

## Orchids From Mount Sago Nature Reserve, West Sumatera

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### Abstract

Mount Sago Nature Reserve is a conservation site located in West Sumatera Province that was designated as a nature reserve to save its rich biodiversity. The nature reserve holds many plant species that are potential and high values, such as orchids. This study aimed to inventory orchid species from Cagar Alam Gunung Sago using exploratory methods. The study found 47 species comprising 13 species of terrestrial orchids and 34 species of epiphytic orchids. Some of the terrestrial species include *Plocoglottis lowii*, *Goodyera pusilla*, *Goodyera rubicunda*, *Crepidium obovatum*, *Anoetochillus reinwardtii*, *Corymborkis veratrifolia*, *Apostasia wallichii* and *Cymbidium ensifolium*. Some of the epiphytic orchids are *Thecostele alata*, *Coelogyne* spp., *Cymbidium* spp., *Trichoglottis simplex*, *Pinalia flavescens*, *Bulbophyllum* spp. and *Flickingeria bancana*. Potential ornamental orchids found were *Coelogyne* spp., *Cymbidium* spp., *Pinalia flavescens* and *Vanda helvola*. The important collections for the Bogor Botanical Gardens were *Pinalia flavescens*, *Plocoglottis lowii*, and *Vanda helvola*.

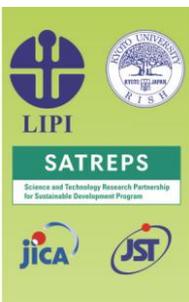
**Keywords:** Diversity, Mount Sago Nature Reserve, orchids

### 1. Introduction

The Mount Sago Nature Reserve is one of the in-situ conservation areas in West Sumatra Province. Administratively, it is included in two Regencies that are Kabupaten Limapuluh Kota and Kabupaten Tanah Datar. Mount Sago Nature Reserve covers of 5,486 hectares. The altitude ranges from 1,060 to 2,000 m above sea level, the topography is hilly and Mount Sago is on the peak [1].

The general condition of the forest in the Gunung Sago Nature Reserve area is still relatively well with high diversity and potential. Besides various native flora found, the pioneer plant species are also identified such as *Ficus* spp., *Melastoma malabathricum*, *Calliandra*, *Macaranga*, and *Mallotus*. The upper vegetation is generally dominated by *Castanopsis*, *Quercus*, *Schima wallichii*, *Dehaasia*, *Cryptocarya*, *Schefflera farinosa*, and *Cinnamomum caesia*. Besides *Pterospermum javanicum*, *Flacourtia rukam*, *Syzygium* sp., *Firmiana malayana*, *Santiria* sp., and several types of Dipterocarpaceae are also found. The shrubs that are commonly found are *Ardisia villosa*, *Psychotria* sp., *Clausena* sp., *Cyathea contaminans*, *Ligustrum* sp., and species from Araliaceae (*Schefflera*, *Arthrophyllum*). The lower plants are dominated by *Tacca chantrieri*, *Cyrtandra picta*, *Globba* spp., *Phyllagathis rotundifolia*, *Zingiber*, *Amomum*, *Labisia pumila*, *Elatostema* spp., *Alocasia*, *Homalomena*, *Scindapsus*, and terrestrial orchids and ferns. Besides that, the Epiphytic plants are also found, such as orchids and ferns.

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The Mount Sago Nature Reserve area has a lot of flora, but not many can be utilized. Tree species that have high commercial value, such as some species of the Dipterocarpaceae and Fagaceae families, have been used by communities around the area. It is observable that there are actually many interesting and potentially plant species in this region. Therefore, those can be developed into useful commodities, such as ornamental plants, fruit plants, medicinal plants, and others.

Mount Sago Nature Reserve is very suitable for the growth of orchids, unfortunately there is no information research of orchid in this area. Although many orchids that have beautiful habitus are often found in the highlands. This study aims to determine the diversity of orchids in the Mount Sago Nature Reserve area. The results of this study are expected to be used as preliminary data that has never been revealed before, and it can be seen in the steps of its conservation strategy in the future.

