

Species diversity of Orchids in Bukit Barisan Selatan National Park, Lampung, Indonesia

ESTI MUNAWAROH[✉], YUZAMMI^{✉✉}

Center for Plant Conservation Botanic Gardens, Indonesia Institut of Sciences. Jl. Ir. H. Juanda 13, Bogor 16122, West Java, Indonesia

Tel./fax. +62-251-8322187 ✉email: munawaroh.esti@yahoo.com ✉✉ yuzammi@yahoo.co.id

Manuscript received: 28 September 2018. Revision accepted: 30 December 2018.

Abstract. Munawaroh E, Yuzammi. 2019. *Species diversity of Orchids in Bukit Barisan Selatan National Park, Lampung, Indonesia. Biodiversitas 20: 343-349.* Orchids, belonging to the family Orchidaceae, are well known ornamental plants due to their beautiful flowers and varied colors. The members of this family have received more scientific attention than other plant families because of their unique botanical features and economic value. This study was conducted to explore and record the species diversity of Orchidaceae in Sumatera, especially in the Bukit Barisan Selatan National Park (BBSNP), Lampung, Indonesia. This research was carried out from 2011 to 2014 at four locations, namely Kubu Perahu Resort, Sukaraja Atas Resort, Pugung Tampak Resort and Sekincau Resort, using purposive sampling method. A total of 132 species belonging to 52 genera of orchids have been identified from BBSNP, Lampung, of which 37 genera are epiphytic orchids and 15 genera are terrestrial orchids. Two species namely, *Vanda sumatrana* and *Grammatophyllum speciosum*, have been recognized as protected species. *Vanda sumatrana* is also endemic to Sumatera. These orchids are also cultivated at Liwa Botanic Garden, as an *ex situ* conservation.

Keywords: Botanical exploration, Bukit Barisan Selatan National Park, orchids, species diversity

INTRODUCTION

Orchids produce most beautiful flowers and their color variations are unlimited, which makes them one of the most popular groups of ornamental plants. As unique plants, orchids get more attention than other plants, especially after the orchid plant group has been recognized to have good economic value (Purwantoro 2005).

Indonesia is home to a large amount of biodiversity with approximately 25,000-30,000 species of flowering plants (Zuhud et al. 2003), while the wealth of orchids in Indonesia is estimated to be around 5,000 species (Rukmana 2000). The island of Sumatera has been found to be having approximately 139 genera and 1,118 species of orchids (Comber 2001).

The high species diversity of orchids in Indonesia has also been indicated by the facts that 38 species of orchids have been reported at an altitude of 1300-1500 m above sea level, and 30 species of orchids at an altitude of 1500-1750 m above sea level, in the tourist forest Taman Eden, North Sumatera (Yahman 2009). The diversity of orchid species, both epiphytic and terrestrial, is more likely found at an altitude of 1300-1500 m above sea level than at other altitudes. The height of the place affects the diversity of plant species because it is related to the adaptations of plants to physical environmental conditions, such as temperature and humidity (Partomiharjo et al. 2005; Yahman 2009).

Bukit Barisan Selatan National Park (BBSNP) is one of the most important conservation areas in Sumatera, Indonesia, with an ecosystem that is rich in biodiversity. This area represents the Bukit Barisan mountain range

which consists of various types of forest vegetation, including mangrove forests, coastal forests, tropical temperate forests and mountain forests. BBSNP extends from Bengkulu Province in the north through the Bukit Barisan Mountains to the southern tip of Lampung Province. Administration division shows that around 70% of BBSNP area is included in Tanggamus District and West Lampung District, Lampung Province and the rest goes to South Bengkulu District, Bengkulu Province. Its declaration as a national park is to protect the tropical rainforests of the island of Sumatera along with the biological natural wealth contained in it (MoF 2008).

The shift in land functions that leads to habitat fragmentation and opening, can reduce the wealth of living species including plants (Franklin et al. 2002). According to WWF (2007), many forest areas in Bukit Barisan Selatan National Park have been turned into agricultural land and settlements. Such habitat fragmentation reduces seed dispersal, speed of regeneration, and changes habitat conditions including influencing the physical properties of the soil (Rahmawati 2007) canal of which collectively causes biodiversity depletion and local species extinctions (Moran et al. 2009).

The development of regional botanical gardens is one of the national priority programs of Indonesia, and as a result, the country now has several prospective new botanical gardens in various regions. Various developmental efforts have been made to complement the plant collections in these botanical gardens. One of the prospective botanical gardens that is coming up actively is the Liwa Botanic Gardens whose plant collection aims to represent the native plants from the Bukit Barisan region of

Sumatera, especially the Bukit Barisan Selatan.

On this background, botanical exploration was needed in order to prepare an inventory of orchid species of the Bukit Barisan Selatan National Park, and also for collecting live specimens or planting materials of various orchids for attempting their *ex-situ* conservation at the Liwa Botanic Gardens, located in West Lampung District, Lampung Province. This report is the outcome of such an effort undertaken by the authors.

