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Inventory and Exploration of Orchid in Polewali Mandar, West Sulawesi

Dwi Murti Puspitaningtyas

Research Center for Plant Conservation and Botanic Gardens, Indonesian Institute of Sciences
Jl. Ir. H. Djuanda No. 13, Bogor 16122, West Java, Indonesia.

email: puspitakrb@yahoo.com; puspitakrb@gmail.com

Abstract

Sulawesi is the fourth largest island in Indonesia. Sulawesi is also a very unique island, possessing a very high biodiversity due to the location on the Wallacea area, and constituting mixing plants from Asia and Australia. An inventory and exploration of orchid in Polewali Mandar Regency was conducted from 25 May to 13 June 2014 to determine and assess the orchid diversity in the area. Orchid specimens were recorded and collected using a purposive random sampling method. A total of 62 orchid collection numbers were found in the study area. These collections represent 21 genera and 52 species, consists of 43 epiphytic orchids species and 9 terrestrial orchids species. Some species are wide distribute in Indonesia, few of them are only found in eastern part of Indonesia, and are even endemic to Sulawesi. *Luisia celebica* Schltr. is noted as endemic orchid to Sulawesi. While *Habenaria beccarii* Schltr. is endemic to the Wallacea region mainly in Sulawesi and Moluccas. Among those orchids found in the study, *Pinalia quinqueangularis* (J.J.Sm.) Ormerod, *Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes and *Dendrobium clavator* Ridl. are noted as a new record in Sulawesi. Many new records of orchids are still to be expected from Sulawesi.

Keywords: Orchid, Polewali Mandar, West Sulawesi, inventory, exploration.

1. Introduction

Indonesia has two of the world's 25 biodiversity hotspots, the Sundaland and Wallacea. Sulawesi with a land area of 174,600 square km, is the fourth largest island of Indonesia. Sulawesi is also very unique island because located on the Wallacea line which has a mixed flora from Asia and Australia and is thought of having a very high biodiversity [1]. Sulawesi is the most geologically complex island as habitat for mixed flora and fauna from Asia and Australia and is also a place of evolution of various endemic fauna [2]. Sulawesi's flora is most closely related to the floras of dry areas in the Philippines, Moluccas, Lesser Sundas, and Java. The lowland forests have affinities to New Guinea, whereas the upland areas are more related to Borneo [3].

The richness of Sulawesi's flora has not been fully revealed until now, they are very unique and diverse. Schlechter (1925) [4] noted the endemic orchids to Sulawesi is estimated to be around 253 species, more than Smith (1929) [5] recorded which only found as many as 161 species. Whereas the last publication [6], a preliminary study on the inventory of orchids in Sulawesi and Maluku recorded as many as 820 species and 60% of them (548 species) were found in Sulawesi, which these types collections are stored in BO (Herbarium Bogoriense), CP (Herbarium Department of Plant Pathology,

Copenhagen), G (Herbarium Conservatoire et Jardin Botaniques de la Ville de Geneve), K (Kew), L (Leiden), NSW (National Herbarium of New South Wales) and PNH (Philippine National Herbarium) and the collection is mostly collected from South Sulawesi [7]. Even though a lot of information reveals this plant, but the detailed information about the distribution and ecological character, especially in conservation areas is still very limited [7].

Exploration and conservation research is an important step in efforts for *ex situ* plant conservation. Bogor Botanic Gardens as an *Ex Situ* Conservation Institution has an important role in plant species conservation, and carrying out population studies, plant propagation, breeding and reintroduction. The aim of this research reported here is to inventory and explore the diversity of orchid species in Polewali Mandar Regency, West Sulawesi Province. The purpose of this exploration and inventory is also to collect and conserve orchid diversity of Sulawesi Island. The orchid collections are not only used for conservation purposes, but also for research, education, reintroduction, which can also be widely useful for scientific knowledge or as material for commercial plant commodities.

2. Methods

The research was conducted in Polewali Mandar Regency from 25 May to 13 June 2014. The objective was to observe and assess orchid diversity in Polewali Mandar Regency. The exploration activity was based on plant collection by purposive random sampling [8]. This was supplemented with environment data measured in Polewali Mandar Regency, that are latitude, altitude, air humidity, air temperature and soil acidity. It requires tools such as GPS (Global Positioning System), Thermo-Hygrometers and soil pH meters.

Observation, data record, collecting living material of orchids and documentation were carried out during exploration. Tools were used for collecting plant material that were plastic bags, ropes, mekolin labels, note books, stationery, cameras, pruning shears cutter, sickle/billhook, machetes and shovels.

Epiphytic orchids were collected by climbing and releasing plants from the host tree. While terrestrial orchids were collected by digging the soil to release the roots of orchids using a shovel and machete. Then roots of terrestrial orchid covered with humus or moss and then wrapped with plastic. Those orchids were carried using a big plastic bag.

