

Orchid inventory in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia

DWI MURTI PUSPITANINGTYAS

Center for Plant Conservation-Bogor Botanical Gardens, Indonesian Institute of Sciences. Jl. Ir. H. Djuanda No. 13, Paledang, Bogor 16122, West Java, Indonesia. Tel. +62-251-8322187, Fax. +62-251-8322187, *email: puspitakrb@yahoo.com

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Abstract. Puspitaningtyas DM. 2017. *Orchid inventory in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia. Biodiversitas 18: 341-350.* Bantimurung-Bulusaraung National Park, commonly abbreviated as Babul National Park, is in South Sulawesi. It occupies an area of 43,750 hectares between 119°34'17"-119°55'13" East and 4°42'49"-5°06'42" South. Babul National Park is an area in the transition zone between Asia and Australia and therefore has a unique flora and fauna. The study reported here aimed to inventory the orchid species in the Babul National Park area and to determine the orchid diversity in the area. The results of the study recorded approximately 60 orchid species found in Babul National Park. These were representative of 32 genera and consisted of 42 species of epiphytic orchids and 18 species of terrestrial orchids. The terrestrial orchid *Habenaria beccarii* and the epiphytic orchid *Aerides inflexa* were the most common orchids found, and were spread evenly throughout the Babul National Park area. *Coelogyne celebensis* and *Aerides inflexa* are endemic orchids of Sulawesi found within the Park. Three species of the genus *Nervilia*, i.e. *N. punctata*, *N. plicata*, and *N. aragoana*, were also found in this area. Some species of orchid such as *Tropidia angulosa*, *Coelogyne rumphii* and *Dendrobium lampongense* were found as *new records* in Sulawesi.

Keywords: Bantimurung-Bulusaraung National Park, inventory, orchid, South Sulawesi

INTRODUCTION

Indonesia has two of the 25 biodiversity hotspots in the world; Sundaland and Wallacea. Sulawesi Island is the largest island in Wallacea and the most geologically complex. It has a mix of oriental and Australian fauna and is location in which various types of endemic fauna have evolved (Coates et al. 2000). Up until now, the flora of Sulawesi has been recognized as unique and very diverse but much of this diversity has yet to be revealed. Schlechter (1925) estimated the number of endemic orchids of Sulawesi to be around 253 species, which significantly exceeded the estimate of 161 species recorded by Smith (1929). In the most recent review of the subject (Thomas and Schuiteman 2002), a preliminary study on the inventory of orchids in Sulawesi and Maluku, a total of 820 species were recorded of which 60% (548 species) are found in Sulawesi.

Bantimurung-Bulusaraung National Park, commonly abbreviated as Babul NP, was proposed as a conservation area or national park by the Ministry of Forestry Number: SK.398 / Menhut-II/2004 on October 18th, 2004. The area of the Park covers ± 43,750 ha (Rais et al. 2007). Administratively, the national park is located in the governmental districts of Maros District and Pangkajene Kepulauan (Pangkep) District, of South Sulawesi Province, Indonesia. Geographically, Babul NP is located between 119 ° 34'11 " -119 ° 55'13" E and 4 ° 43'10 " -5 ° 07'12" S. Babul NP is a unique environment, based largely on on karst formations, with caves that have beautiful stalactites. It is a recognized habitat for large butterfly populations,

which result in Bantimurung being known as the 'The Kingdom of Butterflies'. There are about 103 species of butterflies endemic to Sulawesi (Rais et al. 2007).

Exploration and research is an important step in efforts to safeguard plant diversity, including by methods of ex situ plant conservation. Botanical gardens as ex situ conservation institutions have an important role in plant species conservation, and in carrying out population studies, plant propagation, breeding, and reintroduction, which can also be broadly beneficial for the advancement of scientific knowledge. The aim of the research reported here was to inventory orchid diversity within the Bantimurung-Bulusaraung National Park (Babul NP) in South Sulawesi, Indonesia.

MATERIALS AND METHODS

The research was conducted in Bantimurung-Bulusaraung National Park (Babul NP), between March 15 and April 3, 2012. The objective was to observe orchid diversity in Babul NP. The exploration activity was based on plant collection by purposive random sampling (Partomihardjo and Rahajoe 2005). This was supplemented with environment data measured in Babul NP, such as elevation, humidity, temperature, soil acidity etc. The exploration activities were conducted at four locations: Tompo Bulu, Pattunuang, Bentenge, and Karaenta (Figure 1). The live material collected was mostly planted out in Bogor Botanical Gardens for ex situ conservation purposes. Such plant collections only have scientific value if they are

complemented by informative data such as the sites of collection and the conditions of the natural habitats. For orchids collected not in flower, it is usually only possible for an initial identification to be made to genus level. To identify to species level, it is usually necessary to observe the flower morphology. Identification methods used were by literature review (Sweet 1980; Comber 1990; Seidenfaden and Wood 1992; Gravendeel and de Vogel 2000; Comber 2001) and by reference to herbarium

specimens in the Herbarium Bogoriense and or living collections in the Bogor Botanical Gardens. Valid names were attributed based on the current listings in The Plant List (2013) (www.theplantlist.org). Plants were only sampled and collected for those species that were abundant in the field, so as to support in situ preservation of the species. Some rare species were not sampled and were only recorded or photographed for documentation.