MATERIALS AND METHODS

This research was conducted in four locations of Bukit Barisan Selatan National Park, of the Lampung Province area, Indonesia namely, (i) Kubu Perahu Resort, Liwa, West Lampung District, (ii) Sukaraja Atas Resort, Semaka, Tanggamus District, (iii) Pugung Tampak Resort, Rata Agung, Pesisir Barat District, and (iv) Sekincau Resort, Way Tenong, West Lampung District. The method used in this study was an exploratory method. The entire forest area was explored and an inventory of orchid plants found along the exploration pathway was prepared. Every encountered species was collected and all data and information about the plants collected along with the

environmental data were recorded in the field book. The collected data contains the family name, species name, habitat conditions, altitude, latitude and longitude positions, and morphological data. Living collection protocol of Botanic Gardens was followed during plant collections (BGCI 1995).

Epiphytic hanging and watering during every morning is the field maintenance followed for collected epiphytic orchids. Terrestrial orchids of smaller size were wrapped in wet tissues media, while larger terrestrial orchids were grown with compost media that has been soaked in water. Then, they were covered with plastic bags of 100x50 cm size. Every day, they are kept open approximately for 1-2 hours.

For orchids of unknown identity, herbarium specimens were prepared for the purpose of further identification (Rugayah et al. 2004). Field data was recorded including the name of the location, benefits, habitat, and ecology. Photographic documentation was also carried out to complement and support data. Collections were identified based on vegetative morphology as well as flower and fruit morphology, with the help of relevant literature such as Suryowinoto (1988), Seidenfoden and Wood (1992) and Comber (2001).

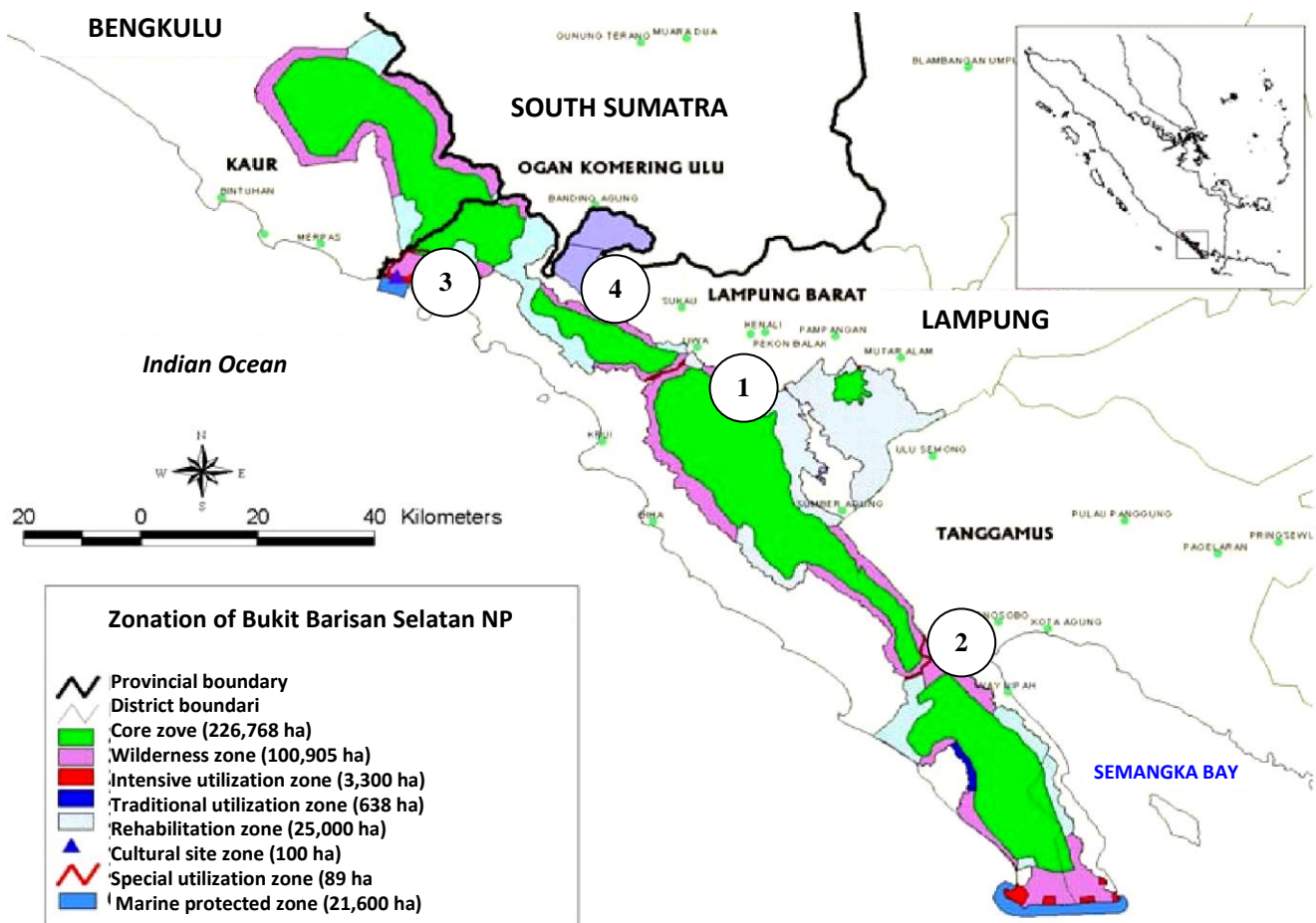


Figure 1. Map of the Bukit Barisan Selatan National Park, Sumatra, Indonesia showing the research locations: 1. Kubu Perahu Resort, 2. Sukaraja Atas Resort, 3. Pugung Tampak Resort, and 4. Sekincau Resort

Orchid plants collected during exploration of Bukit Barisan Selatan National Park were then acclimatised in the nursery of Liwa Botanical Gardens. Terrestrial orchids were planted in pots of 15 cm in diameter size, epiphytic compost and soil media comprising a ratio of 1: 1. Epiphytic orchids were grown with ferns or charcoal.