All collected orchids were labeled with data of collection date, collector's name, collection number, name of orchid (genus-species), and collecting place. Those data was also recorded in Form A1 and note book, including data of altitude, latitude, air temperature, air humidity, soil acidity and morphology characters (habitus, habitat, plant height, leaf colour, flower colour, flower smell) for identification purposes.

Identification was done by observing plant morphology which includes leaves, stems, roots, and flowers. For identification to species, observation on flower morphology is needed. Mostly orchid without flower can only be identified to genus level. However, some species of orchids that have specific vegetative characteristics can

be identified for their species even though they are not flowering. Identification method used were by literature review [9], [10], [11], [12], [13] and by reference to living collections in Bogor Botanic Gardens to determine the genus or species. Valid names were attributed based on the current listings in The Plant List (2013) (www.theplantlist.org). The sampling plants were only collected to those species that were abundant, in terms of to support *in situ* conservation purpose, while some rare species were only recorded or photographed for documentation.

3. Result and Discussion

Exploration activities were conducted at 8 (eight) locations in Polewali Mandar Regency. The altitude of locations were about 175-395 m asl, that are Butu Alla hillside, Mapinni-Bulo village, Bulo sub-district with an altitude of 175 m asl., Butu Tahuana hillside, Pulliwa village, Bulo sub-district with an altitude of 217-380 m asl., Ba'batapua village, Matanga sub-district with an altitude of 392 m asl., Kalimbua village, Tapango sub-district with an altitude of 246 m asl., Tapua village, Matanga sub-district with an altitude of 371 m asl., Mambutapua village, Matanga sub-district with an altitude of 384 m asl., Ambo Padang village, Tutar sub-district with an altitude of 295 m asl., Tubbi village, Tubbi sub-district with an altitude of 265 m asl. The latitude & longitude of these locations were range between S 03°13'07,8" to S 03°17'14,5" and E 119°02'47,7" to E 119°16'22,9". The soil acidity (soil pH) was about 3.8 – 5.9, the temperature during the day was between 27,8°C – 30,4°C, air humidity during the day ranges from 72,8% – 90,9%.

Those data environment and the location of origin are very important for the plant collection. The plant collection will only has a scientific value if it is completed with information data such as the origin location and the condition of the natural habitat. Living material were mostly planted out in Masenrempulu Enrekang Botanic Gardens and some species were planted as well as in Bogor Botanic Gardens for *ex situ* conservation purposes.

Diversity orchids found in Polewali Mandar-West Sulawesi Province is very interesting. The results of the study recorded approximately 62 accession numbers of orchids were collected in that area. After identifying them, these represent 21 genera and 52 species. They consist of 43 epiphytic orchids species and 9 terrestrial orchids species. Details on the number of species and genera for orchid collections are presented in Table 1. The number of species for each genus are represented in diagram Figure 2.

