

Inventory and habitat study of orchids species in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi

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ABSTRACT

Lestari DA, Santoso W (2011) Inventory and habitat study of orchids species in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi. *Biodiversitas* 12: 28-33. Orchid is one of the ornamental plants which have been high commercial value. Therefore, orchid often has been over exploitation. Finally, some of orchid species are becoming threatened or even endangered. Purwodadi Botanical Garden as an institute of ex-situ conservation play role with it. The aim of this research is to inventory orchid's species in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi by explorative method. Observation for habitat study was focused on some ecological factors supported to orchids growth like host tree, zone growth on host tree, abundance of sunlight, thickness of substrate (moss), orchid species and number of individual species. The result showed that there were 27 orchids species, consist of, 25 species (16 genera) epiphytic orchid and 2 species terrestrial orchid such as *Eulophia keithii* var. *celebica* and *Goodyera rubicunda* (Blume) Lindl. The host preference for the epiphytic orchid is the group of Myrtaceae family like *Syzygium* sp., *Metrosideros vera* Niederen and *Metrosideros* sp. They mostly grow on the main stem of the tree zone 1 on thick substrate (moss) and get a little abundance of sunlight (calm).

Key words: orchid, inventory, explorative, Lamedai Nature Reserve.

INTRODUCTION

Lamedai stated as nature reserve according to KepMenHut No. 209/Kpts-II/1994 on April 30, 1994 covers of 635,16 hectare landmass, where habitat of *kayu kuku* (*Pericopsis mooniana* Thwaites). Geographically, Lamedai Nature Reserve range between 3°57'-3°59' LS and 122°48'-122°50' BT, located in Lamedai Village, Watubangga Subdistrict, Kolaka District, Southeast Sulawesi Province. The altitude is from sea level up to 50-200 m asl., the topography is flat and hilly with slope of 15-30°. Soil type is generally alluvial. Climate type is C with dry season on July-December and rainy season on January-July, with rain fall is 2815 mm/year. Humidity is about 80,3% with temperature of 20-34°C (Bugiono 2006).

Lamedai Nature Reserve has been damaged by deforestation or nickel mining activities. It else abuts with road which connects Kolaka – Kendari and transmigrate village. This condition will change flora composition in the area; effect to the reduction of a particular species of host trees, so that the number of orchid species decline in the nature. Park et al. (2000) said that many Asian orchids are threatened by extinction because of over-collection and habitat destruction. Moreover, destruction of habitat due to narrowness of the land, plantation (Djuita et al. 2004), forest fires, logging wild, natural disasters and transfer of forest functions settlements also encourage the extinction of orchids (Yulia and Ruseani 2008). Added to the capture of wild orchids especially without consider sustainability,

which led to the extinction of certain orchids. The rate of destruction of this orchid natural habitat accelerates the existence of such threats. Data from the World Conservation Monitoring Centre (1995) showed that when compared with other species plants native to Indonesia with the status of other threatened the orchid is a plant that receives the highest extinction of 203 species (by 39%). Not even a possibility when it many orchids, which became extinct before he described or documented (Puspitaningtyas 2005); and 253 species ($\pm 80\%$) of the total orchid species endemic to Indonesia in Sulawesi (Peneng et al. 2004). *In-situ* or *ex-situ* conservation and preservation of natural habits of orchid is the most suitable way for sustaining these endangered species.

Orchid is one of the ornamental plants which have been high commercial value. Therefore, it has been often over exploitation. Finally, several of orchid's species are becoming threatened or even endangered. Conservation of them must be done, because they have a good prospect as commodity for trading such as parent stock, medicinal plant and material for cosmetic or perfume. Therefore, it's necessary to conserve it through both *in situ* and *ex situ* conservation (Siregar et al. 2005). The aim of this research was to inventory orchid's species in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi, to gain information about orchid species in this area. Furthermore, the species of orchids collected can be revealed by its potential for the benefit of education, conservation, display, reintroduction and others.

MATERIALS AND METHODS

Inventory was done in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi, Indonesia (Figure 1) on July 21th to August 5th 2009. Identification species were based on orchid flower, and unidentified species were collected as fresh material.