RESULTS AND DISCUSSION

The Bukit Barisan Selatan National Park forest area, which has vegetation of large sized trees and relatively close canopy cover, is the habitat of many species of epiphytic and terrestrial orchids that grow in the protected areas. Ecologically, the diversity of orchid species in the Bukit Barisan Selatan National Park is closely dependent on the other flora. It is well known fact that the species of natural orchids generally depends on the surrounding tree vegetation. Exploration and inventorisation conducted in four locations of Bukit Barisan Selatan National Park resulted in the recording of 132 species of orchids from 52 genera. The genus with highest number of species recorded is *Eria* (14 species), and the other genera listed according to decreasing number of species are: *Dendrobium* (13 species), *Coelogyne* (8 species), *Bulbophyllum* and *Liparis* (each 6 species), *Appendicula* and *Pholidota* (each 5 species), *Cymbidium* and *Thrixspermum* (4 species), *Agrostophyllum*, *Calanthe*, *Malaxis*, *Phaius*, *Pomatocalpa*, *Tainia* and *Thelasis* (3 species each), *Acriopsis*, *Dendrochilum*, *Flickingeria*, *Nervilia*, *Neuwiedia*, *Oberonia*, *Polystachya*, *Sarcostoma* and *Tropidia* (2 species each). Genera with one species each are: *Canthephippium*, *Anoectochilus*, *Cadetia*, *Chelonistele*, *Claderia*, *Corymborkis*, *Diglyphosa*, *Dipodium*, *Eulophia*, *Grammatophyllum*, *Hippeophyllum*, *Hylophila*, *Lepidogyne*, *Malleola*, *Micropora*, *Ephelaphyllum*,

Oberonia, *Phalaenopsis*, *Robiquetia*, *Spathoglottis*, *Thecostele*, *Trichoglottis*, *Trichotosia* and *Vanda* (Table 1).

The diversity of orchid species found in each study location of the southern Bukit Barisan National Park varies. The highest orchid diversity of 78.7% (103 species) of total species was found at Kubu Perahu Resort, while Pugung Tampak Resort has 24.22% (32 species), diversity of upper Sukaraja Resort was 19.69% (26 species) and the lowest diversity of 12.12% (16 species) of all species found was at Resort Sekincau (Figure 2).

Many factors influence differences in species diversity, such as sunshine, humidity, altitude, species adaptability, and surrounding tree vegetation, as well as damage to the area. This is closely related to the geographic distribution of each location (Gunadi 1979).

Diversity of epiphytic orchids

Species of epiphytic orchids in the Bukit Barisan Selatan National Park have different habitats. They usually live on stems or branches of plants that are still alive or that have collapsed or are dead. However, in general, epiphytic orchids live on the substrate that are suitable for their survival. Orchids do not have a specific relationship with the host, but hosts play a greater role as a micro climate support (Puspitaningtyas 2001). The orchid root has a soft part (sponge) which is useful for absorbing nutrients from air or water in the rainy season, and is usually used by orchids whose roots have not been attached to the host substrate (Gunadi 1985).

The diversity of epiphytic orchids in the Bukit Barisan Selatan National Park was 106 species from 37 genera (Figure 3). Some species of monopodial orchids that grow as epiphytes include *Malleola baliensis*, *Trichoglottis tricostata* and *Vanda sumatrana*. The species of epiphytic sympodial orchids include *Agrostophyllum* spp., *Appendicula* spp., *Bulbophyllum* spp., *Coelogyne* spp., *Cymbidium* spp. and *Flickingeria* spp.

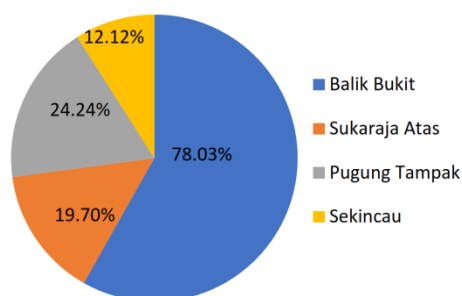


Figure 2. Relative orchid species diversity at different research locations of Bukit Barisan Selatan National Park, Sumatera, Indonesia

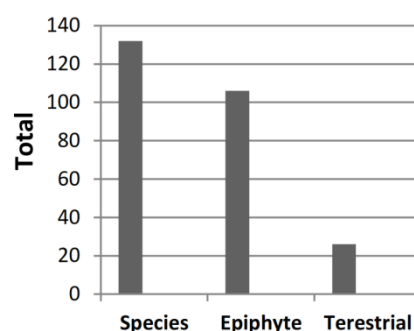


Figure 3. The diversity of epiphytic and terrestrial orchids in the Bukit Barisan Selatan National Park, Sumatera, Indonesia