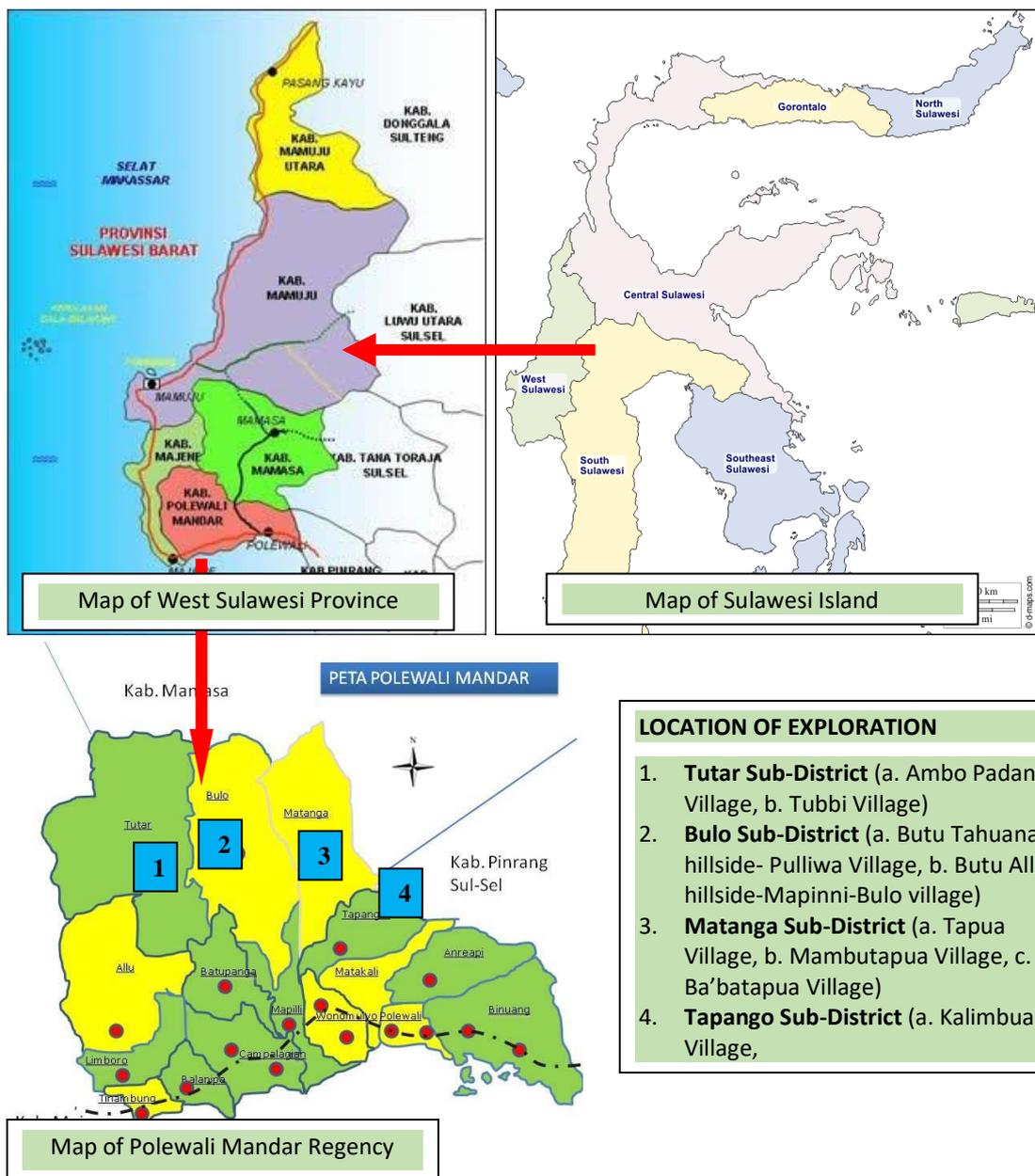


Figure 1. Location of exploration activities in Polewali Mandar Regency, West Sulawesi Province, Indonesia

Table 1. Orchids in Polewali Mandar Regency, West Sulawesi Province, Indonesia

No	Scientific Name of Orchid	Habitus	Location							
			1	2	3	4	5	6	7	8
1.	<i>Acriopsis liliifolia</i> (J.Koenig) Seidenf.	Ep.		x						
2.	<i>Aerides odorata</i> Lour.	Ep.		x	x	x				
3.	<i>Aerides</i> sp.1 TR 01	Ep.						x		
4.	<i>Aerides</i> sp. 2 TR 26	Ep.			x					
5.	<i>Bulbophyllum</i> sp. 1 TR 03	Ep.						x		
6.	<i>Bulbophyllum</i> sp. 2 TR 17	Ep.		x						
7.	<i>Bulbophyllum</i> sp. 3 TR 18	Ep.		x						
8.	<i>Bulbophyllum</i> sp. 4 TR 32	Ep.	x							
9.	<i>Bulbophyllum clandestinum</i> Lindl.	Ep.	x							
10.	<i>Cymbidium finlaysonianum</i> Lindl.	Ep.		x		x				
11.	<i>Cymbidium</i> sp. 1 TR 19	Ep.		x						