## 2. Methods

### 2.1. Research sites

Sibaladung is one of the entrances in the Gunung Sago Nature Reserve area. In general, the topography of Sibaladung forest is hilly to mountainous with a slope of 45° -90° and an altitude of 1,060 - 1,280 m above sea level. Soil pH ranges from 4.5-7. The average air temperature during the activity from morning, noon to night, respectively is 15 °C, 20 °C, and 15 °C. The average air humidity during the morning, afternoon to night, respectively is 80%, 60%, and 80%. The conditions of the forest is sheltered until somewhat open [2].

### 2.2. Methods

The research was carried out by exploratory methods, namely by exploring each part of the forest to and recorded all orchids found in the forest (Rugayah *et al.*, 2004). Each collected specimen is identified by a collection number and field data is recorded. The records of field data are the place to grow, the way of growing, the altitude and others. This ecological data is needed to record the natural conditions of plant collections for conservation strategy purpose in the Bogor Botanic Gardens. For identification purposes, a herbarium specimen is taken. For identification, references such as Comber [3], Seidenfaden & Wood [4], and Comber [5] are used. Some of the collections are taken for conservation in the Bogor Botanical Gardens.

## 3. Result and Discussion

The forest area in Sibaladung is directly adjacent to the fields. Most of these fields are planted with Cinnamon, species of pulses and vegetables. Although the Gunung Sago Nature Reserve area is bordered by community fields, the community does not make efforts to expand the area of cultivation. The community help to maintain the forest well, although efforts to collect wood by several people still occurred. If the forest conservation efforts are not carried out, the community will suffer the consequences. They rely heavily on water for their daily lives from the forest. If the forest is damaged, they will have difficulty in getting water.

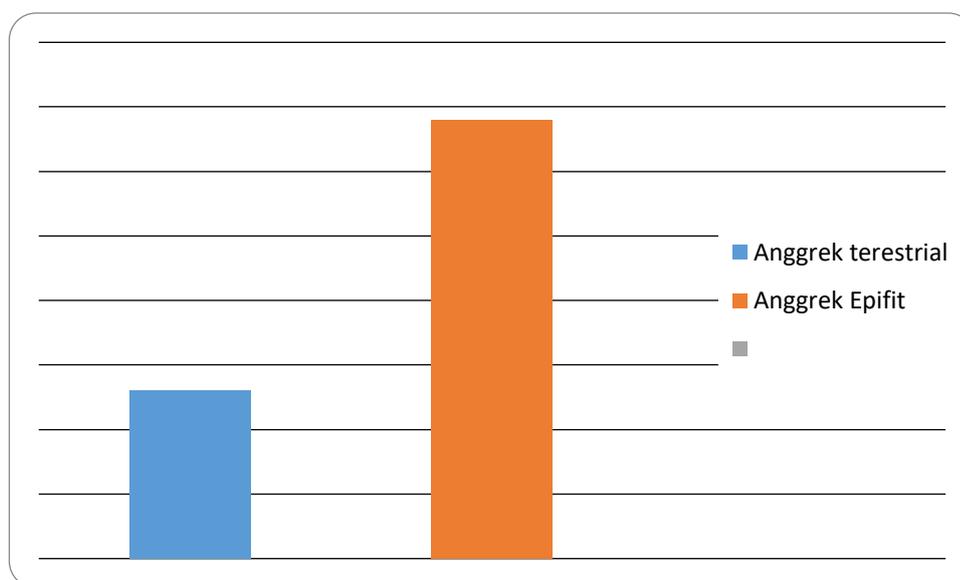
**Table 1.** Orchids found in the Sibaladung forest in the Mount Sago Nature Reserve, West Sumatra.