Table 1. The list of orchid plants identified from four study locations of Bukit Barisan Selatan National Park, Sumatera, Indonesia. 1. Kubu Perahu Resort, 2. Sukaraja Atas Resort, 3. Pugung Tampak Resort, 4. Sekincau Resort

Genus	Species Name	Locations				Habitat
		1	2	3	4	
<i>Acanthephippium</i>	<i>Acanthephippium javanicum</i> Blume	●	-	-	-	Terrestrial
<i>Acriopsis</i>	<i>Acriopsis javanica</i> Reinw.	●	●	-	●	Epiphytic
	<i>Acriopsis liliifolia</i> (J. Konig.) G. Seidenfaden	●	-	-	-	Epiphytic
<i>Adenoncos</i>	<i>Adenoncos parviflora</i> Ridl.	●	-	-	-	Epiphytic
	<i>Adenoncos virens</i> Blume	●	-	-	-	Epiphytic
<i>Agrostophyllum</i>	<i>Agrostophyllum bicuspidatum</i> J.J.Smith	●	●	●	-	Epiphytic
	<i>Agrostophyllum majus</i> Hook.f.	●	●	●	-	Epiphytic
	<i>Agrostophyllum stipulatum</i> Griff. Schltr	-	-	-	●	Epiphytic
<i>Anoectochilus</i>	<i>Anoectochilus reinwardtii</i> Blume	-	●	●	-	Terrestrial
<i>Appendicula</i>	<i>Appendicula congenera</i> Blume	●	-	-	-	Epiphytic
	<i>Appendicula cornuta</i> Blume	●	-	●	-	Epiphytic
	<i>Appendicula elegans</i> Rchb.f.	●	-	-	-	Epiphytic
	<i>Appendicula torta</i> Blume	-	●	-	-	Epiphytic
	<i>Appendicula undulata</i> Blume	●	-	●	-	Epiphytic
<i>Ascidieria</i>	<i>Ascidieria longifolia</i>	●	-	-	-	Epiphytic
<i>Bulbophyllum</i>	<i>Bulbophyllum biflorum</i> T. & B.	●	-	-	-	Epiphytic
	<i>Bulbophyllum flavescens</i> (Blume) Lindl.	●	●	-	-	Epiphytic
	<i>Bulbophyllum lepidum</i> (Blume) J.J.Sm.	-	-	-	●	Epiphytic
	<i>Bulbophyllum lobbii</i> Lindl.	-	-	-	●	Epiphytic
	<i>Bulbophyllum odoratum</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Bulbophyllum pahudii</i> (De Vr.) Rchb.f.	●	-	-	-	Epiphytic
<i>Cadetia</i>	<i>Cadetia taylori</i> Scitlect.	●	-	-	-	Epiphytic
<i>Calanthe</i>	<i>Calanthe pulchra</i> (Blume) Lindley	●	-	-	-	Terrestrial
	<i>Calanthe triplicata</i> (Willemet) Ames	●	-	●	●	Terrestrial
	<i>Calanthe zollingeri</i> Rchb.f.	●	-	-	-	Terrestrial
<i>Chelonistele</i>	<i>Chelonistele sulphurea</i> (Blume) Pfitzer	●	-	-	-	Epiphytic
<i>Claderia</i>	<i>Claderia viridiflora</i> Hook. f.	●	-	-	-	Terrestrial
<i>Coelogyne</i>	<i>Coelogyne asperata</i> Lindl.	-	-	●	-	Epiphytic
	<i>Coelogyne foerstermannii</i> Rchb.f.	-	-	●	-	Epiphytic
	<i>Coelogyne miniata</i> (Blume) Lindley	-	-	-	●	Epiphytic
	<i>Coelogyne prasina</i> Ridl.	●	-	-	-	Epiphytic
	<i>Coelogyne rochussenii</i> De Vr.	●	●	-	-	Epiphytic
	<i>Coelogyne salmonicolor</i> Rchb.f.	●	-	-	-	Epiphytic
	<i>Coelogyne speciosa</i> (Blume) Lindl.	-	-	-	●	Epiphytic
	<i>Coelogyne xyrekes</i> Ridl.	●	-	-	-	Epiphytic
<i>Corymborkis</i>	<i>Corymborkis veratrifolia</i> (Reinw.) Blume	●	●	●	●	Terrestrial
<i>Cymbidium</i>	<i>Cymbidium bicolor</i> Lindl.	●	-	-	-	Epiphytic
	<i>Cymbidium dayanum</i> Rchb. f.	●	-	-	-	Epiphytic
	<i>Cymbidium ensifolium</i> (L.) Sw.	●	-	●	-	Epiphytic
	<i>Cymbidium finlaysonianum</i> Lindl.	●	-	●	-	Epiphytic
<i>Dendrobium</i>	<i>Dendrobium acuminatissimum</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Dendrobium cruminatum</i> Swartz	●	●	●	-	Epiphytic
	<i>Dendrobium heterocarpum</i> Wall. Ex Lindl.	●	-	-	-	Epiphytic
	<i>Dendrobium kruianense</i> J.J. Simith.	●	-	-	-	Epiphytic
	<i>Dendrobium lamellatum</i> (Blume) Lindl.	-	-	●	-	Epiphytic
	<i>Dendrobium leonis</i> (Lindl.) Rchb.f.	-	●	●	-	Epiphytic
	<i>Dendrobium lobatum</i> (Blume) Miq.	●	-	-	-	Epiphytic
	<i>Dendrobium montanum</i> J.J.Sm.	-	-	-	●	Epiphytic
	<i>Dendrobium pachyphyllum</i> (O.K.) Bakh.f.	-	-	●	-	Epiphytic
	<i>Dendrobium rosellum</i> Ridl.	-	●	-	-	Epiphytic
	<i>Dendrobium salaccense</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Dendrobium sanguinolentum</i>	●	-	-	-	Epiphytic
	<i>Dendrobium setifolium</i> Ridley	●	-	-	-	Epiphytic
<i>Dendrochilum</i>	<i>Dendrochilum longifolium</i> Rchb.f.	●	-	-	-	Epiphytic
	<i>Dendrochilum palide-flavens</i> Blume	●	-	-	-	Epiphytic
<i>Diglyphosa</i>	<i>Diglyphosa latifolia</i>	●	-	-	-	Epiphytic
<i>Dipodium</i>	<i>Dipodium scandens</i> (Blume) J.J.Sm.	●	-	-	-	Epiphytic
<i>Eria</i>	<i>Eria aporoides</i> Lindl.	●	-	-	-	Epiphytic
	<i>Eria citrina</i> Ridl.	●	-	-	-	Epiphytic
	<i>Eria flavescens</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Eria iridifolia</i> Hook.f.	●	●	-	●	Epiphytic
	<i>Eria javanica</i> (Swartz) Blume	●	●	●	-	Epiphytic
	<i>Eria junghuhnii</i> J.J.S.	●	-	-	-	Epiphytic
	<i>Eria leiophylla</i> Lindley	-	●	-	-	Epiphytic
	<i>Eria monostachya</i> Lindl.	●	-	-	-	Epiphytic