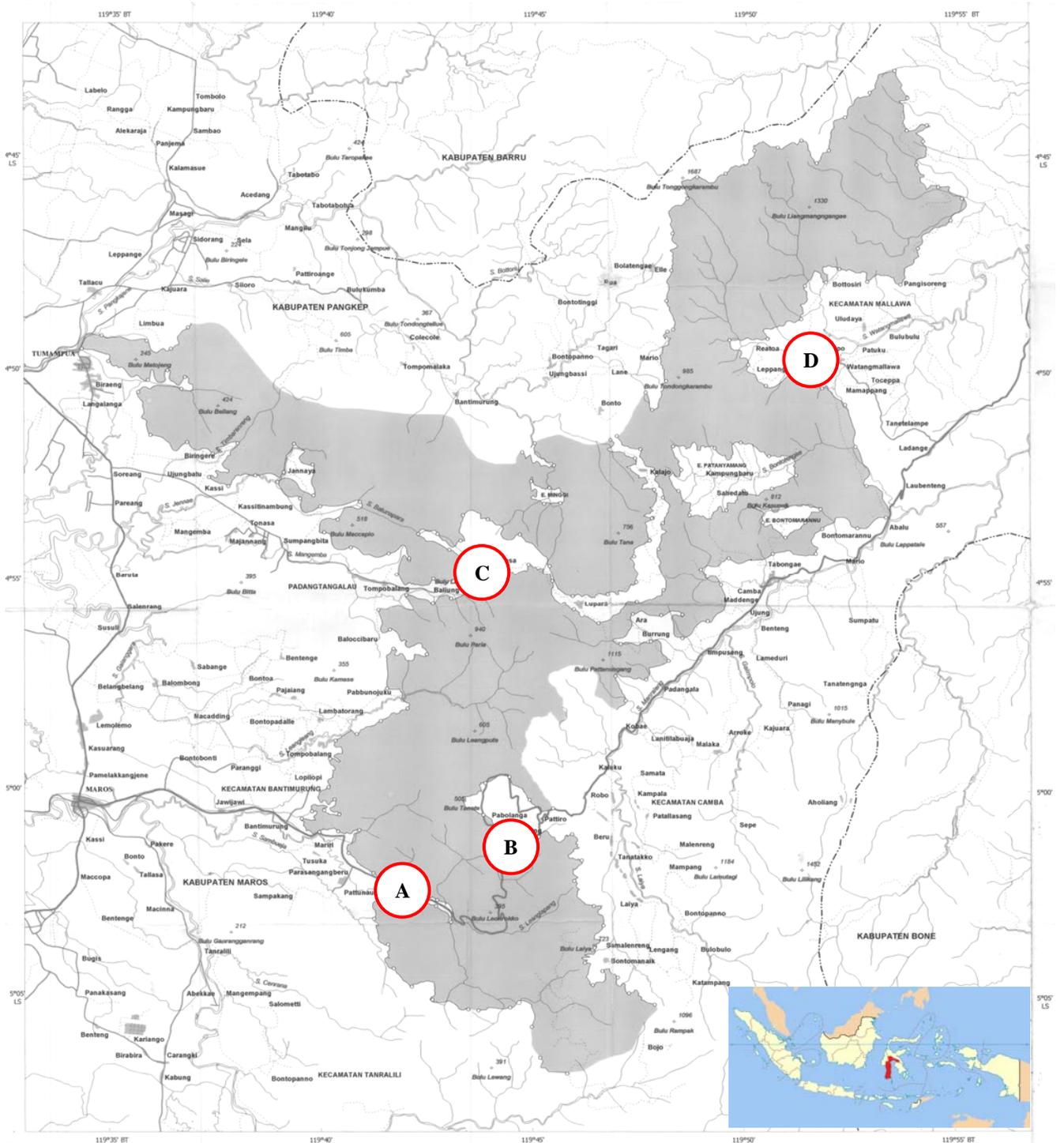


Figure 1. Location of exploration activities in Bantimuring-Bulusaraung National Park, South Sulawesi, Indonesia. A. Pattunuang, B. Karaenta, C. Tompo Bulu, D. Bentenge

RESULTS AND DISCUSSION

Sixty species of Orchidaceae were identified in the results of the inventory of Babul NP. The species were from 32 genera (Figure 2) and comprised 42 species of epiphytic orchid and 18 species of terrestrial orchid. Details of the species found along with their habitus and locations of discovery are presented in Table 1. The habitat conditions in four locations: Tompo Bulu, Pattunuang, Bentenge, and Karaenta are recorded as secondary data for completing information. The habitat in Tompo Bulu is described as disturbed secondary forest. Exploration in this habitat was carried out at an altitude between 539 and 826 m above sea level (m asl.); the degree of soil acidity (soil pH) was 6.5 and humidity (RH) was 85%. The habitat in Pattunuang is described as disturbed primary forest growing on karst rock terrain. Exploration here was carried out at an altitude between 60 and 167 m asl., soil pH was 6.2 and RH was 75%. The habitat in Bentenge is described as disturbed secondary forest. Exploration was carried out at an altitude between 793 and 800 m asl., the soil pH was 6.5; RH was 85%. The habitat in Karaenta is described as disturbed primary forest growing on karst rock terrain. Exploration was carried out at an altitude between 275 and 318 m asl., soil pH was 6.2; RH was 75%.

Terrestrial orchid

There were about 60 species of the Orchidaceae family in Babul NP, consists of 42 species of epiphytic orchids and 18 species of terrestrial orchids. Among 18 species terrestrial orchid in Babul NP, the most common terrestrial orchids was *Crepidium* spp. which is formerly known as *Malaxis*. Generally orchids were not found in flowering condition, so species name could not be identified. One species of terrestrial orchids was *Malaxis latifolia* Sm. which is now a synonym of *Dienia ophrydis* (J.Koenig) Seidenf. In Karaenta, Babul NP, *Tropidia angulosa* (Lindl.) Bl. more commonly grow solitary and spread. Only some orchids species which are unique, endemic, attractive, or important information as new record will be described in this paper (Figure 3).

