

Identification of Orchid Species in The Forest Area of East Tomohon

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Abstract. Orchids which belong to the Orchidaceae family, are popular ornamental plants that are loved by many people. It is estimated that there are around 5,000 species of orchids in Indonesia. Orchids live in various habitats including epiphytic, terrestrial, lithophytic, and saprophytic. Environmental factors such as temperature, air humidity, soil pH, and light intensity can affect the growth, development, and spread of orchids. Tomohon City is known as one of Indonesia's largest flower producers, one of which is orchids. In the East Tomohon forest area, various types of orchids were found, but the types of orchids that grow have not been identified. The purpose of this study was to identify the types of orchids that grow in the East Tomohon forest area based on their morphology. The identification of orchid plants is done by observing the morphological characteristics of the shape of leaves, roots, stems, colors, and flower shapes in detail so that their taxonomy can be known. The research was conducted on August 5-19, 2022 using the cruising method (exploratory survey) the acquisition of data was analyzed descriptively. The results of research on Orchid Species in the forest area of East Tomohon found 192 individuals consisting of 10 orchid species, 4 species are terrestrial orchids, they are *Calanthe triplicate*, *Nervilia aragoana*, *Phaius thankervilleae*, *Vanda* sp., and 6 species are epiphytic orchids, they are *Coelogyne asperata*, *Coelogyne pandurata*, *Cattleya* sp., *Dendrobium crumenatum*, *Oncidium ornithorhynchum*, *Phalaenopsis amabilis*.

Keywords: orchid, morphological, identification, forest area of East Tomohon

I. INTRODUCTION

Orchids are one of Indonesia's most famous flowering plants with unique, distinctive flowers that vary in color, shape, size, and motif.[1]. Orchids live spread from lowlands to highlands, or wet forests to dry forests. It is estimated that worldwide there are 26,000 orchid species and around 5,000-6,000 are distributed in Indonesia.[2] Orchid is a plant whose diversity must be maintained, not only as a tropical forest ecosystem, but orchids have many advantages and potential to be managed and developed. The economic potential of natural orchids in terms of their potential as ecotourism assets is very high because orchids are very popular and have many enthusiasts.[3]. Tomohon City is known as one of the largest flower producers in Indonesia, one of which is orchids.[4]. Initial observations made in the East Tomohon forest area showed that orchids found growing in this area are of various types and several types of orchids are not yet known or identified.

Given the important role of orchids as constituents of tropical forest ecosystems and the absence of data on the types of orchids growing in the East Tomohon forest area,

it is necessary to research the identification of orchid species in the Forest Area Of East Tomohon. The results of this study can be used as a source of information about the biodiversity of an area, can be used as additional knowledge for the surrounding community, and is very useful in the world of education.

II. METHODS

The research was conducted in the forest area of East Tomohon, by dividing 2 exploration points. The first point was in the Rurukan forest area and the second point was in the Rurukan 1 forest area. The total area to be observed is 6 Ha with an area of 3 Ha at each exploration point starting from the community plantation to the forest or about 1500 m and 30 m wide (15 m left and 15 m right) This research was conducted on August 5-19, 2022.

The tools and materials used in this study are writing utensils to record the data found, a smartphone camera for the documentation process during the research, a soil tester to measure soil pH and soil moisture, a cellphone GPS to determine coordinate points, a literature book 1001

Species of Indonesian Orchids (2012) as a guide to help identify orchids, a hygrometer to measure air temperature and humidity.