No	Scientific Name of Orchid	Habitus	Location							
			1	2	3	4	5	6	7	8
12.	<i>Cymbidium</i> sp. 2 DM 2782	Ep.								x
13.	<i>Dendrobium acerosum</i> Lindl.	Ep.		x						
14.	<i>Dendrobium acinaciforme</i> Roxb.	Ep.	x							
15.	<i>Dendrobium anosmum</i> Lindl.	Ep.		x						
16.	<i>Dendrobium bicaudatum</i> Reinw. ex Lindl.	Ep.		x						
17.	<i>Dendrobium clavator</i> Ridl.	Ep.	x					x		
18.	<i>Dendrobium crumenatum</i> Sw.	Ep.		x						
19.	<i>Dendrobium</i> sp. 1 TR 50	Ep.					x			
20.	<i>Dendrobium</i> sp. 2 TR 40	Ep.					x			
21.	<i>Dendrobium</i> sp. 3 TR 47	Ep.					x			
22.	<i>Dendrobium</i> sp. 4 DM 2778	Ep.								x
23.	<i>Eria javanica</i> (Sw.) Blume	Ep.					x			
24.	<i>Eria</i> sp. 1 TR 14	Ep.		x						
25.	<i>Eria</i> sp. 2 TR 20	Ep.		x						
26.	<i>Liparis condylobulbon</i> Rchb.f.	Ep.					x			
27.	<i>Liparis parviflora</i> (Blume) Lindl.	Ep.								x
28.	<i>Luisia celebica</i> Schltr.	Ep.		x						
29.	<i>Micropera</i> cf. <i>sterrophylla</i> (Schltr.) Garay	Ep.								x
30.	<i>Oberonia</i> cf. <i>fungumolens</i> Burkill	Ep.	x							
31.	<i>Oberonia lycopodioides</i> (J.Koenig) Ormerod	Ep.		x						
32.	<i>Oberonia padangensis</i> Schltr.	Ep.								x
33.	<i>Oberonia costeriana</i> J.J.Sm.	Ep.	x							
34.	<i>Oberonia</i> sp. TR 35	Ep.	x							
35.	<i>Oberonia</i> sp. DM 2779	Ep.								x
36.	<i>Pinalia bicristata</i> (Blume) Kuntze	Ep.							x	
37.	<i>Pinalia bractescens</i> (Lindl.) Kuntze	Ep.	x	x			x			
38.	<i>Pinalia quinquangularis</i> (J.J.Sm.) Ormerod	Ep.	x							
39.	<i>Pinalia xanthocheila</i> (Ridl.) W.Suarez & Cootes	Ep.	x							
40.	<i>Pteroceras</i> sp.	Ep.							x	
41.	<i>Thelasis pygmaea</i> (Griff.) Lindl.	Ep.					x			
42.	<i>Thrixspermum centipeda</i> Lour	Ep.								x
43.	<i>Vanilla</i> cf. <i>planifolia</i> Jacks. ex Andrews	Ep.					x			
44.	<i>Acanthephippium splendidum</i> J.J.Smith Blume	Tr.	x							
45.	<i>Corymborkis veratrifolia</i> (Reinw.) Blume	Tr.							x	
46.	<i>Crepidium carinatifolium</i> (J.J.Sm.) Szlach.	Tr.	x							
47.	<i>Crepidium</i> sp. 1 TR 41/DM 2762	Tr.					x			
48.	<i>Dienia ophrydis</i> (J.Koenig) Seidenf.	Tr.					x			
49.	<i>Eulophia spectabilis</i> (Dennst.) Suresh	Tr.				x				x
50.	<i>Eulophia zollingeri</i> (Rchb.f.) J.J.Sm.	Tr.					x			
51.	<i>Habenaria beccarii</i> Schltr.	Tr.					x			x
52.	<i>Habenaria</i> sp.	Tr.								x
TOTAL species			12	15	3	12	5	3	7	3

Note: x = exist
 1 = Tapua Village, Matanga Sub-District (371 m asl.)
 2 = Butu Tahuana hillside, Pulliwa Village, Bulu Sub-District (217 m asl.)
 3 = Kalimbia Village, Tapango Sub-District (246 m asl.)
 4 = Mambutapua Village, Matanga Sub-District (384 m asl.)
 5 = Butu Alla hillside, Mapinni-Bulo village, Bulu sub-district (175 m asl.)
 6 = Ba'batapua Village, Matanga Sub-District (392 m asl.)
 7 = Tubbi Village, Tubbi Sub-District (265 m asl.) 8 = Ambo Padang Village, Tutar Sub-District (295 m asl.)