Tropidia angulosa (Lindl.) Bl.

The genus *Tropidia* is generally characterized by tough, hard stems and by small stature. *Tropidia angulosa* has a height of 15-20 cm and has no storage organ. So it is quite sensitive and tends to die if deprived of its roots. Its stem is erect or creeps on the ground; sometimes it is branched, each stem or branch bearing two leaves at the top. Leaves are plicate, ovate, acuminate, 12 x 7 cm. Inflorescence is terminal, on the top between two leaves, with a \pm 5 cm peduncle and a \pm 6 cm rachis that supports 8-16 flowers, even reaching 20-30 flowers (Comber 1990). Flowers are white or pale yellow, not fully open, flower size is very small, 1-2 cm wide across. The lip is lanceolate, pure white or with an orange blotch near the apex.

Tropidia angulosa commonly grows near sea level up to 1,200 m asl. (Comber 1990; Puspitaningtyas et al. 2013), in forests with moderate humidity, or in shady places that

are a bit dark. It has a widespread distribution from India, Burma, Malaysia, Sumatra, to Java (Comber 1990) and is now reported in Sulawesi as a new record.

Habenaria beccarii Schltr.

Habenaria beccarii is a very specific kind of orchid. It grows on rocky soil as a terrestrial, dispersed evenly across almost every area of Babul NP, in Tompo Bulu, Pattunuang, and Karaenta, at an altitude below 800 m asl.. Its habitat is karst hills, in humid, shady forest. This orchid species is endemic to the Wallacea region comprising Sulawesi and Moluccas.

Habenaria beccarii is a terrestrial orchid of small stature, about 2-20 cm high, bearing 4-5 leaves, linear-lanceolate, acuminate, sessile, positioned along the whole length of the stem. The inflorescence is terminal, erect, with peduncle about 15-36 cm length, bearing 5-17 white flowers on a rachis 4-12 cm. The dorsal sepals, are green, forming a hood over the column, in combination with white petals, and with lateral sepals ovate, acuminate, white. The lip is trilobed, about 2.5-3 cm broad; the side lobes broad with deeply toothed margins into filiform segments, 15-20 segments; the mid-lobe is narrow and entire, 0.5-0.6 cm long. Spur is 3-4 cm long, white at the base and half green to the tip.

This species from Sulawesi was at one time identified with the wrong name as *Habenaria medioflexa* Turrill (Yuzammi and Hidayat 2002) or *Habenaria medusa* Kraenzl. (Hartini and Puspitaningtyas 2005; Puspitaningtyas et al. 2013). After detailed observation on flower morphology, *H. beccarii* was found to be different from both *H. medioflexa* and *H. medusa*, based on the shape of the flower's lip. Furthermore, the distribution of *H. medioflexa* is commonly in mainland Asia such as Malaysia, Thailand, Laos, Vietnam and Cambodia (Seidenfaden and Wood 1992); while the distribution of *H. medusa* is in Sumatra, Borneo, Java, as well as Sulawesi (Comber 1990; Kurzweil 2009).

The terrestrial orchid genus *Nervilia*, is represented in Babul NP by as many as three species; namely, *N. punctata*, *N. plicata*, and *N. aragoana*. The population of *N. punctata* was found to be most abundant in Karaenta, It has creeping stolon tubers. *N. aragoana* has populations not as abundant as the former species but is more widely spread, being found in Karaenta, Pattunuang, and Tompo Bulu. The pattern of growth of *Nervilia* is similar in the area of Lambusango-Kakenauwe Nature Reserve as on the island of Buton, Southeast Sulawesi (Puspitaningtyas 2011).

Nervilia plicata (Andrews) Schltr.

The uniqueness of this terrestrial orchids is in its leaves. The leaf is shaped like a heart, cordate, apex acute; petiole is erect, green, 1-3 cm, green with white or yellowish blotches, sometimes with purple blotches, both sides hairy, with many curved veins raised alternately above and below, plicate, 10-14 cm broad. The inflorescence is 8-12 cm, bearing 2 flowers; with peduncle dark green or pale brown. The flower is pale brown with a white lip; flowers