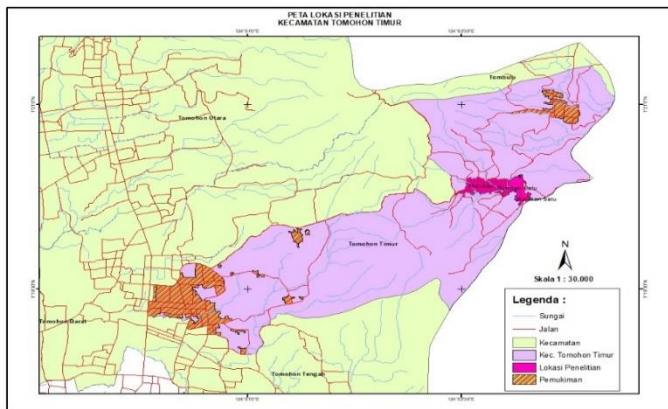


Fig.1. Research Sites

A parameter is the object of research or the target that is the center of research. The parameters observed were the types of orchid plants. Types of orchids were observed based on their morphological characteristics, habitat consisting of epiphytes, terrestrial, lithophytes, and saprophytes, and environmental factors including temperature, pH, and humidity. The data obtained were analyzed descriptively or explained explicitly about the orchid species found by mentioning the scientific name, and genus name, and describing each species found based on its morphological characteristics then displayed in the form of pictures or photos.

Research Procedure

Preliminary Preparation

Firstly, surveyed to get information that will be used as a research site then determine the location for the observation site after which data collection and literature studies related to the object of observation are carried out.

Data collection

Data collection techniques were carried out using the explore method. The cruising method used in this research is the exploratory survey method, by exploring 2 predetermined points in the East Tomohon forest area to collect data on orchids in that location.

Identification

The orchids found were observed and identified with the aid of the literature book 1001 Species of Indonesian Orchids [5]. What is carried out during identification is by studying the morphology of the plant until the stage of comparing the properties and characteristics of the plant. The process of orchid identification is directly carried out in the field up to the species level if not found then it will reach the genus level. It is carried out by identifying orchid morphology from the shape of leaves, roots, stems, colors, and flower shapes. Morphological identification observation data obtained were noted and documented.

III. RESULTS AND DISCUSSION

Results

Species of Orchid in the Forest Area of East Tomohon

The research conducted on August 5-19 2022 using the cruising method by dividing two exploration points in the East Tomohon forest area found 196 individuals consisting of 10 orchid species grouped in 9 genera, 4 species are terrestrial orchids namely, *Calanthe triplicata*, *Nervillia aragoana*, *Phaius Tankervilleae*, *Vanda* sp., and 6 species are epiphytic orchids namely, *Coelogyne asperata*, *Coelogyne pandurata*, *Cattleya* sp., *Dendrobium crumenatum*, *Oncidium ornithorhynchum*, and *Phalaenopsis amabilis* (Table 1).

In the Rurukan forest, 10 species of 94 individual orchids. The most common type of orchid in the Rurukan forest area is *Phalaenopsis amabilis* with 12 individuals and the least common type of orchid is *Nervillia aragoana* with 7 individuals (Table 2).

TABEL 1.

AMOUNT OF ORCHID SPECIES FOUND IN THE FOREST AREA OF EAST TOMOHON

Family	Genus	Species	Habitat	Total
Orchidaceae	<i>Calanthe</i>	<i>Calanthe triplicata</i>	Terrestrial	18
	<i>Coelogyne</i>	<i>Coelogyne asperata</i>	Epiphytes	16
		<i>Coelogyne pandurata</i>	Epiphytes	17
	<i>Cattleya</i>	<i>Cattleya</i> sp.	Epiphytes	21
	<i>Dendrobium</i>	<i>Dendrodium crumenatum</i>	Epiphytes	20
	<i>Nervillia</i>	<i>Nervillia aragoana</i>	Terrestrial	13
	<i>Oncidium</i>	<i>Oncidium ornithorhynchum</i>	Epiphytes	18
	<i>Phalaenopsis</i>	<i>Phalaenopsis amabilis</i>	Epiphytes	27
	<i>Phaius</i>	<i>Phaius tankervilleae</i>	Terrestrial	21
	<i>Vanda</i>	<i>Vanda</i> sp.	Terrestrial	25
Total				196