	<i>Eria nutans</i> Lindl.	-	-	●	-	Epiphytic
	<i>Eria ornata</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Eria pachystachya</i> Lindl.	●	-	-	-	Epiphytic
	<i>Eria pannea</i> Lindl.	-	●	-	-	Epiphytic
	<i>Eria retusa</i> (Blume) Rchb.f.	-	●	-	-	Epiphytic
	<i>Eria rigida</i> Blume	●	-	-	-	Epiphytic
<i>Eulophia</i>	<i>Eulophia spectabilis</i> (Dennst.) Suresh	●	-	-	-	Epiphytic
<i>Flickingeria</i>	<i>Flickingeria bancana</i> (J.J. Smith) A.D. Hawkes	●	-	-	-	Epiphytic
	<i>Flickingeria fimbriata</i> (Blume) Hawkes	●	-	-	-	Epiphytic
<i>Grammatophyllum</i>	<i>Grammatophyllum speciosum</i> Blume	●	-	●	-	Epiphytic
<i>Grosourdyia</i>	<i>Grosourdyia appendiculata</i> (Blume) Rchb.f.	-	●	●	-	Epiphytic
<i>Hippeophyllum</i>	<i>Hippeophyllum schortechinii</i>	●	-	-	-	Epiphytic
<i>Hylophila</i>	<i>Hylophila lanceolata</i> Hook.f.	●	-	-	-	Terrestrial
<i>Lepidogyne</i>	<i>Lepidogyne longifolia</i> (Blume) Blume	●	-	-	-	Terrestrial
<i>Liparis</i>	<i>Liparis condylobulbon</i> Rchb.f.	●	●	●	-	Epiphytic
	<i>Liparis gibbosa</i> Finet	-	-	-	●	Epiphytic
	<i>Liparis latifolia</i> (Blume) Lindley	●	●	-	-	Epiphytic
	<i>Liparis parviflora</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Liparis viridifolia</i> (Blume) Lindl.	●	-	-	-	Epiphytic
	<i>Liparis wrayii</i> Hook. f.	●	-	-	-	Epiphytic
<i>Malaxis</i>	<i>Malaxis latifolia</i> J.J.Sm.	●	-	-	-	Terrestrial
	<i>Malaxis obovata</i> Ames & Schweinf.	●	-	-	-	Terrestrial
	<i>Malaxis rheedii</i> B. Heyne ex Wallace	●	-	-	●	Terrestrial
<i>Malleola</i>	<i>Malleola baliensis</i> J.J.Sm.	●	-	-	-	Epiphytic
<i>Micropera</i>	<i>Micropera callosa</i> (Blume) Garay	●	-	-	-	Epiphytic
<i>Nephelaphyllum</i>	<i>Nephelaphyllum pulchrum</i> Blume	●	-	-	-	Epiphytic
<i>Nervilia</i>	<i>Nervilia aragoana</i> Gaud.	-	-	●	-	Terrestrial
	<i>Nervilia punctata</i> (Blume) Schltr.	-	-	●	-	Terrestrial
<i>Neuwiedia</i>	<i>Neuwiedia javanica</i> J.J.Smith.	-	-	●	-	Terrestrial
	<i>Neuwiedia zollingerii</i> Rchb. f.	●	-	-	-	Terrestrial
<i>Oberonia</i>	<i>Oberonia anceps</i> Lindl.	●	-	-	-	Epiphytic
	<i>Oberonia stenophylla</i> Ridl.	●	-	-	-	Epiphytic
<i>Phaius</i>	<i>Phaius flavus</i> (Blume) Lindl.	●	-	-	-	Terrestrial
	<i>Phaius pauciflorus</i> (Blume) Blume	●	-	-	-	Terrestrial