Table 1. Orchids in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia

Name of species	Habitus	Locations in Babul NP			
		Tompo Bulu	Pattunuang	Bentenge	Karaenta
<i>Abdominea minimiflora</i> (Hook.f.) J.J. Sm.	Epiphytes			+	
<i>Aerides inflexa</i> Teijsm. & Binn.	Epiphytes	+	+		
<i>Aerides</i> sp.	Epiphytes	+	+		
<i>Agrostophyllum (tenue)</i>	Epiphytes			+	
<i>Ascocentrum miniatum</i> (Lindl.) Schltr.	Epiphytes	+			
<i>Bulbophyllum</i> sp.1	Epiphytes			+	
<i>Bulbophyllum</i> sp.2	Epiphytes	+			
<i>Calanthe triplicata</i> (Willemet) Ames	Terrestrial			+	
<i>Cleisostoma subulatum</i> Blume	Epiphytes		+		
<i>Coelogyne celebensis</i> J.J.Sm.	Epiphytes			+	
<i>Coelogyne rumphii</i> Lindl.	Epiphytes	+			
<i>Corymborkis veratrifolia</i> (Reinw.) Blume	Terrestrial				+
<i>Crepidium</i> sp.1	Terrestrial		+		
<i>Crepidium</i> sp.2	Terrestrial		+		
<i>Crepidium</i> sp.3	Terrestrial	+			
<i>Crepidium</i> sp.4	Terrestrial	+			
<i>Crepidium</i> sp.5	Terrestrial				+
<i>Cymbidium bicolor</i> Lindl.	Epiphytes	+			
<i>Cymbidium finlaysonianum</i> Lindl.	Epiphytes	+			
<i>Dendrobium crumenatum</i> Sw.	Epiphytes			+	
<i>Dendrobium lampongense</i> J.J.Sm.	Epiphytes		+		
<i>Dendrobium reflexitpalum</i> J.J.Sm.	Epiphytes		+		
<i>Dendrobium salaccense</i> (Blume) Lindl.	Epiphytes	+			
<i>Dendrobium</i> sp.	Epiphytes	+			
<i>Dendrobium sphenochilum</i> F.Muell. & Kraenzl.	Epiphytes			+	
<i>Dieniaophrydis</i> (J.Koenig) Seidenf.	Terrestrial				+
<i>Eria</i> sp.	Epiphytes			+	
<i>Eulophia</i> sp.	Terrestrial	+			
<i>Eulophia spectabilis</i> (Dennst.) Suresh	Terrestrial	+	+		+
<i>Flickingeria</i> sp.1	Epiphytes			+	
<i>Flickingeria</i> sp.2	Epiphytes			+	
<i>Flickingeria</i> sp.3	Epiphytes		+		
<i>Flickingeria</i> sp.4	Epiphytes		+		
<i>Flickingeria</i> sp. 5	Epiphytes			+	
<i>Grosourya appendiculata</i> (Blume) Rechb.f.	Epiphytes		+		
<i>Habenaria beccarii</i> Schltr.	Terrestrial	+	+		+
<i>Hetaeria</i> sp.	Terrestrial				+
<i>Liparis condylobulbon</i> Rechb.f.	Epiphytes	+			
<i>Liparis</i> sp.	Epiphytes				+
<i>Liparis viridiflora</i> (Blume) Lindl.	Epiphytes	+			
<i>Luisia</i> sp.	Epiphytes	+			
<i>Malleola</i> sp.1	Epiphytes			+	
<i>Malleola</i> sp.2	Epiphytes			+	
<i>Nervilia concolor</i> (Blume) Schltr.	Terrestrial	+	+		
<i>Nervilia plicata</i> (Andrews) Schltr.	Terrestrial				+
<i>Nervilia punctata</i> (Blume) Makino	Terrestrial				+
<i>Oberonia celebica</i> Schltr.	Epiphytes			+	
<i>Oberonia costeriana</i> J.J.Sm.	Epiphytes	+			
<i>Oberonia fungumolens</i> Burkill	Epiphytes			+	
<i>Oberonia</i> sp.	Epiphytes	+			
<i>Peristylus</i> sp.1	Terrestrial				+
<i>Peristylus</i> sp.2	Terrestrial	+			
<i>Phalaenopsis amboinensis</i> J.J.Sm.	Epiphytes				+
<i>Pholidota articulata</i> Lindl.	Epiphytes	+			
<i>Pholidota imbricata</i> Lindl.	Epiphytes				+
<i>Pomatocalpa spicatum</i> Breda, Kuhl & Hasselt	Epiphytes		+		
<i>Robiquetia</i> sp.	Epiphytes	+			
<i>Thelasis carinata</i> Blume.	Epiphytes			+	
<i>Trichoglottis</i> sp.	Epiphytes	+			
<i>Tropidia angulosa</i> (Lindl.) Blume	Terrestrial				+

Note: + = exist

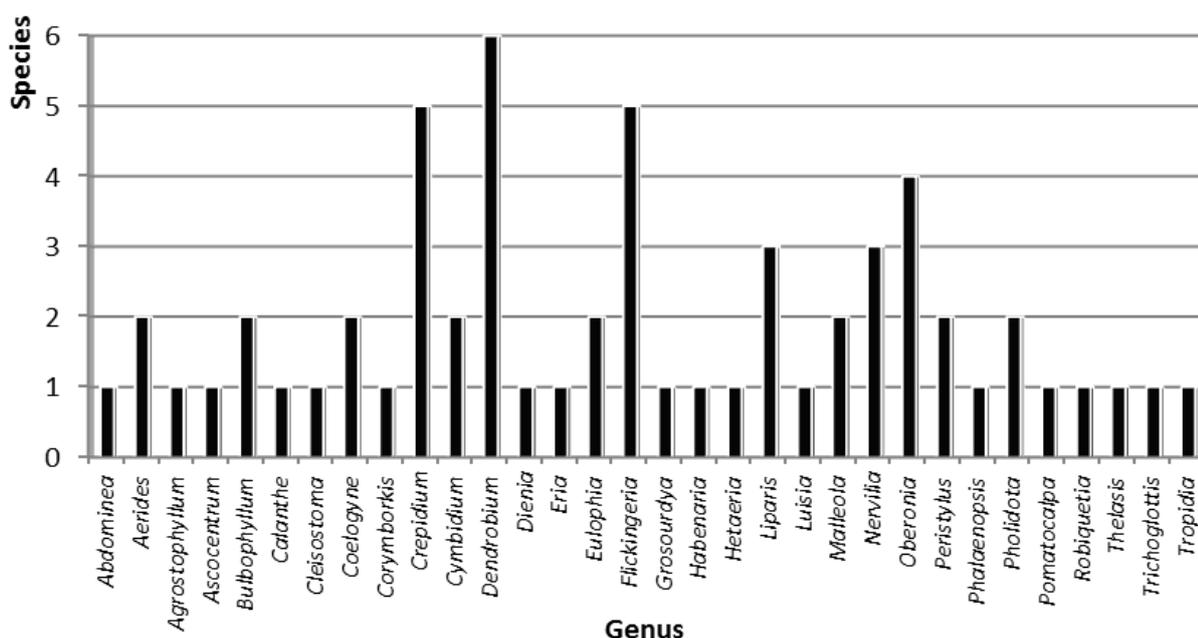


Figure 2. Number of orchids species for each genus found in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia

have green veins turning yellow. Generative and vegetative phases alternate; with periodic flowering. There is potential in this species for use as ornamental potted plants because of the beauty of its leaves.