No.	Species name	Habitus
1.	<i>Acanthephippium javanicum</i> Blume	Terrestrial
2.	<i>Acriopsis liliifolia</i> (J.Koenig) Seidenf.	Epiphytic
3.	<i>Agrostophyllum majus</i> Hook.f.	Epiphytic
4.	<i>Agrostophyllum stipulatum</i> subsp. <i>bicuspidatum</i> (J.J.Sm.) Schuit.	Epiphytic
5.	<i>Anoectochilus reinwardtii</i> Blume	Terrestrial
6.	<i>Apostasia wallichii</i> R.Br.	Terrestrial
7.	<i>Appendicula reflexa</i> Blume	Epiphytic
8.	<i>Bulbophyllum odoratum</i> (Blume) Lindl.	Epiphytic
9.	<i>Bulbophyllum</i> sp.	Epiphytic
10.	<i>Calanthe triplicata</i> (Willemet) Ames	Terrestrial
11.	<i>Ceratostylis subulata</i> Blume	Epiphytic
12.	<i>Cleisostoma</i> sp.	Epiphytic
13.	<i>Coelogyne asperata</i> Lindl.	Epiphytic
14.	<i>Coelogyne miniata</i> (Blume) Lindl.	Epiphytic
15.	<i>Coelogyne pulverula</i> Teijsm. & Binn.	Epiphytic
16.	<i>Coelogyne rochussenii</i> de Vriese	Epiphytic
17.	<i>Corymborkis veratrifolia</i> (Reinw.) Blume	Terrestrial
18.	<i>Crepidium obovatum</i> (J.J.Sm.) Szlach.	Terrestrial
19.	<i>Cymbidium bicolor</i> Lindl.	Epiphytic
20.	<i>Cymbidium dayanum</i> Rchb.f.	Epiphytic
21.	<i>Cymbidium ensifolium</i> (L.) Sw.	Terrestrial
22.	<i>Dendrobium bancanum</i> J.J.Sm.	Epiphytic
23.	<i>Dendrobium capituliflorum</i> Rolfe	Epiphytic
24.	<i>Dendrobium salaccense</i> (Blume) Lindl.	Epiphytic
25.	<i>Dendrochilum</i> sp.	Epiphytic
26.	<i>Eria javanica</i> (Sw.) Blume	Epiphytic
27.	<i>Eria lasiopetala</i> (Willd.) Ormerod	Epiphytic
28.	<i>Eulophia zollingeri</i> (Rchb.f.) J.J.Sm.	Terrestrial
29.	<i>Goodyera pusilla</i> Blume	Terrestrial
30.	<i>Goodyera rubicunda</i> (Blume) Lindl.	Terrestrial
31.	<i>Liparis cespitosa</i> (Lam.) Lindl.	Epiphytic
32.	<i>Liparis condylobulbon</i> Rchb.f.	Epiphytic
33.	<i>Liparis pallida</i> (Blume) Lindl.	Epiphytic
34.	<i>Liparis rheedei</i> Lindl.	Terrestrial
35.	<i>Liparis viridiflora</i> (Blume) Lindl.	Epiphytic
36.	<i>Mycaranthes monostachya</i> (Lindl.) Rauschert	Epiphytic
37.	<i>Oberonia</i> sp.	Epiphytic
38.	<i>Pholidota imbricata</i> Lindl.	Epiphytic
39.	<i>Pinalia flavescens</i> (Blume) Kuntze	Epiphytic
40.	<i>Plocoglottis lowii</i> Rchb.f.	Terrestrial
41.	<i>Pteroceras teres</i> (Blume) Holttum	Epiphytic
42.	<i>Sacolabium</i> sp.	Epiphytic
43.	<i>Tainia</i> sp.	Terrestrial
44.	<i>Thecostele alata</i> (Roxb.) E.C.Parish & Rchb.f.	Epiphytic
45.	<i>Thrixspermum pensile</i> Schltr.	Epiphytic
46.	<i>Trichoglottis simplex</i> J.J.Sm.	Epiphytic
47.	<i>Vanda helvola</i> Blume	Epiphytic