Explorative methods were used to inventory orchids species. Observation was focused on some ecological factors supported to orchids growth like host tree (for epiphytic orchid), zone growth on host tree, abundance of sunlight and thickness of substrate (moss), orchid species

and number of individual species. Number of individual species for sympodial orchid such as *Bulbophyllum*, *Acropsis*, *Cymbidium*, *Dendrobium*, etc. are counted per clump.

Determinations of zone used Johansson (1975) method, which divide host tree, into 5 zones, as follow: (i) Zone 1: basal parts of the trunk (part of the trunk), (ii) Zone 2: the upper basal of the trunk to the first ramification (part of the upper trunk), (iii) Zone 3: the basal part of the large branches (part of the total length of the branch), (iv) Zone 4: the middle part of the large branches (part in the

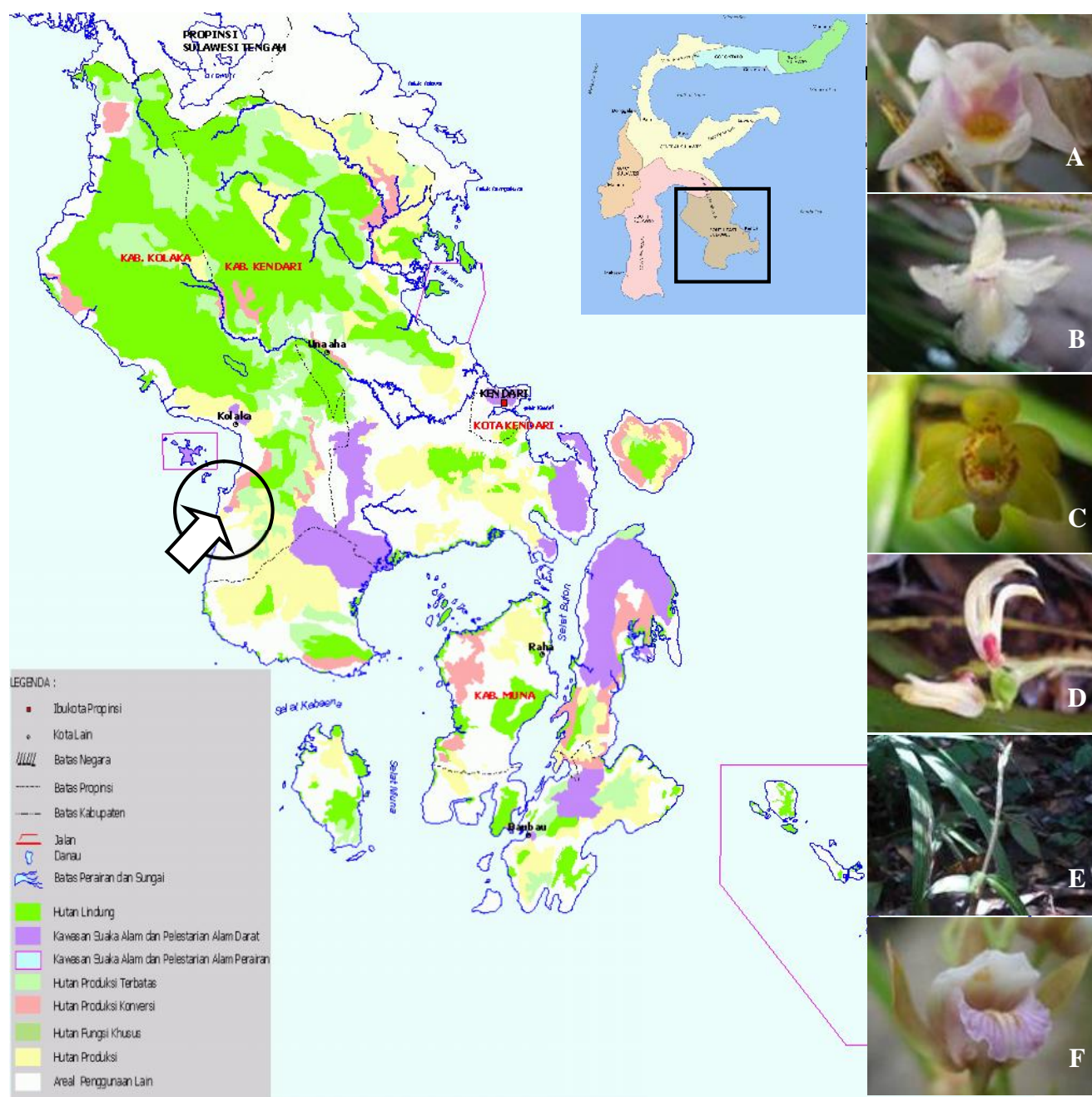


Figure 1. Lamedai Nature Reserve (circle) at Kolaka, Southeast Sulawesi, and some of orchid species at this area: (A). *Dendrobium platygastrum* Reichb.f., (B). *Dendrobium section strongyle*, (C). *Grosourdya appendiculata* (Blume) Reichb.f., (D). *Thrixspermum* sp., (E). *Goodyera rubicunda* (Blume) Lindl., and (F). *Eulophia keithii* var. *celebica*.

middle of the total length of the branch), and (v) Zone 5: The outer part of the large branches (outer part of the total length of the branch)

Determination of substrate thickness used measurement standard to measure thickness of substrate from orchid in their zone, as follow: (i) thick (>5 cm), medium (2-5 cm), and (iii) thin (<1 cm) (Yulistyarini et al. 2001).

Determination of sunlight abundance used measurement standard for quality of light into the plant (Tirta et al. 2010), as follow:

Table 1. Criteria of sunlight abundance

Sunlight abundance	Criteria
Calm	If substrate closed by trees, so that get a little sunlight
Rather calm	If substrate get an enough sunlight
Open	If substrate get more sunlight

Table 2. Criteria of Light intensity

Light intensity	Criteria	Luxmeter
Heavy shade	Low light intensity	<35 lux