TABLE 2.
 AMOUNT OF ORCHID SPECIES IN THE RURUKAN FOREST AREA

Family	Genus	Spesies	Habitat	Total
Orchidaceae	<i>Calanthe</i>	<i>Calanthe triplicate</i>	Terrestrial	11
	<i>Coelogyne</i>	<i>Coelogyne asperata</i>	Epiphytes	8
		<i>Coelogyne pandurate</i>	Epiphytes	9
		<i>Cattleya</i>	<i>Cattleya sp.</i>	Epiphytes
	<i>Dendrobium</i>	<i>Dendrodium crumenatum</i>	Epiphytes	9
	<i>Nervillia</i>	<i>Nervillia aragoana</i>	Terestial	7
	<i>Oncidium</i>	<i>Oncidium ornithorhynchum</i>	Epiphytes	9
	<i>Phalaenopsis</i>	<i>Phalaenopsis amabilis</i>	Epiphytes	12
	<i>Phaius</i>	<i>Phaius tankervilleae</i>	Terrestrial	9
	<i>Vanda</i>	<i>Vanda sp.</i>	Terrestrial	10
Total				94

TABLE 3.
 AMOUNT OF ORCHID SPECIES IN THE RURUKAN 1 FOREST AREA

Family	Genus	Spesies	Habitat	Total
Orchidaceae	<i>Calanthe</i>	<i>Calanthe triplicata</i>	Terrestrial	7
	<i>Coelogyne</i>	<i>Coelogyne asperata</i>	Epiphytes	8
		<i>Coelogyne pandurate</i>	Epiphytes	8
		<i>Cattleya</i>	<i>Cattleya sp.</i>	Epiphytes
	<i>Dendrobium</i>	<i>Dendrodium crumeatum</i>	Epiphytes	11
	<i>Nervillia</i>	<i>Nervillia aragoana</i>	Terestial	6
	<i>Oncidium</i>	<i>Oncidium ornithorhynchum</i>	Epiphytes	9
	<i>Phalaenopsis</i>	<i>Phalaenopsis amabilis</i>	Epiphytes	15
	<i>Phaius</i>	<i>Phaius tankervilleae</i>	Terrestrial	12
	<i>Vanda</i>	<i>Vanda sp.</i>	Terrestrial	15
Total				102

In the Rurukan 1 forest area 10 species of 102 orchid individuals. The most commonly found orchid species in the Rurukan 1 forest area are *Phalaenopsis amabilis*, and *Vanda sp.* with 15 individuals, and *Nervilia aragoana* are the rarest orchids to find 6 individuals (Table 3).

Differences in physical environmental factors at the research site can also affect the amount and species of orchids found.

Classification and Description of Orchid Species in the Forest Area of East Tomohon

TABLE 4.
 PHYSICAL FACTOR PARAMETERS IN THE EAST TOMOHON FOREST AREA

Stasiun	pH of Soil	Air Temperature (C)	Air Humidity (%)	Soil Moisture (%)
I	6,4	24°C	66%	7%
II	6,6	26°C	78%	7.5%

The physical factors of the research location can be seen in Table 4. Station I and Station II have different microclimates with temperatures ranging from 24-26°C, this is still the optimal temperature to maintain orchid life.

1. *Calanthe triplicata*

- Kingdom : Plantae
- Divisi : Magnoliophyta
- Class : Lilioptida
- Ordo : Asparagales
- Family : Orchidaceae
- Genus : *Calanthe*
- Species : *Calanthe triplicata*

Calanthe triplicata has white flowers resembling a sleeping baby and has dark green leaves with lengths up to 50 cm, width of 20 cm, and heights up to 100 cm [6]. In Fig. (A) *Calanthe triplicata* orchid found in the research area with terrestrial habitat grows with stems arranged

tightly together with 5-6 leaves. Oval-shaped leaves, dark green color with a length of 20-25cm, width of 8-12cm, with a tapered leaf tip and wide center, uneven and striped leaf surface. Flower stalks grow upright to a height of about 30-35 cm, separated by partitions with about 6-10 flowers. Flowers are 6 cm in diameter with a unique shape and white.