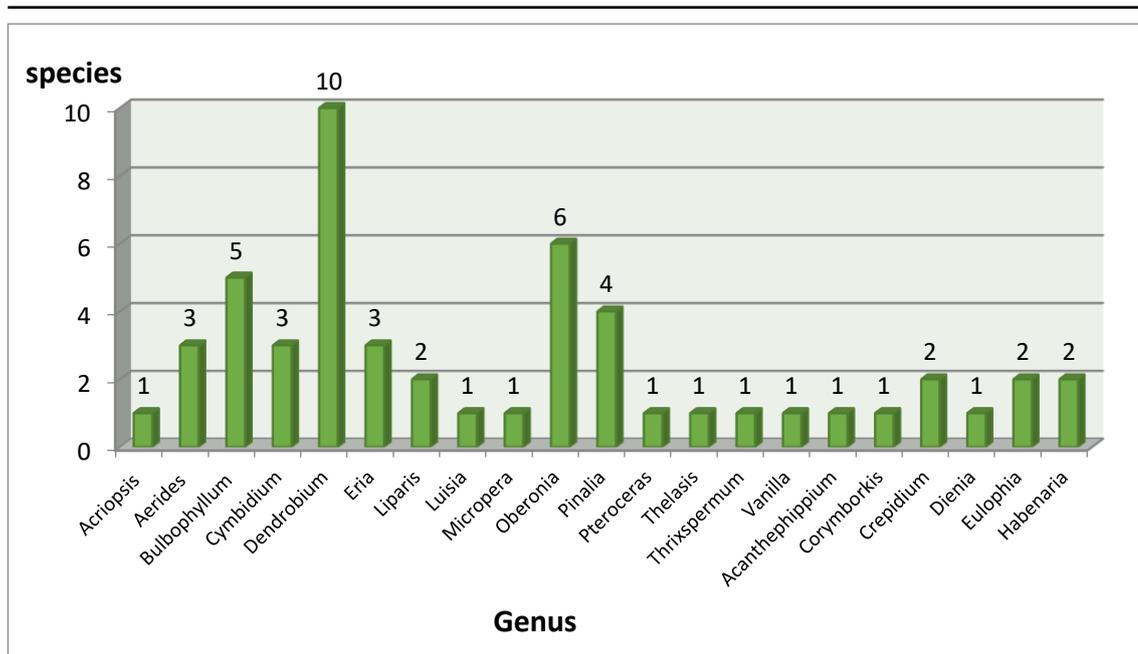


Figure 2. Number of orchids species for each genus found in Polewali Mandar Regency, West Sulawesi

There are about 52 species of the Orchidaceae family in Polewali Mandar Regency, consists of 43 species of epiphytic orchids and 9 species of terrestrial orchids. Based on Table 1 and Figure 2, *Acriopsis liliifolia* (J.Koenig) Seidenf. was only one species of the genus *Acriopsis* found in this area. The other genus were only one species found, that are *Luisia celebica* Schltr., *Micropera sterrophylla* (Schltr.) Garay, *Pteroceras* sp., *Thelasis pygmaea* (Griff.) Lindl., *Thrixspermum centipeda* Lour, *Vanilla* cf. *planifolia* Jacks. ex Andrews, *Acanthephippium splendidum* J.J.Smith, *Corymborkis veratrifolia* (Reinw.) Blume and *Dienia ophrydis* (J.Koenig) Seidenf. The other genus found in this area at least with 2 (two) to 11 (eleven) members species of their genus. The most diverse species found in this area are members of the genus *Dendrobium* (10 species) and *Oberonia* (6 species). Orchids commonly found in Butu Tahuana hillside, Pulliwa Village, Bulo Sub-District (15 species), then in Tapua Village, Matanga Sub-District (12 species) and Mambutapua Village, Matanga Sub-District (12 species).

3.1. Epiphyte Orchids

The genus *Acriopsis* can be recognised by their crowded egg-shaped pseudobulbs surrounded by nest of erect white roots, each pseudobulb has 2-4 linear leaves at the apex, growing as trunk epiphyte on tress. It consists of eight or nine species which distributed to South East Asia to Australia [13]. One of them is *Acriopsis liliifolia* (J.Koenig) Seidenf, which is formerly named as *Acriopsis javanica* Reinw. ex Blume [9]. It is very common species found in South East Asia from sea level to highland forest. It has long slender inflorescences with many branches, bearing numerous small cross-shaped flowers. Flowers are 1.2 mm broad, white or pale yellow with median violet streak. The lateral sepals are fused together as synsepalum behind the lip, and the base of the lip is joined to the column margins to form a nectary. Lip is white-violet with distinct side-lobes which are each broader than mid-lobe.

Three species of *Aerides* was recorded growing epiphyte on the trees. There is no species found in flowering time, but based on vegetative plant, one of them identified as *Aerides odorata* Lour.

There are five species of the genus *Bulbophyllum* found in this area, only one species were flowering and identified as *Bulbophyllum clandestinum* Lindl. which was formerly named as *Bulbophyllum sessile* (Kuntze) J.J.Sm. These orchids are widespread from Thailand, Laos, Vietnam, Burma, Malaysia, Indonesia, New Guinea, Philippines and Fiji. It grows epiphyte on tree trunks in lowland forests up to 1,000 m above sea level (asl.).

Three species of the genus *Cymbidium* was also found in this area. One species of them is identified as *Cymbidium finlaysonianum* Lindl., although they were not in flowering time, but based on vegetative morphology this plant has thick, hard, long leaves (70 cm) and widest leaves (at least 4.5 cm) among the pendulous inflorescence in this genus [9].

Among ten species of *Dendrobium* found in this area, only six number collections of them can be identified into species, that are *Dendrobium acerosum* Lindl., *Dendrobium acinaciforme* Roxb., *Dendrobium anosmum* Lindl., *Dendrobium bicaudatum* Reinw. ex Lindl., *Dendrobium clavator* Ridl., and *Dendrobium crumenatum* Sw., while the other still under genus *Dendrobium* sp. The distribution of *Dendrobium clavator* recorded in the Malay Peninsula and Thailand, thus Sulawesi is a new record for its distribution [7]. It grows epiphytes in the lowlands to the highlands, at an altitude of 371-1,300 m asl.