Nervilia plicata is distributed from India, China, Burma, Laos, Vietnam, Thailand, Java, Sumatra, and the Philippines, to Papua New Guinea and Australia (Comber 1990). This species grows in tropical forest under shady trees at an altitude of 320-450 m asl.. In Babul NP, this species was found growing at an elevation of 275 m asl..

Nervilia punctata (Bl.) Makino

This terrestrial orchids is unique with orbicular leaves, 5 to 7 lobed; the apical lobe being acute, shiny green, cordate below with a petiolate leaf base 3-4 cm in diameter. The inflorescence has a single flower, held on a 10-15 cm long peduncle, the flower facing sideways. Sepals and petals are linear in shape, 15-18 cm long, light brown-green, with a broadly lanceolate lip, white with many small purple spots.

The distribution is widespread, through Thailand, Peninsular Malaysia, Sumatra, and Java (Comber 1990). Its presence in Sulawesi is a new record. Comber (1990) never came across this orchid in the lowlands, but in Babul NP, the species was found at an altitude of 275 m asl.. Backer (1968) recorded that this species usually grow in lowland at an altitude 25-1,000 m asl. Holttum (1964) also stated that in Singapore and Peninsular Malaysia, this species grows in lowlands area. This species prefers growing on rich soil humus or thick leaf litter and grow in colonies from their stolons in the soil.

Nervilia concolor (Blume) Schltr.

Previously, this species was known as *Nervilia aragoana* Gaud., but its valid name now is *N. concolor* (Blume) Schltr. The uniqueness of this terrestrial orchid is in its heart shaped leaves, with leaf tips pointed. Leaves are plicate, folded and pleated, with wavy margins; glabrous and green or green with chocolate brown blotches, with reddish purple petioles, the leaves are about 8 cm in diameter. The inflorescence reaches 35 cm in height, bearing about 4-10 flowers, not fully open, emerging from bulbs underground. Sepals and petals are narrowly lanceolate, acute, yellowish-green with brown veins. The lip is trilobed, white-yellowish with dark brown veins and undulate margins. Generative and vegetative phases appear alternately. Blooming throughout the year, the species has potential for use as ornamental potted plants.

Its habitat has a rather broad range in altitude from 0 to 1,200 m asl.. This species tolerates growing in open area or under shady trees, even along roadsides or in shady grasslands. The distribution is widespread from India, China, Southeast Asia, Australia, to the Pacific Islands (Comber 1990).

Eulophia spectabilis (Dennst.) Suresh.

This species prefers full sunlight, and is most often found growing in grassy fields. It is found from lowlands to highlands, with an altitudinal range from 0 to 1,300 m asl..

Eulophia spectabilis is a terrestrial orchid, with underground pseudobulbs, slightly rounded, about 3 cm in diameter, giving rise to shoots that emerge at their tips. The plant is 20 cm high, bearing 2 to 4 leaves, oblong-narrowly

lanceolate, with pointed tips, plicate, approximately 54 x 10 cm. The inflorescence is up to 1 meter tall, bearing 10-15 flower buds, a third of them blooming simultaneously, not usually all opening together, but occasionally there are fully opened flowers. Flowers are about 3 cm broad with a unique combination of colors. Sepals are oblong-lanceolate, acute, facing forward, 2.5 x 0.4 cm, a dull reddish brown combined with some green, petals shorter and broader, 2 x 0.6 cm, white apically, often with some reddish stripes to the base, shrouding the column. The lip is trilobed; the side-lobes erect, and the mid-lobe with undulate margins forwards and down to the tip, white with brown veins in the center and pink veining toward the edges, 2 cm long and 1.2 cm wide, spur short at the base of flower. Fruit is oval measuring 5 cm x 1.3 cm.

Eulophia spectabilis is spread widely, ranging from India, Myanmar, Sri Lanka, China, Thailand, Peninsular Malaysia, Singapore, Borneo, Sumatra, Java, Sulawesi, and the Philippines, to Papua New Guinea and the Solomon Islands (Seidenfaden and Wood 1992; Comber 1990; Comber 2001).

Calanthe triplicata (Willem.) Ames

It is a terrestrial orchid with pseudo-bulbs close together, each pseudo-bulb bearing 5-8 leaves. Leaves are lanceolate, acuminate tipped, green, 50-60 x 10-20 cm on 10-20 cm long petioles. The inflorescence is up to 100 cm high, bearing dense (10-50) pure white or creamy white flowers, with short persistent green flower bracts. The lip is trilobed, the side lobes oblong, the mid-lobe deeply divided into two and splitting apart, callus between the side-lobes can be white, yellow or red; spur \pm 1 cm long, at the base and parallel to the pedicel, white (Comber 1990).

It grows in a very broad range of habitats, ranging in altitude from 0 to 1,850 m asl.. Therefore, variations in the shape and colour of flowers are also diverse. It is widespread from Madagascar, India, Southeast Asia, Japan, and Australia, to the Pacific Islands (Comber 1990).