Open shade	Medium light intensity	35-70 lux
Full sun	High light intensity	>70 lux

RESULTS AND DISCUSSION

More less 27 orchids species were found in Lamedai Nature Reserve, consist of 25 epiphytic orchids (in 16 genera), and 2 terrestrial orchid species such as *Eulophia keithii* var. *celebica* and *Goodyera rubicunda* (Blume) Lindl. (Table 3). Those orchids mostly grow at elevation from sea level up to 500-600 m, evenly at 700 m (Puspitaningtyas 2005). From all the species, which are 11 orchids still unidentified species because they were not in flowering for species identification. According to Arditti (1992), epiphytic is one of the conspicuous characters in orchid comparison with terrestrial orchid in the way of living. Approximately, from total of orchid species were epiphyte on the stem of several plants (Koopowitz 2001). Mostly, total of orchid individual from each species are *Bulbophyllum* sp. (126 individual), *Bulbophyllum lepidum* (Blume) J.J. Smith (44 individual) and *Dendrobium* sp.1 (36 individual).

Mostly, total of orchid species from 16 genera were *Dendrobium* and *Bulbophyllum* (4 species). *Dendrobium* also found dominant in the Mount Tinombala Natural Reserve, Tolitoli District, Central Sulawesi (Putri 2006). Then *Thrixspermum* (3 species), *Cymbidium*, *Pomatocalpa* and *Taeniophyllum* (2 species). *Grosourdia*, *Luisia*, *Phalaenopsis*, *Pteroceras* and *Schoenorchis* have one species. In Lamedai, *Grammatophyllum scriptum* Blume found in the forest line and epiphytic on the *Castanopsis buruana*. But this species can be found on the terrestrial habitat such as *G. speciosum* Blume in the Kersik Luway

Nature Reserve (Puspitaningtyas and Fatimah 1999). Accordance by type of growth, know 18 species of sympodial orchids and 9 species monopodial orchids in Lamedai Nature Reserve such as *Grosourdia appendiculata* (Blume) Reichb.f., *Phalaenopsis* sp., *Pteroceras emarginatum* (Blume) Holtt, *Schoenorchis juncifolia* Blume ex. Reinw., *Taeniophyllum* sp., *T. biocellatum* J.J. Smith, *Thrixspermum* sp., *T. arachnites* (Bl.) Reichb. and *T. accuminatissimum* (Blume) Reichb.f.