Note: Name refers to The Plant List 2016

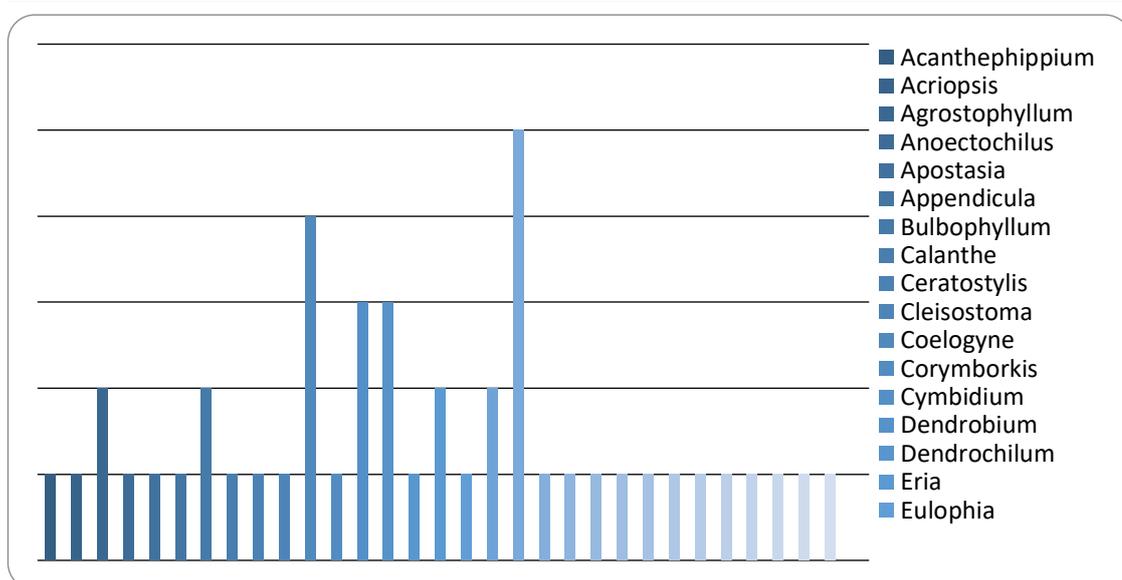
Sibaladung forest seems to be a suitable habitat for orchids. The environmental conditions are suitable for growing orchids because the condition of the forest is quite sheltered and the air humidity is quite high. Orchids found consist of terrestrial and epiphytic orchids. Exploration results show that in Sibaladung forest, 47 species of orchids were found. It consists of 13 terrestrial orchids and 34 epiphytic orchids. The 47 orchids are presented in the following Table 1.

The diversity of orchids in the Mount Sago Nature Reserve is relatively high. This is probably due to the condition of the forest that is suitable for orchid growth. In general, Sumatra is one of the islands that are ideal for orchid growth. Some of the reasons that make Sumatra is a paradise for orchids are due to changes of wet and dry climate, with rainfall throughout the year. This is a very important factor and it is needed for orchid life. In the Gunung Sago Nature Reserve, the diversity of epiphytic orchids is higher (34 species) than terrestrial orchids (13 species). Terrestrial orchids were found in 13 species, while epiphytic orchids were 34 species. Diagram between terrestrial orchids and epiphytic orchids in the Sago Mountain Nature Reserve area is presented in Fig 1.



**Figure. 1.** Number of terrestrial and epiphytic orchids in the Mount Sago Nature Reserve

The species found are included 31 genera, and the most were from the genus *Liparis* (4 species), and it is followed by *Coelogyne* (3 species), *Cymbidium* and *Dendrobium* (3 species), *Agrostophyllum*, *Bulbophyllum*, *Eria* and *Goodyera* (2 species), and other genera each with 1 species. Diagram of the number of species from each genus is presented in Fig 2.



**Figure 2.** Number of orchid species from each genus in the Mount Sago Nature Reserve area

Orchids in the Gunung Sago Nature Reserve consist of terrestrial orchids and epiphytic orchids. Almost all orchids have the potential to be ornamental plants. The interesting of orchids is not only the flowers but also the shape and color of the leaves. There are interesting orchids in the flowers, and there are interesting orchids on the leaves. Moreover, many orchids attract both on flowers and leaves.

Here are the interesting orchids found in the Sibaladung area, Mount Sago Nature Reserve.

### 3.1. Terrestrial Orchids

*Calanthe triplicata* lives in a place that lacks direct sunlight, lots of litter, and damp places. The leaves reach 1 m long, the leaves are large (up to 70 cm long and 20 cm wide). Terminal flowering (emerging from the tip of the stem), towering upward, supports many flowers. The flowers are pure white, with lips that are very similar to sleeping babies. For this reason, this orchid is often called the "sleeping baby" orchid.