There are three species of *Eria* found in this area, one of which is *Eria javanica* (Sw.) Blume. and the others are still unidentified species because no flower. *E. Javanica* has fat pseudobulbs formed from a single internode, each support two lanceolate leaves, size about 50x10 cm, quite thick and fleshy. Inflorescence about 60 cm long, emerging from near the apex of pseudobulbs, each bearing 40-50 flowers, most of which open at once. Flowers are sweet fragrant, about 4 cm broad. There is a lot of variation in flower colour and size, pale yellow, sometimes with purple or red veining. The distribution widespread in South and South east Asia from sea level to 2400 meters altitude.

Two species of the genus *Liparis* were found in this area, that are *Liparis condylobulbon* Rchb.f. and *Liparis parviflora* (Blume) Lindl. They are epiphyte, having pseudobulbs which support two leaves. They are very distinctive because they have different forms on the pseudobulb and leaves *L. condylobulbon* has an obovate pseudobulb with long terete tip, linear leaves and an erect inflorescence. *L. parviflora* has a conical pseudobulb, lanceolate leaves and a pendulous inflorescence.

Luisia celebica Schltr. is one of endemic orchid to Sulawesi found in this area. *Luisia*'s name comes from the name of a Portuguese botanist Don Luis de Torres, in recognition of his love for orchids. While the *celebica* comes from Celebes, the island of Sulawesi, where it was first discovered. At present the distribution is known only in Sulawesi [12].

Genus *Micropera* consist of about 21-22 species which is distributed from India, Indochina, Vietnam, Malaysia, Indonesia, Philippines, Australia to the Pacific Islands. There is only one species of *Micropera* recorded in Sulawesi, that is *Micropera sterrophylla* (Schltr.) Garay [13], [<https://en.wikipedia.org/wiki/Micropera>]. In this area, this species found at altitude of 265 meters, but O'Byrne [13] stated it found in Sulawesi

at elevations of 600 to 1200 meters. This plant is growing epiphyte on roadside trees on branches with branching stems carrying rigid, strap shaped leaves. The inflorescences curve upwards and can reach 40 cm long with up to 30 flowers, only a few are open at a time.

While genus *Oberonia*, there are six (6) species were recorded in this area, that are *Oberonia cf. fungumolens* Burkill, *Oberonia lycopodioides* (J.Koenig) Ormerod, *Oberonia padangensis* Schltr., *Oberonia costeriana* J.J.Sm. *Oberonia* sp. TR 35 and *Oberonia* sp. DM 2779. This genus are mostly characteristic by stemless and have distichous leaves which bilaterally flattened and often fleshy, inflorescence terminal with numerous very small flowers arranged in whorls in a raceme. Two species of them are still unsure to identify their species names because there is no flower, that are *Oberonia* sp. TR 35 and *Oberonia* sp. DM 2779. *Oberonia* sp. TR 35 is similar to *Oberonia cf. imbricata* (Blume) Lindl. or *Oberonia cf. lycopodioides* (J.Koenig) Ormerod. Only their flowers can distinguish the species.

Pinalia is formerly to be palced in genus *Eria* section *Pinalia*. *Pinalia* was recently reinstated as distinct from *Eria* based on thin filamentous roots, large, laterally flattened pseudobulbs of several nodes, each node with a papyraceous bract, leaves with obscure venation, racemes with a cylindrical peduncle and rhachis, cupulate flowers and narrow column with obscure wings [19]. Furthermore O'Byrne et al. (2018) [20] proposed *Pinalia* as a genus especially for the sundaic orchids, particularly those of Sulawesi and Moluccas. Some member of genus *Eria* section *Pinalia* is now become a new genus *Pinalia*, such as *Pinalia quinquangularis* (J.J.Sm.) Ormerod which is formerly named as *Eria quinquangularis* J.J.Sm.; *Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes which is formerly named as *Eria xanthocheila* Ridl.; *Pinalia bractescens* (Lindl.) Kuntze which is formerly named as *Eria bractescens* Lindley. However, some species of genus *Eria* section *Eria* still valid as genus *Eria*, such as *Eria javanica* (Sw.) Blume.

Pinalia quinquangularis (J.J.Sm.) Ormerod is found on Ambon Island of the Moluccas as a miniature sized, hot growing epiphyte with a stout creeping rhizome, pseudobulbs 4 to 5 cm, carrying 5 to 6 leaves. Inflorescence 12 cm long, many flowered 90 in one inflorescence. It is also found in Sulawesi as new record [13].

Pinalia xanthocheila (Ridl.) W.Suarez & Cootes is widespread to Burma, Thailand, Malaysia, Sumatra, Java, Borneo to the Philippines [9], [12]. Sulawesi has never been mentioned as distribution area, so Sulawesi become a new record for its distribution. Generally grown in the lowlands at an altitude of 300 to 1,600 m asl. It is a growing epiphyte or lithophyte with a clavate pseudobulbs, carrying several inflorescences (5 to 9 cm) with up to 25 fragrant flowers.