Table 3. Orchid's species in Lamedai Nature Reserve, Kolaka, Sulawesi Tenggara

Species	Habitat	Total of individual
<i>Acriopsis</i> sp.	Epiphytic	1
<i>Agrostophyllum</i> sp.	Epiphytic	1
<i>Bulbophyllum</i> sp.	Epiphytic	126
<i>B. macranthum</i> Lindl.	Epiphytic	16
<i>B. lepidum</i> (Blume) J.J. Smith	Epiphytic	44
<i>B. odoratum</i> (Blume) Lindl.	Epiphytic	30
<i>Cymbidium</i> sp.	Epiphytic	10
<i>C. finlaysonianum</i> Lindl.	Epiphytic	21
<i>Dendrobium</i> sp.1	Epiphytic	36
<i>Dendrobium</i> sp.2	Epiphytic	5
<i>D. crumenatum</i> Sw.	Epiphytic	12
<i>D. platygastrium</i> Reichb.f.	Epiphytic	1
<i>Eulophia keithii</i> var. <i>celebica</i>	Terrestrial	3
<i>Goodyera rubicunda</i> (Blume) Lindl.	Terrestrial	1
<i>Grammatophyllum scriptum</i> Blume	Epiphytic	1
<i>Grosourdia appendiculata</i> (Blume) Reichb.f.	Epiphytic	1
<i>Luisia</i> sp.	Epiphytic	1
<i>Phalaenopsis</i> sp.	Epiphytic	1
<i>Pteroceras emarginatum</i> (Blume) Holtt	Epiphytic	1
<i>Pomatocalpa</i> sp.	Epiphytic	7
<i>P. spicata</i> Breda	Epiphytic	13
<i>Schoenorchis juncifolia</i> Blume ex. Reinw.	Epiphytic	23
<i>Taeniophyllum</i> sp.	Epiphytic	1
<i>T. biocellatum</i> J.J. Smith	Epiphytic	2
<i>Thrixspermum</i> sp.	Epiphytic	2
<i>T. arachnites</i> (Bl.) Rchb.	Epiphytic	5
<i>T. accuminatissimum</i> (Blume) Reichb.f.	Epiphytic	1

Host tree

Epiphytic orchid need host tree in association to live in suitable environment. Host trees provide the substrate for epiphytes, so establishment seems to be affected by host tree traits (Hirata et al. 2008). The result showed that there were 32 species host trees for epiphytic orchid in this area.

Table 4 showed that 5 species were the most preference host tree for epiphytic orchid such as *Metrosideros vera* Niederen, *Syzygium* sp., *Cratoxylum formosum* (Jack.) Dyer., *Vitex* sp. and *Barringtonia* sp. This result was supported by Tirta et al. (2010), that epiphytic orchid in Senturan forest mostly grow on *Syzygium racemosum*, *Syzygium* sp., *Glochidion rubrum*, *Artocarpus* sp., *Baccaurea* sp., *Trema orientalis* and *Shorea* sp. In the other case, epiphytic orchid grow well on other species trees out group of *Syzygium* family such as *Lagerstroemia speciosa*, *Tectona grandis* (Yulia and Ruseani 2008; Puspitaningtyas 2007), *Clausena indica*, *Mangifera indica* (Puspitaningtyas 2007), *Saraca declinata* and *Dipterocarpus* sp. (Yulia

2007). Epiphytic orchid in Sibolangit mostly grow on *Durio* sp. (Hartini and Puspitaningtyas 2009), same with research orchid in Sintang District, West Kalimantan (Ariyanti and Pa'i 2008). *Syzygium* was not the most preference host tree for orchid; depend on the type of vegetation in the area. Sanford (1974) said that habitat of orchid is has correlation with their environment. *Pouteria* sp., *Cratoxylum* sp., *Barringtonia* sp., *Lophopetalum* sp. and *Syzygium* sp. are suitable host tree for orchid grow, that indicated by the highest population of orchid. But *Syzygium* sp., *Metrosideros* sp., *Barringtonia* sp., *Cratoxylum* sp. and *Lophopetalum* sp. are suitable host trees for a number of orchid species. Host tree species determines traits, such as bark characteristics (Hirata et al. 2008). According to Yulistyarini (2001), Host trees such as *Cratoxylum* sp., *Vitex* sp. and *Syzygium* sp. usually have specific character like rough bark with mossy substrate.