*Plocoglottis lowii* is a terrestrial orchid with conical, olive, purple pseudobulbs. *Pseudobulb* is about 7-8 cm tall by 1.5-2 cm thick at the base, covered with sheaths when young, carrying a single leaf. The leaf is solitary lanceolate, acute, plicate, glabrous, up to 28-30 cm long by 8-9 cm wide, shiny greenish purple above and deep purple beneath. The *Inflorescence* is up to 70-100 cm tall, erect, pubescent, with many flowers but only one flower opening at a time. The flower is 3 cm in diameter, dorsal sepal and petals are narrow, spreading, tip pointed, pale yellow. Lateral sepals are red with a yellow patch a half, curly and recurved inside. Lip rectangular to square, 6 mm long by 7 mm wide, thick, fleshy and red, with a narrow tip and bent down. These flowers have a moveable lip that triggers and shuts tight when something touches it. It is found in Thailand, Peninsular Malaysia, Borneo, Sumatra, in lowland and hill forests at elevations of sea level (0 m) to 1,000 m [4], [6]. In the Sago Malintang Nature Reserve, this orchid is found in a rather open place at an altitude of 1,100 m above sea level, found in one location, and not found anywhere else.



*Goodyera pusilla* has attractive leaves, in shape and color. Habitus is very small, grows almost flat on the ground. The leaves are elongated triangles, the edges are pointed, purple are white silver stripes. The middle part of the leaf has a white silver pattern and is very shiny. It usually grows in a sheltered place until it is rather open. This type is a type that is rather difficult to find. The amount is relatively lacking and the place of growth also spreads. Whereas *Goodyera rubicunda* grows throughout the region starting from an altitude of 1,080-1,260 m above sea level. The usual grow in groups. So if you have found one, then the others are around it. The habitus is slender, rather creepy and finally erect, the leaves are bumpy.

*Crepidium obovatum* jura is an attractive orchid. The stem and stalks are bright purples. Leaves are lanceolate, arranged intermittently-tightly. The leaves are reddish brown in color, with yellow stripes in the center. Inflorescence at the end of the stem, supporting bright yellow flowers.

*Anoetochillus reinwardtii* is small, grows almost attached to the ground, and at first glance is similar to dried litter. But the color of the leaves is not brown like dried leaves, but red hearts with red veins. This orchid is one of the most difficult to find. The amount is relatively small and the place to grow is spread. It usually grows in a sheltered and humid place. This orchid has the potential to be developed.

*Corymborkis veratrifolia* 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 three pure white or greenish-white flowers. 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. This orchid love growing in shady and moist habitats, especially in rich humus soil. It mostly grows at an altitude of 0-2.000 m asl. The distribution is from India, Southeast Asia to some parts of the Pacific Islands. In Indonesia, it spread from Sumatra, Java, Borneo to Sulawesi [3].

*Apostasia wallichii* is a terrestrial orchid that can reach 91 cm in length. The leaves are numerous and arranged tightly on the upper stem. The leaves are line-shaped, 21-35 cm long, 1-1.7 cm wide, the leaf edges are wavy, the texture is rather smooth. Its inflorescence is a terminal, branched, each branch supports 7-15 flowers. Flowers are small, pale yellow,  $\pm$  1 cm wide, supported by  $\pm$  2 cm flower stalks. The petals and crown are almost the same sizes, 0.5 X 0.1 cm. *A. wallichii* is very common in moist, wet and thick-topped forest grounds. These orchids can be found from the lowlands to the mountains at an altitude of 200-1,300 m above sea level. These orchids are spread in Sri Lanka, Nepal, Assam, throughout Southeast Asia to New Guinea and Australia [7], [5].

*Cymbidiun ensifolium* also has a leaf-like a line, just like most other species. The length of the leaves reaches 50 cm and is 1.5-2 cm wide. Inflorescence arises from the end of the stem (terminal), supporting 2-3 very beautiful flowers. Petals are yellow with brown spots. These orchids are generally found in quite open places, both in flat areas, on slopes, or in hills.

### 3.2. Epiphytic Orchids

*Thecostele alata* is epiphytic orchids with pseudo-clumped bulbs. Pseudo bulbs are flat round, grooved surface, supporting one leaf. The leaves are oval-shaped, light green, smooth and slightly shiny. A pendulous inflorescence is borne from the base of the stem, usually, 5 flowers bloom together. The flower stalk will extend along with the change of appearance of new flowers. Flowers are white, dominated by red patches. These orchids spread from India, Southeast Asia, to Sumatra, Java, Kalimantan to the Philippines. In Sumatra, it is found in every province, from the lowlands to 1,800 m above sea level [5], [8].