2. *Coelogyne asperata*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Asparagales
Family : Orchidaceae
Genus : *Coelogyne*
Species : *Coelogyne asperata*

Coelogyne asperata is one of the epiphytic orchids with some specific characteristics. [7] In Fig. (B) *Coelogyne asperata* at the research location lives in terrestrial areas, has a pseudobulb on each leaf blade in the form of a cone with a 5 cm circle, and is slightly flattened ribbed as high as 11 cm, this pseudobulb is attached to the rhizome for 3 cm. Hard-stemmed leaves are folded with 5 leaf bones. The flower stem is about 25 cm and a half from the base and is erect and curved, with 16 white flowers that bloom about 4-6 cm in diameter, thick white and in full bloom, yellow corolla, and white fringe.

3. *Coelogyne pandurata*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Asparagales
Family : Orchidaceae
Genus : *Coelogyne*
Species : *Coelogyne pandurata*

Coelogyne pandurata, also known as the black orchid, is a sympodial orchid that is typical for its bright green flower color with a black labellum and violin-like shape that is purple-black or black and some parts green. [8]. In the research area, *Coelogyne pandurata* In Fig. (C) grows in clusters, lives epiphytically, has green leaves, and on each bulb has only one leaf which is oval and pleated, the width of the leaf is approximately 4-6 cm with a length of about 8-10 cm. The flat stem is yellowish-green in color, the roots are cylindrical, fleshy, and long.

4. *Cattleya* sp.

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Orchidales
Family : Orchidaceae

Genus : *Cattleya*
Species : *Cattleya* sp.

Cattleya is so popular, that it was given the title The Queen of Orchid Based on its growth, *Cattleya* is included in the evergreen group, namely leaves that do not fall together and remain green [9]. In Fig. (D) *Cattleya* sp. found in the forest area of East Tomohon based on the growth of the stem is a sympodial orchid with roots that have a cylindrical shape, thick, and tapered root tips, pseudobulbs are double-shaped, about 3-5 cm long, rather flat, hard, and fleshy. This orchid has large, thick fleshy dark green leaves about 3-4 cm wide. The flower consists of 4-6 flowers and is purple in color with a diameter of about 11-13 cm consisting of 3 petals, 1 petal being the lip of the flower which has a yellowish color at the end.

5. *Dendrobium crumenatum*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Asparagales
Family : Orchidaceae
Genus : *Dendrobium*
Species : *Dendrobium crumenatum*

Dendrobium crumenatum is one of the orchid species with flowering that requires cool ambient temperatures. [10] In Fig. (E) *Dendrobium crumenatum* found growing in the research location has many roots, brown stem color, branched, stem length of about 6-13 cm, sympodial stem growth, a pseudo-bulb from the bottom of the stem, with a pseudo-bulb length of approximately 4.5-6.5 cm, about 1 cm wide, the shape of thick oval leaves has a light green color, the tip of the leaf splits, the leaves are not symmetrical, the length of the leaves is about 4-7 cm, and the width is about 1-2cm, the flower stalks emerge from the books on bare and leafy stems, have compound flowers, white with a diameter of approximately 5cm, shaped like a trumpet.

6. *Nervilia aragoana*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Magnoliopsida
Ordo : Orchidales
Family : Orchidaceae
Genus : *Nervilia*
Species : *Nervilia aragoana*

Nervilia aragoana is a terrestrial orchid that lives in groups. This orchid can be found in lowland to highland forests.[11] In Fig. (F) *Nervilia aragoana* which was found during the research living epiphytically has 2 heart-shaped leaves, the edges of the leaves are wavy, the leaves are dark

green with a striped leaf surface, has a brownish stem with a length of around 10 cm.

7. *Oncidium ornithorhynchum*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Asparagales
Family : Orchidaceae
Genus : *Oncidium*
Species : *Oncidium ornithorhynchum*

Oncidium ornithorhynchum often called *Oncidium obedient bird* is a medium-sized plant. This orchid develops in dry areas and requires varied light or alternating light. [12] In Fig. (G) *Oncidium ornithorhynchum* found growing in the research location has a pseudobulb of 5x3 cm yellowish color and, a thick and slightly tapered tip. It has about 10 green leaves, lance-shaped, about 15-30 cm long with a width of about 4-5cm, and has blackish brown fibrous roots.