Corymborkis veratrifolia (Reinw.) Blume

This is a tough, evergreen, terrestrial orchid without underground storage. It has a hard, erect, unbranched and leafy stem, growing to 1.5-2 m tall. Leaves are lanceolate, plicate and tough, with pointed leaf tip; sessile, leaf position alternately around the stem, about 35 x 10 cm. The inflorescence is axillary, arranged in panicles, branched, each branch bears pure white flowers with green stipule. Sepals are lanceolate, acute, spreading; petals oblong, spreading wider, apices curled back; lip is trilobed, entire, 3 cm long and 1.5 cm broad, convex, the margins undulate (Comber 1990).

Epiphytic orchids

The epiphytic orchids found in Babul NP are very interesting, there were about 42 species. Some species are only found in eastern Indonesia, and are even endemic to Sulawesi (e.g. *Coelogyne celebensis* and *Aerides inflexa*). The populations of *A. inflexa* found were abundant, growing along the roadside on the trunk and branches of tamarind trees. There are some unique, endemic or

attractive species or new record which will be described in this paper.

Aerides inflexa Teijsm. & Binn.

Aerides inflexa is one of the orchid species that are endemic to Sulawesi (O'Byrne 2001). Generally, this species grows in the lowlands at an altitude of 200-300 m asl., and is found growing along the road to Babul NP on the trunks and branches of tamarind trees, and also, scarcely, in Pattunuang and Tompo Bulu. In Lambusango-Kakenauwe Nature Reserve (Buton island, Southeast Sulawesi), *A. inflexa* is often found on the stems and branches of host plants 'wola' (*Vitex cofassus*) and 'angsana' or 'cendana' tree (*Pterocarpus indicus*), the local names for these trees given by the Buton people (Puspitaningtyas 2011). The preference of the orchid for a particular host plant actually depends on the dominant trees in that area; i.e. those that can create a suitable microclimate for the orchid in regards to providing a suitable intensity of light, air movement, air temperature and humidity.

Aerides inflexa is an epiphytic orchid, is monopodial, single stemmed, pendulous, up to 75 cm. The leaves are thick and tough, strap-shaped, positioned in two rows, green, 11-31 cm long and 1.5-3 cm wide. Its inflorescence is axillary, pendulous, about 50 cm long, bearing more or less 25 flowers, well spaced, each flower being 2-3 cm broad, white with purple blotch on the tip of sepals and petals; fragrant with a soft scent.

Coelogyne

There are two members of the genus *Coelogyne* encountered in the Babul NP i.e. *C. celebensis* and *C. rumphii*. The two species have morphological similarity in leaves as well as in flowers, but the leaves of *C. celebensis* are widened at the ends (obovate), in contrast to leaves of *C. rumphii*.

Coelogyne rumphii Lindl.

Coelogyne rumphii is an epiphytic orchid, sympodial, with pseudobulbs oblongoid, obtusely 4-ridged, about 10 cm and 4 cm in diameter, each bearing one leaf on the top of the pseudobulb. Leaves are lanceolate, with apex acuminate, 10-50 cm long, 5-11 cm wide, light green. The inflorescence emerging from the tip of a new shoot, is erect, 15-30 cm long, with 2-6 flowers, but the flowers opening in succession; fully open, 4-8 cm in diameter. Sepals are oblong-lanceolate, with apex acuminate, measuring 4 x 1 cm, and lateral sepals leaner, and measuring 4 x 0.7 cm, yellow to creamy yellow; petals linear, apex acute, recurved, measuring 3.5 x 0.3 cm, yellow to creamy yellow; the lip is trilobed, the light brown side lobes are erect, white with light brown to orange, the mid-lobe is wider, about 4 cm long and 3 cm wide, white on the tip of lips, two ribs which extend from the apex and converge on the midlobe, margins undulate, the lip tip is slightly bend downward; the column is greenish yellow, slightly fragrant. This species is recognized by the five rows of slender, tapering, undulating, plate-like projections on the keels (Gravendeel and de Vogel 2000).

