luisia* Gaud.	16	5	2	2	2	2
20	*Micropera* Lindl.	4	4*	2	1	-	-
21	*Mycaranthes*	-	2*	1	1	-	-
22	*Oberonia* Lindl.	53	14*	1	1	-	1
23	*Papilionanthe* Schltr.	5	2*	1	1	1	1
24	*Peristylus* BL.	29	3	1	1	-	-
25	*Phaius*	7	4*	1	-	-	-
26	*Phalaenopsis* Bl.	16	10*	1	3	-	-
27	*Pholidota* Lindl.	7	6*	3	3	2	3
28	*Pinalia* Lindl.	-	8*	3	2	-	1
29	*Rhynchostylis* Bl.	2	1*	1	1	1	1
30	*Robiquetia* Gaud.	4	2*	1	1	1	1
31	*Thelasis*	4	2*	1	1	-	-
32	*Vanda* Jones ex .R.Br.	16	7*	1	2	-	-
33	*Zeoxine* Lindl.	19	10*	1	-	-	-

* Gogoi, 2017 Wild Orchids of Assam -A pictorial guide
**Sharma *et al*, 2006, Orchids of Assam: I. A Systematic approach
*** Chowdhury, 2005 Assam,s Flora (Present Status of Vascular Plants).

Plate 1: Natural view of the forests a- Tinkopani RF b- Namphai RF c- Kotha RF d-*Rhynchostylis* shelter by *Lagerstroemia* in Kotha RF e- Illegal rat hole coal mining in Namphai RF f- Destruction of orchids by felling tree in Tinkopani RF

Plate 2

References

1. Barua Kuntala N, Bora B, Borah A. Diversity and ex situ conservation of orchid species in Lekhapani Reserve Forest under Makum Coal Field, Assam. Journal of Orchid Society of India,2020:33:113-119.
2. Barua IC. Orchid flora of Kamrup District, Assam (With illustration) Bishen Singh Mahendra Pal Singh. 23- A Connaught Place DehraDun 248001, 2001.
3. Barua IC, Barua Kuntala N. A New species of Zduxine Orchidaceae) from Assam, India. Journal of Economic Taxonomic Botany,1997:21(2):491-494.
4. Champion SHG, Seth SK. A review survey of the forest types of India. Manager of publication. Govt. of India. New Delhi, 1968.
5. Chowdhery HJ. Orchid diversity in North Eastern states. Journal of Orchid Society of India,2009:23(1-2):17-25.
6. Chowdhury S, Assam S. Flora (Present Status of Vascular Plants) Assam Science Technology & Environment Council. Silpukhuri, Guwahati 781003, Assam, India, 2005.
7. Dey S, Lahkar BP, Das JP, Nath NK, Brahma N. Orchid Diversity in Manas National Park, Assam. Journal of Orchid Society of India,2007:21(1-2):65-68.
8. Bhattacharjee B, Dutta BK, Hajra PB. *Orchid Flora of Southern Assam (Barak Vally) Diversity and their conservation*. Bishen Singh Mahendra Pal Singh, 23-A, New Connaught Place, Dehra Dun, India, 2018.
9. Gogoi K. *Dendrobium* of Joypur Reserve Forest of Dibrugarh District of Assam. NeBIO,2011:2(1):20-26.
10. Gogoi K. A checklist of orchids in Tinsukia District of Assam, India. Pleione,1912:6(1):5-26.
11. Gogoi K. *Wild Orchids of Assam A pictorial guide*. Assam State Biodiversity Board, 2017.
12. Gogoi K, Borah RL, Sharma GC. Additions to the *Orchid* flora of Joypur Reserve Forest in Dibrugarh district of Assam, India. Pleione,2011:5(1):65-70.
13. Gogoi K, Borah RL, Sharma GC, Yonzone R. Present status of Orchid species Diversity Resources and Distribution in Dibrugarh District of Assam of North East India. Inter. Journal of Modern Botany,2012:2(2):19-33.
14. Govaerts R. World Checklist of Monocotyledons Database in ACCESS:1-71827. The Board of Trustees of the Royal Botanical Gardens, Kew, 2003.
15. Pridgeon AM. Status survey and conservation Action Plan Orchids ed. Eric Hagsater and Vinciane Dumont. IUCN, Gland, Switzerland and Cambridge, UK, 1996.
16. Seidenfaden G. Orchid genera in Thailand XII. *Dendrobium* Sw. Opera botanica,1986:83:5-255.
17. Tandon P, Abrol YP, Kumaria S. In: Biodiversity and its significance, IK International Pvt Ltd, 2007, 370.
18. Vij SP. Orchidology in India current status. In Orchids: Conservation, Culture, Farming and Trade (S.N.Hegde, Eds.), Himalayan Publishers, Delhi-Itanagar, 2001.