Only one species of *Pteroceras* was found in this area. However, this plant has no flower, so it could not be identified to species. The genus *Pteroceras* consist of 19 species which distributed from India to Philippines, Maluku and the Lesser Sunda Islands [12], [13]. There are two species of *Pteroceras* recorded in Sulawesi, *Pteroceras cladostachyum* (Hook.f.) H.A.Pedersen [12] and *Pteroceras teres* (Blume) Holttum [13]. So the *Pteroceras* sp. which found in this area, could be as one species of them.



Genus *Thelasis* consist of 20 species, which is distributed from eastern India to New Guinea and the Pacific Islands [12], [13]. Only one species of *Thelasis* was found in this area, that is *Thelasis pygmaea* (Griff.) Lindl. It is a small epiphytes with onion-shaped green pseudobulbs which support one large and one small leaf at the apex. The inflorescences emerges at the pseudobulb base, on a 6 cm long peduncle with many tiny flowers, only a few of which are open at once. This species is widespread from China, Taiwan, Assam, eastern Himalayas, India, Nepal, Bhutan, Andaman Islands, Myanmar, Thailand, Laos, Vietnam, Borneo, Java, Lesser Sunda Islands, Malaysia, Moluccas, the Philippines, Sulawesi, Sumatra, Bismark archipelago, Solomon Islands and New Guinea [9], [13].

Only one species of genus *Thrixspermum* was found in this area, that is *Thrixspermum centipeda* Lour. Seidenfaden and Wood (1992) [11] revised the formerly name of *Thrixspermum arachnites* (Blume) Rchb.f. as a synonym of the valid name *Thrixspermum centipeda* Lour. Both of name *centipeda* and *arachnites* refers to the shape of a spider. It is an epiphytic orchid, stems 10-15 cm long, bearing 5-7 leaves at 1 cm apart, lanceolate shaped, bilobed apically, and slightly thick. The inflorescence reaches 20 cm long, the rachis gradually extending up to 15 cm long, supporting 2-3 flower. Flowers pale yellow, 4-5 cm broad, smelled softly fragrant. The pouch lip is about 9 mm long, white with reddish-brown dots. It generally grows at an altitude of 0-1,300 m asl., both in primary and secondary forests. It grows mainly in the region of India to Southeast Asia, from Laos, Myanmar, Thailand, Peninsular Malaysia, Sumatra Borneo, Java, Sulawesi and the Philippines [9], [12].

There was no flower when *Vanilla* sp. was found, so it cannot be identified to species name. There are two possibility species names, that are *Vanilla planifolia* Jacks. ex Andrews. or *Vanilla platyphylla* Schltr.. Distribution of *V. platyphylla* is Sulawesi and the Philippines [13], [12]. Furthermore, O'Byrne [13] recorded that *V. platyphylla* was found in Mindoro (North Sulawesi) at an altitude of 450-760 m asl. So it is likely that the *Vanilla* was found in Polewali Mandar Regency, West Sulawesi Province is *Vanilla planifolia* Jacks. ex Andrews. Although this species is not native to South East asia, it is native to Mexico and Central America, but it has widespread in several Asian countries as commercial commodities. *V. planifolia* is a terrestrial or epiphytic orchid vine as a herbaceous climber, and it uses its fleshy roots to support itself as it grows. Flowers are greenish-yellow, with a diameter of 5 cm, they last only a day, and must be pollinated manually. *Vanilla* is the only orchid that produces an edible fruit and the smell is very fragrant.

3.2. Terrestrial orchid

Terrestrial orchid species found in this area were: *Acanthephippium splendidum* J.J.Smith, *Crepidium carinatifolium* (J.J.Sm.) Szlach., *Habenaria beccarii* Schltr., *Eulophia zollingeri* (Rchb.f.) J.J.Sm., *Eulophia spectabilis* (Dennst.) Suresh, *Corymborkis veratrifolia* (Reinw.) Blume.

Acanthephippium splendidum J.J.Smith was found in this area. It is about 80 cm in height and grow on humus soil as terrestrial orchid. Bulb is ovoid to conical (fusiform),

fleshy, 25 cm in length, with 4-6 segments per pseudobulbs covered by sheaths, supporting 2-3 leaves. Leaves are elliptic, tip acuminate, pointed ends, plicate, 65 cm long. Inflorescence is lateral, appearing from node bulb of new growth, 13-16 cm long and bearing 3-6 flowers. Flowers are jar-shaped, fleshy, about 4 cm long, pink colour base, marked with red lines and spots, bright yellow lips marked with red inside. The distribution spread from Sulawesi, Moluccas, New Guinea, Solomon Islands, Fiji, New Caledonia, Tonga, Vanuatu to the Pacific Ocean. Grows in moist and humus forests at altitudes up to 1,300 m asl. [13].