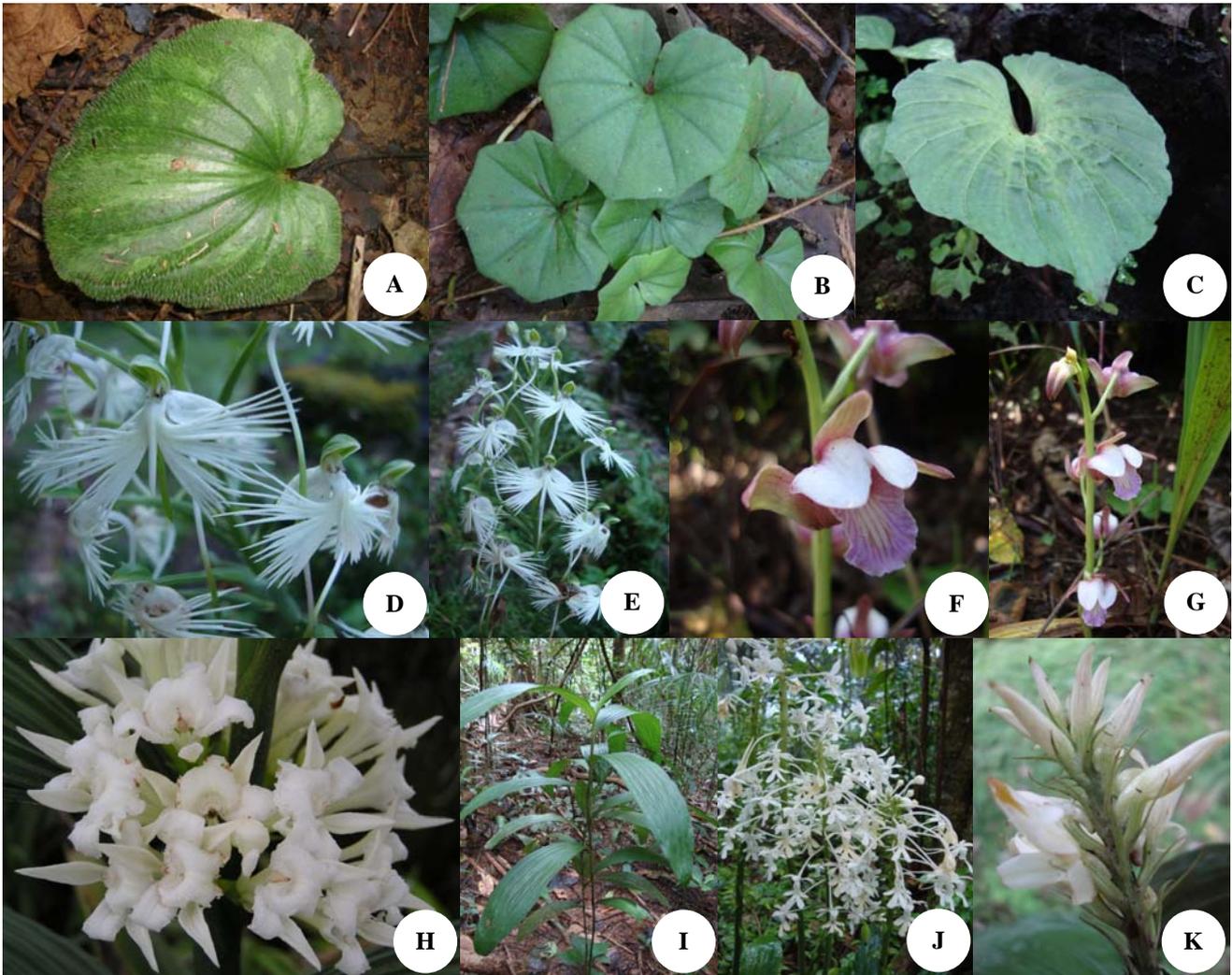


Figure 3. Terrestrial orchid diversity in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia. A. *Nervilia plicata*, B. *Nervilia punctata*, C. *Nervilia concolor*, D-E. *Habenaria beccarii*, F-G. *Eulophia spectabilis*, H-I. *Corymborkis veratrifolia*, J. *Calanthe triplicata*, K. *Tropidia angulosa*

This species grows as an epiphyte in lowland primary forest from 100 m asl. to an altitude of 1,100 m asl.. Its distribution up to now had appeared restricted to Maluku (Gravendeel and de Vogel 2000). But now this species is reported here as a new record in South Sulawesi.

Coelogyne celebensis J.J. Sm.

This is an epiphytic orchid, sympodial, with pseudobulbs oblongoid, distinctly 4-ridged, about 7 cm long and 2 cm in diameter, each bearing 1-2 leaves on the top of the pseudobulb. Leaves are obovate-lanceolate, acuminate, with seven main veins, about 32 cm long and 12 cm wide. The leaf texture is not stiff but slightly soft, with margins slightly wavy. The inflorescence emerges from the tip of a developing pseudobulb; its length can reach 30 cm, with 3-7 flowers opening in succession, the old blooms lasting no more than a week; flowers are 7-8 cm in diameter. Sepals are oblong-lanceolate with acuminate apex, about 5-6 cm long and 1.5-2 cm wide, pale yellow;

while lateral petals are linear, same width for about 5-6 cm long, and only 0.2 cm wide, pale yellow. The lip is trilobed, the brown side lobes being erect; the mid-lobe is wider, about 5 cm long and 4 cm wide, white with dark brown on the tip of the lip, two ribs which extend from the apex and converge on the midlobe, margins undulate, the end part of lip is slightly rolled down; column is pale green to orange at the apex, not scented. This species is recognized by the dark brown elongated lip, with tapering projections on the keels, and broad sidelobes with obtuse front margins (Gravendeel and de Vogel 2000).

Coelogyne celebensis an orchid endemic to Sulawesi (O'Byrne 2001). Its current known distribution is confined to Sulawesi (Central to South Sulawesi). It grows as an epiphyte in primary forests of the lowlands up to an altitude of 1,000 m asl.. In Babul NP (Benteng), it was found growing at an elevation of 793 m asl., whereas in Faruhumpenai Nature Reserve it has been found at an altitude of 643-750 m asl. (Puspitaningtyas 2013).



Figure 4. Epiphytes orchid diversity in Bantimurung-Bulusaraung National Park, South Sulawesi, Indonesia. A. *Coelogyne rumphii*, B. *Coelogyne celebensis*, C. *Dendrobium sphenochilum*, D. *Aerides inflexa*, E. *Cleisostoma subulatum*, F. *Phalaenopsis amboinensis*, G. *Dendrobium lampongense*

Dendrobium lampongense J.J. Sm.

This epiphytic orchid has cylindrical stem-like pseudobulbs with many nodes. Leaves are lanceolate, about 2.25-3.5 cm. When young the plant is leafy but it loses its leaves later. The inflorescence emerges from the leafless stem, 2-6 flowers in each cluster, each 4.2-4.8 cm in diameter when blooming; yellow.

It is found in Thailand, Malaysia, Borneo, and Sumatra (Seidenfaden and Wood 1992) in lowland and hill forests at an altitude of 200-300 m asl.. Thus, South Sulawesi is a new distribution area (new record) for this species. It was found at an altitude of 90 m asl. in the karst hills of Pattunuang of Babul NP.

Dendrobium sphenochilum F.Muell. & Kraenzl.