Some *Coelogyne* were found in Sibaladung, namely *C. asperata*, *C. pulverula*, and *C. rochussenii*. All species have potential as ornamental plants. *Coelogyne asperata* has beautiful flowers. Inflorescence supports 10-15 flowers. Flowers are yellow with brown spots. Unfortunately, these flowers bloom not long but only last for 1 week. The habitus is an epiphytic orchid that has large bulbs and leaves.

*Coelogyne pulverula* has creeping rhizomes, supporting bulbs every 1.5 cm. The bulbs are small, elongated, supporting 2 leaves. The leaves are lanceolate, pointed at the end. A pendulous inflorescence is borne from the base of the pseudobulbs, up to 1 m in length, supports about 30 flowers, is not scented, the inter-flower distance is 2.5 cm, the base of the flower stem is covered by bractea. Flowers are fully open, pale yellow or brown with dark brown on the lips. This species has a wide distribution, including Thailand, Peninsular Malaysia, Sumatra, Java, and Borneo. In Sumatra, it is found from Aceh to South Sumatra at an altitude of 275 - 1,500 m above sea level. These orchids usually grow epiphytes on trees or stick to rocky cliffs [5]. In the Mount Sago Nature Reserve, this species grows in a fairly large clump on the forest floor in a rather sheltered place, on very thick litter. This species is only found in one location in several clusters. It is located not far from the location of *Coelogyne asperata*.

*Coelogyne rochussenii* is a sympodial epiphytic orchid. The rhizomes spread and branched out. Pseudo bulbs are oval round, leaves appear from the tip of the bulbs, each bulb supports two leaves. The leaves are ovoid, the tip is pointed. A pendulous inflorescence is borne from the base of the stem, supporting 20-35 flowers that bloom together. The flowers are yellowish green. In the Sago Mountain Nature Reserve, this species is found in trees, in a rather open place, in large clumps, with excellent conditions. Only once found in this region.

Epiphytic *Cymbidium* found was *C. finlaysonianum*, *C. bicolor* and *C. dayanum*. Habitus *C. bicolor* and *C. dayanum* are almost the same if there are no flowers, but if they are flowering, the flowers are very different. Both species have line-shaped leaves that dangle down, the texture is not stiff, up to 70 cm long and 1-2 cm wide. *C. bicolor* flowers are yellowish brown, while *C. dayanum* flowers are pink. Both are good for ornamental plants.

*Cymbidium finlaysonianum* is an epiphytic orchid which has a sympodial habit, commonly grow on the branch of the trees. Hidden flat and oval bulb, covered by leaves, supports 4-7 strap and leathery leaves, emerging erect but later arching as it lengthens, semi terrete 36-85 cm long and 2.7-6 cm wide, the leaf tip is unequally bilobed. A

pendulous inflorescence is borne from the base of the stem, supporting 7-26 flower buds. The petals and sepals are spreading, the sepals and petals are yellow with or without dark red streaks along the middle, softly scented. The lip is three-lobed; the tip of the lip is recurved, white with red markings. The flower column is dark red and curved. It generally is growing on the branching of shady trees, in a rather open place, an altitude of 0-1,200 m asl. Its distribution is from Vietnam, Cambodia, Thailand, Philippines, Peninsular Malaysia, Sumatra, Java, Borneo and Sulawesi [3], [4].

*Cymbidium bicolor* is an epifit or lithofit orchid. The bulbs are flat and oblong, covered by a leaf midrib, supporting 4-8 leaves. The leaves are line-shaped, blunt and asymmetrical at the end, split in two by the main leaf bone. A pendulous inflorescence is borne from the base of the stem, supporting 5-13 flowers that are maroon with pale white or yellow at the edges. These species are spread in India, Sri Lanka, China, Indochina, Sabah, Peninsula Malaysia to Sumatra, Java, Borneo, and Sulawesi. In general, this species grows in shady tree branches, in a rather open place, at an altitude of 0-1,800 m above sea level. In the Mount Sago Nature Reserve, this species grows on not-so-large trees which are sheltered at an altitude of 1,230 m above sea level.