Bulbophyllum sp. can associate growing on some host trees like *Metrosideros vera* Niederen, *Metrosideros* sp., *Palaquium obovatum* (Griff.) Engl., *Eusideroxylon* sp., *Cratoxylum* sp., *Pouteria* sp., *Vitex* sp., *Maranthes* sp., *Cratoxylum formosum* (Jack.) Dyer., *Lophopetalum* sp.,

Antidesma sp. and *Cleistanthus* sp. *Bulbophyllum* sp. is genera that have more diversity in Malesia area, beside of *Dendrobium* sp. (Comber 1990). Same with research of Yulia (2007) that found more *Bulbophyllum* sp. (15 species) in the natural forest at the Petarikan village, West Kotawaringin District, Central Kalimantan. Data recapitulation of orchid's species on the 10 host trees in Lamedai Nature Reserve is represented at Figure 1.

Metrosideros vera Niederen is the preference host tree for orchid (Figure 1). Base on number of individual orchid on host tree, showed that many orchid species in Lamedai prefer growing on *Pouteria* sp., then on *Syzygium* and Sapotaceae family. *M. vera* synonyms with *Xanthostemon verus* (Lindl.) Peter G. Wilson have bark surface smooth, greyish, branches often low on the bole and slough (Sosef et al. 1998). Orchid preference choose host with rough bark surface (Whitner 1974) because seed of orchid can be drawee on the bark comparison with smooth bark surface (Puspitaningtyas 2007). Mostly, orchid in Lamedai Nature Reserve found epiphytic on the smooth bark surface but slough. So they can be grow on the bark.

Table 4. Relationship between host tree and orchid in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi

Species of host tree	Family	The frequency as host tree	orchid species	individual of orchid	Orchid species/host tree	Individual of orchid/host tree
<i>Syzygium</i> sp.	Myrtaceae	7	7	27	1	3.86
<i>Metrosideros vera</i> Niederen	Myrtaceae	14	10	52	0.72	3.71
<i>Cratoxylum formosum</i> (Jack.) Dyer.	Clusiaceae	6	3	20	0.5	3.33
<i>Vitex</i> sp.	Verbenaceae	5	4	12	0.8	2.4
<i>Calophyllum</i> sp.	Clusiaceae	4	3	7	0.75	1.75
<i>Pouteria</i> sp.	Sapotaceae	4	3	35	0.75	8.75
<i>Metrosideros</i> sp.	Myrtaceae	4	4	14	1	3.5
<i>Barringtonia</i> sp.	Lecythidaceae	5	5	31	1	6.2
<i>Cratoxylum</i> sp.	Clusiaceae	4	4	33	1	8.25
<i>Lophopetalum</i> sp.	Celastraceae	3	3	15	1	5