This species was once commonly known as *Dendrobium litoreum* F.M. Bailey, but now the valid name is *Dendrobium sphenochilum* F.Muell. & Kraenzl. This epiphytic orchid has short stems close together arising from

a rhizome, and pendulous. Leaves are triangular in cross-section, sickle-shaped, lanceolate, thick, fleshy, distichous. The inflorescence is terminal and rarely axillary, the flowers arise from nodes near or at the apex of the stem and on black dry bracts, in pairs, white with a yellow stain in the center of the lip; the flowers are fragrant, 2-2.5 cm wide, with short-lived blooming, lasting no more than a week.

Its distribution is mainly in eastern Indonesia including Sulawesi, Moluccas, Papua and Papua New Guinea (Puspitaningtyas et al. 2013) at elevation of 50-500 m asl.. In Bentenge of Babul NP, this species was found growing at an altitude of 793 m asl..

Cleisostoma subulatum Blume

Cleisostoma subulatum is an epiphytic orchid with a semi pendulous stem and upturned apices. The leaves are thick, fleshy, cylindrically shaped like a pencil, V-channeled especially when young, subulate to the apex or

acuminate, 10-17 cm in length. The inflorescence is unbranched, pendulous, bearing around 25-40 flowers, blooming sequentially starting from the base to the tip. Flowers are about 8-11 cm wide, with sepals and petals bent backwards, and colored creamy white at the base with two longitudinal median reddish brown streaks; the lip is trilobed, thickening at the base, white and yellow, midlobe obtuse, violet and whitish at the apex.

Its distribution is widespread, from Assam in India, Bangladesh, the Himalayas, Bhutan, Sikkim, Myanmar, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Lesser Sunda Islands, Borneo, Moluccas and Sulawesi, to the Philippines. It is a common plant, found in the lowlands at an altitude of 100-500 m asl. (Comber 1990; Seidenfaden and Wood 1992). This species can be found growing at an elevation of 90 m asl. in Pattunuang of Babul NP.

Abdominea minimiflora J.J.Sm.

This small epiphytic orchid has thick roots and a very short stem, about 1.5 cm long, bearing 4-7 flat leaves. The leaves are rather thick, elliptic-oblong, lanceolate, 3-6.5 cm long and 1.8 cm wide. The inflorescence is 15-20 cm long, bearing 25-50 flowers, of which about 5 are fully open at any one time. The flowers are small, with a diameter about 0.3-0.5 cm, and are pale greenish yellow in color (Comber 1990; Yuzammi and Hidayat 2002).

This species is fairly common in Asia, particularly in Thailand, Peninsular Malaysia, the Philippines, Borneo, Java, and Bali (Comber 1990) and Sulawesi (Yuzammi and Hidayat 2002). Thus in Indonesia, this species can be found in Java, Bali, Kalimantan and Sulawesi.

Phalaenopsis amboinensis J.J.Sm.

Only one species of *Phalaenopsis* was found in Babul NP, that is *Phalaenopsis amboinensis* J.J.Sm. It is epiphytic, monopodial, with a short stem completely enclosed by imbricating leaf sheaths; leafy, with thick, fleshy, elliptic to oblong-elliptic or oblanceolate leaves. The inflorescence is axillary, with flower stalks much shorter than the foliage, arching or spread out, 15-20 cm long, bearing 2-4 flowers. Flowers are rounded when in full bloom, 6 x 5 cm in diameter; fragrant. The dorsal sepal and petals are elliptic-ovate and the lateral sepals are oblique-ovate, acute, yellow or white with horizontal reddish-brown bars. This species is found only in eastern Indonesia, comprising the area of Sulawesi, Moluccas, Papua, and Papua New Guinea, at low elevation in shady and humid forests (Sweet 1980; Christenson 2001).

Based on this study, the orchid collections were found in the Bantimurung-Bulusaraung National Park are very diverse. The Orchid inventory recorded 60 species, classified among 32 genera. Among those recorded in the study, *Coelogyne celebensis* and *Aerides inflexa* are epiphytic orchids endemic to Sulawesi. Populations of both were relatively common in Babul NP. The terrestrial orchid *Habenaria beccarii* was observed to be specialized, mostly growing on rocky terrain, found in almost all exploration locations. *H. beccarii* is endemic to Sulawesi and the Moluccas. Similarly, *Phalaenopsis amboinensis* is only

found growing in eastern Indonesia. *P. amboinensis* is one of the vulnerable orchids which is protected by Government Regulation No. 7 in 1999. These endemic orchids need to be protected from extinction in the wild, so plant conservation measures are recommended both in situ and, as a back-up, by protected ex situ cultivation. If the population is observed to be declining, then conservation by a reintroduction program should be carried out to restore the populations in their natural habitat.

The existence of orchids have become rare and endangered due to over exploitation, as well as habitat destruction. Although CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) about orchid has been formed to protect the threaten wild orchid survival, but in fact orchids species have still threaten in the wild due to over-exploitation of commercially traded. Special case on genus *Paphiopedilum* which is included in appendix 1 CITES (no *Paphiopedilum* being traded internationally), at this time the existence of *Paphiopedilum* in Indonesia are threaten in the wild and become a priority for conservation (Risna et al. 2010). Besides that all orchids species except *Paphiopedilum* included in appendix 2 CITES, to trade orchid species should be issued quotas. But in Indonesia was no quota issued for orchid, it means that orchid species may not be traded internationally. Furthermore, the Indonesian Government has also issued a Government Regulation No 7 in 1999 to protect the flora and fauna of Indonesia which are endangered, such as species of Nepenthes, Orchid, Palm etc. For conservation purpose, cultivated commercial plant species should be encouraged, in order to avoid over exploitation from the wild.

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