*Cymbidium dayanum* is an epiphytic orchid that grows in clumps. The bulbs are flat and oblong, covered with leaf midribs. Each tuber has 4-8 leaves. The shape of the leaves is like a sword or ribbon, thick and stiff, pointed at the end. A pendulous inflorescence is borne from the base of the stem, supporting 5-20 white flowers with maroon variations in the middle. The edges are maroon and the center is yellow. This species is suitable for growing in a humid and sheltered place. Usually, these orchids stick to the branching of shady trees or tree cavities. Generally found in the highlands at an altitude of 870-1,500 m above sea level. The distribution areas are India, China, Taiwan, Japan, Thailand, Cambodia, Malaysia, Sumatra, Borneo, and Sulawesi [5]. In the Mount Sago Nature Reserve, this species grows on not-so-large trees sheltered at an altitude of 1,220 m above sea level.

*Tricoglottis simplex* has attractive flowers. The flowers are similar to the 'orchid moon' flower, but the appearance of the leaf armpit and only one. Flowers are yellow with brown spots. The habitus is less attractive because the stem is elongated, pendulous from the host tree, the distance between one leaf and the other leaves is far apart.

Some species of *Bulbophyllum* are also found in the Gunung Sago Nature Reserve. In general, species from this genus have bulbs. But there are some species that do not have bulbs, such as *Bulbophyllum odoratum*. This species does not have bulbs and the flowers are fragrant when blooming. Inflorescence supports many small yellowish white flowers.

*Pinalia flavescens* is an orchid whose flowers and leaves are similar to *Eria bogoriensis*, but this species has longer bulbs. The flowers are arranged in a thread about 10 cm long, consisting of 5-10 reddish-brown flowers.

*Flickingeria bancana* is an epiphytic orchid that grows creeper, the rhizomes are yellow, broad, stiff and hard, the distance between pseudo tuber is  $\pm 0.5$  cm. Pseudobulbs are stiff and hard, elongated round, yellowish brown in color, supporting



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one oval leaf. A single flower, appearing at the end of a pseudo tuber near the base of the leaf, the size of a small, light yellow color, with variations of veins that are parallel to the red line. This species generally grows in lowland forests, found in disturbed secondary forests, on the banks of rivers, at an altitude of 470 m above sea level. Spread widely from Vietnam, Thailand, Peninsula Malaysia, Sumatra, and Borneo.

#### 4. Conclusion

The exploration of orchids in the Gunung Sago Nature Reserve obtained 47 species which were included in 32 genera, 13 terrestrial orchids, and 34 epiphytic orchids. The most common species is the genus from *Liparis* with 5 species, followed by *Coelogyne* with 4 species, *Cymbidium* and *Dendrobium* each with 3 species. The most common orchid is *Pinalia flavescens*, which grows in almost all regions. Potential ornamental orchids found were *Coelogyne* spp., *Cymbidium* spp., *Pinalia flavescens*, and *Vanda helvola*. The important collections for the Bogor Botanic Gardens are *Pinalia flavescens*, *Plocoglottis lowii*, and *Vanda helvola*.

#### 5. References

- [1]. Anonim. Kawasan Konservasi Indonesia 2006. Departemen Kehutanan. Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam. 2006.
- [2]. Hartini S, Puspitaningtyas DM. Flora Sumatera Utara: Eksotik dan Berpotensi. Pusat Konservasi Tumbuhan Kebun Raya Bogor-LIPI. Bogor. 2005.
- [3]. Comber JB. Orchids of Java. Bentham-moxon Trust. Royal Botanic Garden. Kew. 1990.
- [4]. Seidenfaden G, Wood JJ. The Orchids of Peninsular Malaysia and Singapore (A Revision of R.E. Holttum: Orchids of Malaya.). Olsen & Olsen, Fredensborg, Denmark. 1992.
- [5]. Comber JB. 2001. Orchids of Sumatra. The Royal Botanic Gardens. Kew.
- [6]. Teoh ES. Medicinal Orchids of Asia. Springer International, Switzerland. 2016.
- [7]. Wood JJ Apostasia in Pridgeon AM, Cribb PJ, Chase MW, Rasmussen FN (eds), Genera Orchidacearum, 1999; Vol. 1. Oxford University Press.
- [8]. O’Byrne P. A to Z of South East Asian Orchid Species. Orchid Society of South East Asia. Singapore. 2001.