Corymborkis veratrifolia (Reinw.) Blume 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 trilobes, entire, 3 cm long and 1.5 cm broad, convex, the margins undulate [9]. 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 [9].

This terrestrial orchid populations found growing on the forest floor were generally not abundant, they grew in small groups and spread. Generally orchids were not found in flowering condition, so species name could not be identified. There were two species of *Crepidium* were also found, but only one species has been identified, that is *Crepidium carinatifolium* (J.J.Sm.) Szlach. which has previous name *Malaxis carinatifolia* (J.J.Sm.) P.F.Hunt. The genus *Crepidium* Blume reestablished recently [15], it differs from the genus *Malaxis* Sw. to which most of its species were classified previously in the gynostemium structure [16]. It distributes from Sulawesi, Papua to New Guinea. It grows at an altitude of 300 to 1,200 m asl.

Dienia ophrydis (J.Koenig) Seidenf. was formerly named as *Malaxis latifolia* J.E. Smith [9] or *Malaxis ophrydis* (Koenig) Ormerod [13]. This plant has stems close together, swollen into pseudobulbs, each bearing 3-4 leaves. Leaves are broadly lanceolate and acuminate to the tip, up to 30x10 cm. Inflorescence sometimes up to 50 cm tall, bearing many small flowers, about 5 mm broad. Flowers facing downwards, the colours are yellow and green, then fade to red or brown. This common terrestrial orchid is widely distributed from India, China, and South-East Asia to Australia. It occurs in a range of open situations such as grassy roadsides at elevation from 0-1500 m asl. [9], [13].

There were two species of *Eulophia* growing in this area, *Eulophia zollingeri* (Rchb. f.) J.J. Sm. and *Eulophia spectabilis* (Dennst.) Suresh. *E. zollingeri* is a mycoheterotrophic terrestrial, green leaves absent. Pseudobulbs are underground, giving rise to an erect inflorescent about 60 cm tall, supporting 15 to 20 flowers, rhachis with subulate floral bracts, flowers dull red-brown, not wide opening, and pungently fragrant flowers. Found in India through Indonesia to New Guinea and Queensland Australia, hill to lower montane forests at elevations of 500 to 1500 meters with deep shade or open place

with thick humus [11].

There were two species of *Habenaria* was recorded growing as terrestrial orchids, one of them was identified as *Habenaria beccarii* Schltr. It is a small orchid with 2-20 cm high, bearing 4-5 leaves. The inflorescence is terminal, erect, bearing 5-17 white flowers on a rachis 4-12 cm. It grows on humus soil under shady forest as a terrestrial, only found in Tubbi Village, Tubbi Sub-District. This orchid species is endemic to the Wallacea region mainly in Sulawesi and Moluccas [17].

According to Puspitaningtyas (2017) [17] this species from Sulawesi was identified with the wrong name as *Habenaria medioflexa* Turrill [23] or *Habenaria medusa* Kraenzl [21, [22]. After detailed observation on flower morphology, *H. beccarii* is 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 [11]; while the distribution of *H. medusa* is in Sumatra, Borneo, Java, as well as Sulawesi [9], [18].

4. Conclusion

The orchid collections were found in Polewali Mandar Regency are very diverse. The results of the study recorded approximately 52 species of the Orchidaceae family, represent 21 genera, consists of 43 epiphytic orchids species and 9 terrestrial orchids species. There are some orchids species that are very important for note and need attention for conservation. *Luisia celebica* Schltr. is noted as endemic orchid to Sulawesi. While *Habenaria beccarii* Schltr. is endemic to the Wallacea region mainly in Sulawesi and Moluccas. Among those orchids found in the study, *Pinalia quinquangularis* (J.J.Sm.) Ormerod, *Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes and *Dendrobium clavator* Ridl. are noted as a new record in Sulawesi. Many new records of orchids are still to be expected from Sulawesi.

These endemic orchids need to be protected from extinction in the wild. so plant conservation is recommended both *in situ* conservation by protecting the habitat and *ex situ* conservation as a back-up by cultivation orchids out of the habitat. For conservation purpose, cultivated commercial plant species should be encouraged, in order to avoid over exploitation in the wild. If the population declines in the wild, then reintroduction program should be carried out to restore the populations in their natural habitat. Therefore forest degradation must be prevented to avoid biodiversity loss of flora and fauna. In the other hand, botanic garden is one of the solution to save plants diversity by *ex situ* conservation. Whereas *in situ* conservation is primarily save the habitat in nature.

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