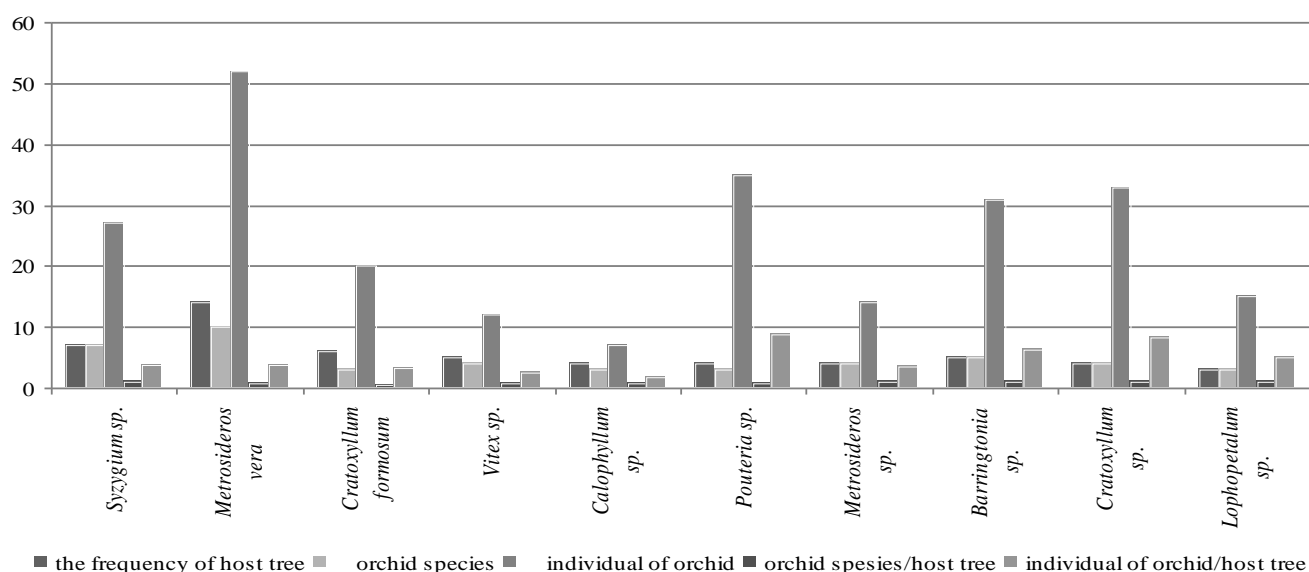


Figure 1. Recapitulation of orchids species on the 10 host tree in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi

Height zone of tree

Epiphytic orchids always patch grow on the trunk or ramification of specific tree. Height of tree is divided into 5 zone, there are zone 1, zone 2, zone 3, zone 4 and zone 5. Those zone were correlated with the way of epiphytic orchid to get sunlight. According to Solikin et al. (2010), epiphytic orchids rarely grow on the basal trunk. Usually, epiphytic orchid like growing on the zone 3 because in this zone get properly sunlight for orchid growth. Meanwhile some specific orchid can grow on the zone 1 when they need high humidity and low intensity light. Epiphytic orchid in Lamedai Nature Reserve mostly grow on the zone 1. It is showed that they need high humidity and the conservation status is easy exploitation. Orchid will stay on the zone 3-5 when they need medium to high light intensity. Result of zone observed for epiphytic orchid in Lamedai Nature Reserve as follow (Table 5):

Table 5. Zone of epiphytic orchid in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi

Zone	Frequency
Zone 1	49
Zone 2	28
Zone 3	16
Zone 4	8
Zone 5	1
Total	102

Dendrobium sp.1 grow on every zone and almost all of orchid species in Lamedai Nature Reserve grow on the zone 1, except *Agrostophyllum* sp., *Dendrobium platygastrum* Reichb.f., *Grammatophyllum scriptum* Blume, *Grosourda appendiculata* (Blume) Reichb.f., *Luisia* sp., *Phalaenopsis* sp. and *Thrixspermum* sp. Only once orchid found on zone 5, it means that epiphytic orchid cannot stand under full sunlight. Usually, epiphytic orchid will choose appropriate zone of host tree to get light for growing. Based on the research of Tirta and Lugrayasa (2006), epiphytic orchid mostly grow on zone 2 (36%) and only few orchids grow on zone 5 (6%). But *Dendrobium capra* J.J. Smith in Madiun and Bojonegoro can found at 5th zone because it needs to get a direct sunshine (Yulia and Ruseani 2008). Sometimes epiphytic orchid found on zone 3 and 4 (Tirta et al. 2010; Hirata et al. 2008). Dressler (1982) said that zone 2 and 3 are the most suitable zone for epiphytic orchid.