	<i>Phaius tankervilleae</i> (W.Aiton) Blume	●	-	-	-	Terrestrial
<i>Phreatia</i>	<i>Phreatia scunda</i> Lindl.	●	-	-	-	Epiphytic
<i>Pholidota</i>	<i>Pholidota articulata</i> Lindley	●	●	-	-	Epiphytic
	<i>Pholidota carnea</i> (Blume) Lindley	●	-	-	●	Epiphytic
	<i>Pholidota gibbosa</i> (Blume) De Vr.	●	-	-	-	Epiphytic
	<i>Pholidota imbricata</i> Lindl.	●	-	-	-	Epiphytic
	<i>Pholidota ventricosa</i> (Blume) Rchb.f.	●	-	-	-	Epiphytic
<i>Plocoglottis</i>	<i>Plocoglottis javanica</i> Blume	●	●	-	-	Terrestrial
<i>Polystachya</i>	<i>Polystachya concreta</i> (Jacq.) Garay & Sweet	-	-	●	-	Epiphytic
	<i>Polystachya flavescens</i>	●	-	-	-	Epiphytic
<i>Pomatocalpa</i>	<i>Pomatocalpa kunstleri</i> (Hook.f.) J.J.Sm.	●	●	●	-	Epiphytic
	<i>Pomatocalpa latifolia</i> (Lindley) J.J. Smith	-	-	●	-	Epiphytic
	<i>Pomatocalpa spicata</i> Breda	-	-	●	-	Epiphytic
<i>Robiquetia</i>	<i>Robiquetia spathulata</i>	●	-	-	-	Epiphytic
<i>Sarcostoma</i>	<i>Sarcostoma javanica</i> Blume	●	-	-	-	Epiphytic
<i>Schoenorchis</i>	<i>Schoenorchis micrantha</i> Blume	●	●	-	-	Epiphytic
<i>Spathoglottis</i>	<i>Spathoglottis plicata</i> Blume	●	-	-	-	Terrestrial
<i>Tainia</i>	<i>Tainia elongata</i> J.J. Simith.	●	-	-	-	Terrestrial
	<i>Tainia maingayi</i> Hook.f.	●	-	-	-	Terrestrial
	<i>Tainia pauciflora</i> (Brenda) J.J.Smith	●	-	●	-	Terrestrial
<i>Thecostele</i>	<i>Thecostele alata</i> (Roxb.) Par. & Rchb.	●	●	●	-	Epiphytic
<i>Thelasis</i>	<i>Thelasis carinata</i> Blume	●	-	●	-	Epiphytic
	<i>Thelasis micrantha</i> (Brongn.) J.J.Sm.	-	●	●	-	Epiphytic
	<i>Thelasis pygmaea</i> Lindl.	●	-	-	-	Epiphytic
<i>Thrixspermum</i>	<i>Thrixspermum acutilobum</i> J.J.Sm.	-	-	-	●	Epiphytic
	<i>Thrixspermum centipeda</i> Lour.	●	-	-	-	Epiphytic
	<i>Thrixspermum subulatum</i> (Blume) Rchb.f.	-	-	-	●	Epiphytic
	<i>Thrixspermum trichoglottis</i> Kuntz.	●	●	-	-	Epiphytic
<i>Trichoglottis</i>	<i>Trichoglottis tricosata</i> J.J. Smith.	●	-	-	●	Epiphytic
<i>Trichotosia</i>	<i>Trichotosia pauciflora</i> Blume	●	-	-	-	Epiphytic
<i>Tropidia</i>	<i>Tropidia angulosa</i> Blume	●	-	-	-	Terrestrial
	<i>Tropidia curculigoides</i> Lindl.	●	-	●	-	Terrestrial
<i>Vanda</i>	<i>Vanda sumatrana</i> Schlecht.	●	-	-	-	Epiphytic