8. *Phalaenopsis amabilis*

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Magnoliopsida
Ordo : Orchidales
Family : Orchidaceae
Genus : *Phalaenopsis*
species : *Phalaenopsis amabilis*

Phalaenopsis amabilis In Fig. (H) found growing at the research site is an epiphytic orchid that develops fibrous or succulent roots attached to the trunk of the tree on which it grows. The stem grows thickened and short covered with leaf arrangement stem growth is monopodial. Flower stalks are hanging and branched. Dark green leaves with an oval shape 15-20 cm long by 6-11cm wide, fleshy alternate leaf positions. The flower is around 10 cm in diameter with petals larger than sepals, a pure white flower lip yellow base spotted red with 2 tendrils at the end of the lip.

9. *Phaius thankervilleae*

Kingdom : Plantae
Devisi : Spermatophyta
Class : Liliopsida
Ordo : Asparagales
Family : Orchidaceae
Genus : *Phaius*
Species : *Phaius thankervilleae*

Phaius thankervilleae has the nickname Nun's Orchid which is a terrestrial orchid in fertile soil fields in lowlands, hills, and mountains with hot to moderate climates. [13]. In Fig. (I) *Phaius thankervilleae* found in

the research location has a pseudobulb wrapped in fronds with a stem as high as 40 cm in green color. Ribbon-shaped leaves are 15-20 cm long and approximately 4-6cm wide with parallel, pleated, and green leaf bones. Upright flower stalks with more than 7 flowers, blooming in turn. Flowers are about 11cm in diameter, and sepals and petals are almost similar, yellowish-white in color. The inner funnel-shaped flower lip is purplish in color.

10. *Vanda* sp.

Kingdom : Plantae
Divisi : Magnoliophyta
Class : Liliopsida
Ordo : Orchidales
Family : Orchidaceae
Genus : *Vanda*
Species : *Vanda* sp.

Vanda orchids are popular because of their beautiful flowers. There are more than 40 species in the genus *Vanda* with a very wide distribution. Diversity in flower color is an advantage of this plant that allows it to be made into new hybrids. [14] In Fig. (J) *Vanda* sp. found is an orchid that grows terrestrial monopodial, which is an orchid that has the characteristics of a stem that grows straight up, straight and slender stem shape, light green leaf color as well as dark green, alternate leaf arrangement facing each other closely covering the stem, leaf shape like pandanus and flat edged, with a length of about 25-30 cm and a width of about 4-6 cm. It has cylindrical fibrous roots, soft fleshy, and pointed brown.

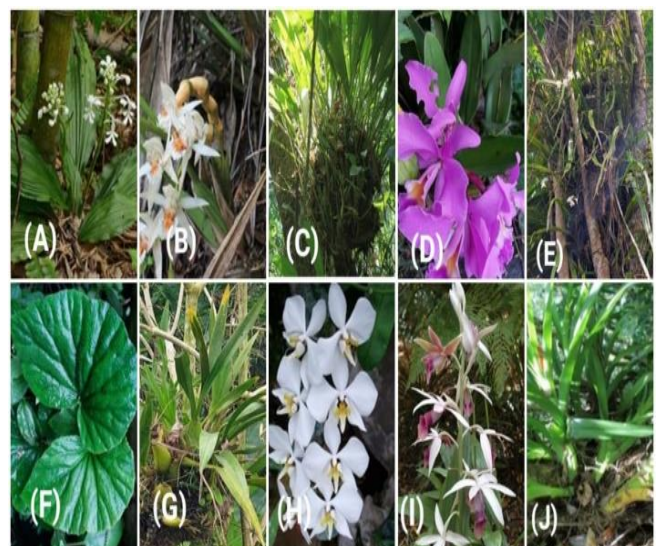


Fig. 2. Species of orchid : (A) *Calanthe triplicata*, (B) *Coelogyne asperata*, (C) *Coelogyne pandurata*, (D) *Cattleya* sp., (E) *Dendrodium crumeatum* (F) *Nervillia aragoana*, (G) *Oncidium ornithorhynchum*, (H) *Phalaenopsis amabilis* (I) *Phaius tankervilleae*, (J) *Vanda* sp (Personal Documentation, 2022).