Substrate

Category of substrate thickness on the habitat of epiphytic orchid divided into thin, medium and thick. Usually, thick or thin of substrate depend on physically condition of host tree. Thick substrate showed that high humidity in their habitat. In Lamedai Nature Reserve, humidity was about 60-80% and temperature 22-32°C, this condition created thick humus deposits. There were 51 orchid species growing on thick humus and 7 species on thin humus, such as *Bulbophyllum* sp., *Cymbidium finlaysonianum* Lindl., *Dendrobium* sp.1, *Dendrobium*

crumenatum Sw., *Schoenorchis juncifolia* Blume ex. Reinw., *Thrixspermum arachnites* (Bl.) Rchb. and *Thrixspermum accuminatissimum* (Blume) Reichb.f. and usually found lichen on their habitat. Yulistyarini et al. (2001) said that in Pleihari, Martapura, epiphytic orchid mostly grew on medium to thick humus on zone 2. According to Rahayu (2004), lichen supply water to epiphytic orchid that influence to photosynthesis plant. Substrate thickness of epiphytic orchid in Lamedai Nature Reserve presented on Table 6.

Table 6. The correlation between substrate and the occurrence of epiphytic orchid

Substrate thickness	Frequency
Thick	51
Medium	44
Thin	7
Total	102

Whether orchids grow perched on the branches of trees in tropical forests, or barely holding their leaves above the water in temperate marshy meadows, they are well adapted to survive in their own particular environment (Rahayu 2004). Epiphytics find themselves in an unusually harsh environment. High up in the canopy, water is only abundant when it rains. Even though it may rain regularly, there are often times when precipitation is reduced. Nearly all exposed epiphytic orchids tend to have heavily waxed leaves or a thick cuticle, which helps to conserve moisture.

Sunlight intensity

Usually, orchids need sunlight with ratio 20-90% and depend on species of orchid. Several of orchids can be growing on the place with enough sunlight or not. Characteristic of epiphytic orchid is one of the adaptations to sunlight. Every orchid species need different sunlight, lower or higher sunlight intensity from optimum requirement cause obstacle growth (Harwati 2007). The result showed that species of epiphytic orchids in Lamedai Nature Reserve more founded in shady condition (Table 7).

Sunlight intensity are acceptance more and more little if orchid reside in the forest, because had the hands tied with crown of tree and high humidity relatively. Frequency epiphytic orchid in heavy shady was 40 individual, open shade was 43 individual and full sun was 9 individual. This condition show that epiphytic orchid in Lamedai commonly grow in high humidity, frequently on zone 1. Relatively same with research from (Tirta and Lugrayasa 2006) in Malinau that epiphytic orchid oftenly grow in zone 2 and rarely grow in zone 5. Yulia and Ruseani (2008), stated that usually on zone 5, epiphytic orchid get more sunlight intensity and low humidity relatively with dry substrate condition. In Lamedai, *Phalaenopsis* sp. rarely grows under full sunlight. They generally grow in shady condition. *Phalaenopsis* sp. and *Paphiopedillum* sp. need low light intensity (Pridgeon and Morrisson 1992). But *Dendrobium* sp. *Thrixspermum* sp. and other orchid's species commonly grow under open shade area. From the

result know that light intensity interfered with growth and development of these orchids (Stancato et al. 2002).

Table 7. Abundance of sunlight for epiphytic orchid in Lamedai Nature Reserve, Kolaka, Southeast Sulawesi. The correlation between sunlight intensity and the occurrence of epiphytic orchid.

Sunlight intensity	Frequency
Heavy shade	40
Open shade	43
Full sun	9
Total	102

CONCLUSION

In Lamedai Nature Reserve, there were 27 orchids species, consist of 25 species (16 genera) epiphytic orchid and 2 species terrestrial orchid such as *Eulophia keithii* var. *celebica* and *Goodyera rubicunda* (Blume) Lindl. Member of Myrtaceae such as *Syzygium* sp., *Metrosideros vera* Niederen and *Metrosideros* sp. were the most preference host tree for epiphytic orchid. They frequently grow on zone 1 with thick mossy substrate and low sunlight intensity.

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