Note: ●: present, -: absent

The genus with maximum species of epiphytic orchids in the Bukit Barisan Selatan National Park is *Eria*, followed by *Dendrobium*, *Coelogyne*, *Bulbophyllum* and *Liparis*. These species are usually found at an altitude of 500-900 m asl, with an average ambient temperature of 27°C and humidity of 90-100%. Many of these orchids attached on the branches of trees which were about 20 m and more in height. The epiphytic orchids found in the Bukit Barisan Selatan National Park generally were not in flowering stage except a few of them. The highest diversity of epiphytic orchids was found in Kubu Perahu Resort location, at an altitude of 500-750 m above sea level and its humidity was quite high. These species were found in this resort including *Adenoncos parviflora*, *Adenoncos virens*, *Acriopsis javanica*, *Appendicula cornuta*, *Appendicula elegans*, *Appendicula congenera*, *Agrostophyllum bicuspidatum*, *Agrostophyllum wise*, *Cleisostoma javanica*, *Dendrobium acuminatissimum*, *Dendrobium heterocarpum*, *Dendrobium kruianse*, *Dendrobium lobatum*, *Dendrobium lobatum*, *Eria iridifolia*, *Eria ornata*, *Eria pachystachya*, *Hippeophyllum schortechinii*, *Oberonia anceps*, *Oberonia stenophylla*, *Phreatia scunda*, *Polystachya concreta*, *Sarcostoma javanica*, *Schoenorchis micrantha*, *Thelasis micrantha*, *Thelasis pygmaea*, *Trichotosia pauciflora*, *Thrixspermum centipeda* and *Thrixspermum trichoglottis*

Epiphytic orchids were found in locations where close to the rivers grow in tall trees and get approximately 25-50% of sunlight. Among such species are: *Adenoncos virens*, *Appendicula elegans*, *Coelogyne speciosa*, *Coelogyne xyrekes*, *Cymbidium dayanum*, *Eria iridifolia*, *Grammatophyllum speciosum*, *Hippeophyllum schortechinii*, *Robiquetia spathulata*, *Thelasis carinata* and *Vanda sumatrana*

The epiphytic orchids are commonly found, at least in three study areas in the Bukit Barisan Selatan National Park, viz: *Agrostophyllum bicuspidatum*, *Agrostophyllum majus*, *Dendrobium cruminatum*, *Eria iridifolia*, *Eria javanica*, *Liparis condylobulbon*, *Pomatocalpa kunstleri*, *Thecostele alata* and *Thelasis micrantha*. These orchids species are, therefore, widely distributed at Bukit Barisan Selatan National Park.

Other species of epiphytic orchids, *Dipodium scandens* for example, is climber orchid or its hanging on small trees. This orchid initially grew on the ground and after a long time it would attached to tree trunks. *D. scandens* is only found at Kubu Perahu Resort.

Terrestrial orchid diversity

Terrestrial orchids in the study region are quite diverse, with 26 species from 15 genera (Figure 3). The soil surface which is highly moist and full of humus formed by litter, is thought to be very supportive for the growth of various species of terrestrial orchids such as *Anoectochilus reinwardtii*, *Calanthe pulchra*, *Calanthe zollingeri*, *Hylophila lanceolata*, *Malaxis latifolia*, *Malaxis obovata*, *Malaxis rheedii*, *Nervilia aragoana*, *Nervilia punctata*, *Neuwiedia javanica*, *Phaius flavus*, *Phaius pauciflorus*, *Phaius tankervilleae*, *Tainia elongata*, *Tainia maingayi*, *Tainia pauciflora* and *Tropidia angulosa*.

In the open slope area with high intensity of light, terrestrial orchids such as *Claderia viridiflora*, *Neuwiedia zollingerii*, *Spathoglotis plicata*, *Plocoglottis javanica* and *Tropidia curculigoides* are found. In this area, terrestrial orchids like *Calanthe triplicata*, *Corymborkis veratrifolia*, *Malaxis rheedii* and *Tropidia curculigoides* are found in large numbers.

Corymborkis veratrifolia is a species of orchid that easily adapts to the environment. Generally, it grows at an altitude of 0-1,100 m above sea level. This orchid prefers humus rich soil and sometimes it can also grow in dry places even though its fertility is somewhat less. This species is distributed in India and Southeast Asia to the Pacific Islands. In Indonesia, it is spread in Sumatera, Jawa, Kalimantan and Sulawesi (Hartini and Puspitaningtyas 2005)

Protected and endemic orchids

A plant species is included into protected of plant species group if it meets the following criteria: a) It has a small population, b) There is a sharp decrease in the number of its individuals in the world, and c) Limited distribution area. From the results of the present study, there are two epiphytic orchids that have been recognized as protected species, namely *Grammatophyllum speciosum* Blume, and *Vanda sumatrana* Schlecht. (PP 7/1999).

The species of *Grammatophyllum speciosum* is called a giant orchid (or sugar cane orchid) because it has a very large habit (Comber 2001). This is an epiphytic orchid where the stem can reach a length of 3 m. Initially the stem is erect and later becomes dangling. The lamina is ribbon-like, thin, 0.5-1 m long, 3-4 cm wide, tapered toward the tip. Inflorescence reaches 1-2 m long, consists of 50-100 florets, has abnormal flowers at the base of inflorescences of 1-5 flowers, a separate position from other normal flowers. The shape of corolla is irregular obovoid, wavy edges, yellow with reddish brown spots; 5x2.5 cm petals. Having small lips, 2 cm long, yellow with reddish brown stripes, purplish red velvet hair on the middle of lobes, curved upward lobes, growing in the branches of large and tall trees. This orchid prefers the tree canopy and requires more than 50% light intensity. This species generally grows at an altitudes of 100 to 1200 meters. It is distributed in Myanmar, Thailand, Laos, Vietnam, Malaysia, Kalimantan, Java, Maluku, Philippines, Sulawesi, Sumatra, Bismark Islands, Papua and New Guinea and Solomon Islands (Hartini and Puspitaningtyas 2005).