Discussion

The orchids found growing at the research location are orchids that live in epiphytic and terrestrial habitats. Epiphytic orchids are orchids that live on other trees without damaging the tree on which they grow [7]. At the research site, epiphytic orchids are the most commonly found orchids, namely *Coelogyne asperata*, *Coelogyne pandurata*, *Cattleya sp.*, *Dendrobium crumenatum*, *Oncidium Ornithorhynchum*, and *Phalaenopsis amabilis*, this can occur because of the many trees in the research location that support the growth and development of these orchids. While terrestrial orchids are orchids that grow and develop directly on the ground [15]. *Calanthe triplicata*, *Nervilia aragoana*, *Phaius thankervilleae*, and *Vanda sp.* are terrestrial orchids found growing at the research location.

Phalaenopsis amabilis is the most common type of orchid found growing at the research location with as many as 27 individuals because, at the research location, many trees support the growth and development of this species. Lowlands or highlands can be the best place for *Phalaenopsis amabilis* to grow, to survive *Phalaenopsis amabilis* usually attaches to branches or trunks of other trees or epiphytes [16]. *Phalaenopsis amabilis* is widely distributed and is thought to be highly adaptable to its environment. This orchid species prefers dense tropical forests with many trees as its habitat.

Many factors affect the discovery or absence of orchid species, one of which is air humidity. The air humidity in the study region was variable at each point, with the first point having a humidity of 66% and the second having a humidity of 78%. Nevertheless, the levels of humidity in the study area were sufficiently typical to support the development and growth of orchids at the study site. A good orchid humidity range is 60 to 80%. During the day the orchid humidity should not be too low and at night it should not be too high. One of the functions of humidity for plants is to avoid excessive evaporation that can cause root rot on young shoots. High humidity is needed by orchids but should not be constantly humid [17].

The minimum temperature for orchid growth is around 15-35°C. But some mountain orchids can live and thrive at low temperatures of 5-10°C. Temperatures that are too high can make orchids dehydrated or lose water, thus affecting the growth of orchids [18]. On the research location, the temperature obtained at each point is different at the first point the air temperature is 24°C while at the second point, the air temperature is 26°C so the temperature difference is also one of the factors of the difference in the number and type of orchids found at the research location.

Orchids have light intensity requirements that vary from one species to another, ranging from about 40-60% [19]. If

the light an orchid gets exceeds its need then some or all of the plant tissue will be damaged, usually, signs of burning will be seen immediately, especially on leaves exposed to direct sunlight. The appearance of a reddish-brown color on the leaf surface is usually the symptom. Lack of light on orchids is also not good as it can inhibit orchid growth and cause the leaves to turn pale yellow and wilt. The orchid will have a hard time blooming if this situation occurs.

Each species of orchid has a different altitude place for growth. Some orchids grow better at high altitudes, while others grow better at low altitudes. However, some orchid species can grow and flower in both lowlands and highlands. In addition, altitude also greatly impacts variations in air temperature, air humidity, light intensity, and the diversity of species that grow [20].

IV. CONCLUSIONS

The orchids growing in East Tomohon Forest Area amounted to 192 individuals consisting of 10 species of orchids. Four species are terrestrial orchids namely *Calanthe triplicata*, *Nervilia aragoana*, *Phaius thankervilleae*, *Vanda sp.* and six species are epiphytic orchids namely *Coelogyne asperata*, *Coelogyne pandurata*, *Cattleya sp.*, *Dendrobium crumenatum*, *Oncidium ornithorhynchum*, and *Phalaenopsis amabilis*.

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