Another species of orchid found in this area that has been recognized as a protected species is *Vanda sumatrana* Schlecht. Comber (2001) mentioned that it is endemic to Sumatera. This species belongs to epiphytic orchid which has a stem growing up to 75 cm long, 1.5 cm in diameter. Initially the stem grows straight then hanging on the branch of tree as its growing older. The species has long leaf, 35 x 5 cm, splitting at a tip divided in two. Inflorescence consists of several rachises and up to 6 flowers on each. The flowers are dark brown on the petals and light brown in the labellum with a size of 5 cm. *Vanda's* labellum is quite large. As the name implies, *Vanda sumatrana* is restricted to the Sumatera region, found from middle to

high mountain of 300-1000 m altitude. In the Bukit Barisan Selatan National Park, this species is only found in the Kubu Perahu Resort.

One of the unique feature of the *Grammatophyllum speciosum* is the freshness of its flowers that can retain up to 2 months after cutting. *Vanda sumatrana* orchid is favored because of its beautiful flowers. These two species of orchids are in great demand by the public and thus their existence is protected by the government of Indonesia law (PP 7/1999).

REFERENCES

- BCGI. 1995. A handbook for botanic gardens on the reintroduction of plants to the wild. Botanic Gardens Conservation International, Surrey, UK
- Comber JB. 2001. Orchids of Sumatera. The Royal Botanic Garden, Kew
- Franklin AB, Barry RN, Luke TG. 2002. What is habitat fragmentation?. *Studies in Avian Biology* 25: 25-29.
- Gunadi T. 1985. *Kenal anggrek*. Penerbit Angkasa, Bandung.
- Gunadi T. 1979. Indonesian orchid. Congress and Orchid III Meeting. Indonesian Orchid Association, Bandung
- Hartini S, Puspitaningtyas DM. 2005. Exotic and potential flora of north Sumatra, Center for Plant Conservation Bogor Botanic Gardens
- MoF. 2008. Taman Nasional Bukit Barisan Selatan. Direktorat Jenderal Perlindungan Hutan & Kekayaan Alam (PHKA), Departemen Kehutanan Republik Indonesia, Jakarta. [Indonesian]
- Moran C, Catterall CP, Kanowski J. 2009. Reduced dispersal of native plant species as a consequence of the reduced abundance of frugivore species in fragmented rainforest. *Biology Conservation* 142: 541-552
- Partomiharjo T, Purwanto Y, Yayuk RS. 2005. Muller Mountains: World Heritage in the heart of Borneo. Center for Plant Conservation Botanic Gardens, Indonesia Institut of Sciences, Bogor.
- PP 7/1999. Peraturan Pemerintah No. 7 Tahun 1999 tentang : Pengawetan Jenis Tumbuhan dan Satwa. Jakarta. [Indonesian]
- Purwanto A. 2005. Orchid species kinship based on morphological properties of plants and flowers. Faculty of Agriculture, Gadjah Mada University. Yogyakarta. [Indonesian]
- Puspitaningtyas DM. 2001. The potential of natural orchid diversity in the Dolok Sipirok-North Sumatra Nature Reserve. In: *Prosiding Seminar Nasional Hortikultura Kongres Perhorti*, Malang.
- Rahmawati NE. 2007. Impact of forest land opening on physical, chemical and biological properties of soil (Study case at Deli Serdang Sibolangit Nature Park. [Thesis]. Faculty of Forestry, Bogor Agricultural University, Bogor. [Indonesian]
- Rugayah EA, Widjaja, Praptiwi. 2004. *Pedoman pengumpulan data keanekaragaman flora*. Pusat Penelitian Biologi, LIPI, Bogor. [Indonesian]
- Rukmana R. 2000. *Budidaya anggrek bulan*. Penerbit Kanisius, Yogyakarta. [Indonesian]
- Seidenfoden G, Wood JJ. 1992. *The Orchids of Peninsular Malaysia and Singapore*. Royal Botanic Gardens, Kew.
- Suryowinoto M. 1988. *Knowing Indonesian Natural Orchids (Mengenal Anggrek Alam Indonesia)*. Penebar Swadaya, Jakarta. [Indonesian]
- WWF. 2007. *Gone in an instant: How illegal coffee trading triggers the damage to Rhino, Elephant and Sumatran Tiger Habitat in the Bukit Barisan Selatan National Park, Sumatra, Indonesia*. WWF-Indonesia, Jakarta.
- Yahman. 2009. *Structure and composition of orchid plants in the Eden Garden Tourism Forest of Toba Samosir District, North Sumatra Province*. [Thesis]. University of North Sumatra, Medan. [Indonesian]
- Zuhud EAM, Siswoyo, Hikmat A, Sandra E, Adhiyanto E. 2003. *Buku Acuan Tumbuhan Obat Indonesia*. Fakultas Kehutanan IPB dan Yayasan Sarana Wanajaya, Jakarta. [Indonesian]