

Exploration and Inventory of *Araceae* Genera in Silui Mountain and Uluisimbone Forest, Kolaka Regency, South-East Sulawesi

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ABSTRACT

The island of Sulawesi has been highlighted as a globally important conservation area, across a range of evaluation criteria. Collection rates on the Sulawesi Island are the lowest among in Indonesia area. Taxonomic study also has been limited, with most experts reporting large numbers of undescribed species. The research of *Araceae* diversity in Sulawesi is subject which in general has not been studied critically. The main purpose of this research is concerned to inventory the diversity of *Araceae* genera. The exploration was conducted in each location used exploring method. The *Araceae* genera in Silui Mountain and Uluisimbone forest consist of 30 numbers, 24 species and 14 genera, including into 3 sub families (*Aroideae*, *Monsteroideae* and *Pothoideae*). Mostly *Araceae* were found at humid location, the river flows. *Schismatoglottis calyptrata* Zoll. & Mor. and *Aglaonema simplex* Bl. are dominant species for terrestrial *Araceae*, where as *Scindapsus* spp. and *Pothoidium* spp. are dominant species for climbing *Araceae*.

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Key words: *Araceae*, Silui, Uluisimbone, Sulawesi.

INTRODUCTION

Indonesia is the fifth biggest country for the biodiversity richness, has more than 38.000 species and 55 percents of them are endemic (Newman *et al.*, 1999). On the other hand, the forest damage in Indonesia attained 43 million hectares (Bappenas, 2003). The increment of deforestation for the last 4 years (1999-2002) was 2.1 million hectares per year. The deforestation in Kalimantan reached 0.94%, Java (0.42%), Papua (0.7%) and the biggest was Sulawesi, (1%) (Badan Planologi Kehutanan, 2002). Approximately of 100.000 species had been extinct and 2.5 centuries latter, approximately 25% of living will be disappeared from the earth (Rugayah *et al.*, 2005). The decrease of this biodiversity can be done if the society yet the benefit from the conservation efforts and sustained uses from the biodiversity (Kementerian Lingkungan Hidup, 2003)

The island of Sulawesi has been highlighted as a globally important conservation area, across a range of evaluation criteria (Dinerstein and Wikramanayake, 1993; Olson and Dinerstein, 2002; Shi *et al.*, 2005). This status is a result of its long history as a large oceanic island (Cannon *et al.*, 2007), position at the biogeographic crossroads between East Asia and Australasia (Wallace, 1869), and complex geology, including the largest mafic outcrops in the world (Cannon *et al.*, 2007). These processes have resulted in high levels of endemism, particularly of the fauna, at both the continental and local scales (Olson *et al.*, 2001; Evans *et al.*, 2003; Eken *et al.*, 2004). A recent survey of plant species richness and endemism across Malesia, using

National Herbarium of Netherlands collections data base (Roos *et al.*, 2004), indicated that Sulawesi was intermediate for these measures. This mediocrity is actually remarkable for several reasons. Firstly, collection rates on the island are the lowest in Indonesia and taxonomic study has been limited, with most experts reporting large numbers of undescribed species (Coode, 1994; Kleijn and Donkelaar, 2001). Additionally, its historical isolation from the Sunda Shelf islands through the Quaternary Period (Voris, 2000; Cannon *et al.*, 2007) prevented the continental enrichment experienced by Borneo, Sumatra, and Java.

The research of *Araceae* diversity in Sulawesi is subject which in general has not been studied critically. Sulawesi is one of the important conservation areas including to genera of *Araceae*. The main threat to the long term survival of many *Araceae* is the loss and reduction inequality of their natural habitats, especially in the rain forest regions of Asia and the Malay Archipelago (Mayo *et al.*, 1997)

Members of the *Araceae* are highly diverse in life forms, leaf morphology, and inflorescence characteristics. Life forms range submerged or free-floating aquatics to terrestrial (sometimes tuberous), and to epiphytic or hemiepiphytic plants or climbers. Leaves range from simple and entire to compound and highly divided, and may be basal or produced from an aerial stem. The family *Araceae* is defined by bearing small flowers on a fleshy axis (spadix) subtended by a modified leaf (spathe). There is much variation on this theme.

The family is predominantly tropical in distribution, with 90% of genera and c. 95% of species restricted to the tropics, with over 3300 species and 105 genera of herbs and vines. The *Araceae* is one of the dominant tropical families. The *Araceae* is strongly supported as a monophyletic group with the inclusion of Lemnaceae (Grayum, 1990; Mayo *et al.*, 1997; Tam *et al.*, 2004). It also distributed mostly in sub tropic with a few reaching temperate latitudes (Leimbeck

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and Balslev, 2001). There are two major centers of species diversity, tropical Asia (with 44 indigenous genera), and tropical America (with 36 genera) (Croat, 2004). Some of them, 33 genera (75%) are endemic to the American tropics and 32 genera (89%) are endemic to Asia. Africa, a less important center of species diversity, has only 19 indigenous genera, 12 genera (63%) of them are endemic (Croat, 2004). There were 31 genera occurred in Indonesia and 20 genera with 80 species of them is widely distributed in East Indonesia such as Sulawesi, West Papua, Moluccas Island, and Lesser Sunda island (Mayo *et al.*, 1997).

The main objective of this research is concerned to inventory the diversity of *Araceae* genera. It can also give information about live characteristics of *Araceae* in the wild, and illustration for next research in Silui Mountain and Uluisimbone forest. Silui Mountain and Uluisimbone forest are a type of mountain forest which have steep slope. Based on the observation in the field, the color of soil is reddish, be found layers of limestone. Generally the soil type in north Kolaka regency is complex soil (Whitten *et al.*, 1987). Inside of the forest of Silui mountain and Uluisimbone can be found many river flows. It has hydrological function for the villages and regions below. Based on the climate distribution according to Schmidt and Ferguson, Southeast Sulawesi has B climate type, with annual rainfall is 2.500-3.000 mm, almost without arid month (Whitten *et al.*, 1987).

MATERIALS AND METHODS

The exploration was conducted in 2 places, Silui Mountain at Silui village, Uluiwoi sub district, Kolaka regency. The other is Uluisimbone forest at Lalingato village, Tirauta sub district, Kolaka regency. The exploration was conducted on May 7-29, 2008. The exploration, in each location used "Exploring Method" (Rugayah *et al.*, 2005). The plant materials which collected in this research include seeds, seedlings or cuttings. The plant number which taken was 5 of each collection number. The data and information about the plants in the field, such as plant species name, local name, family, abiotic environment, altitude, and number of species were recorded in the field book.

The information that used to determine the location and priority of plant species to be collected based on literature studies and herbarium collections and also personal communication with experts who ever doing research activity in Sulawesi.

RESULTS AND DISCUSSIONS

The diversity of Araceae Genera

Silui Mountain included into 23 numbers, 18 species, and 14 genera. In Uluisimbone forest can be identified 7 numbers, 6 species and 4 genera. Those collections belong to 3 sub families (*Aroideae*, *Monsteroideae* and *Pothoideae*), table 1. Each collections of *Araceae* have not identified completely yet up to species level because the plants have not bloomed yet when be taken in the wild.

The *Araceae* species can be found easily are *Schismatoglottis calyprata* Zoll. & Mor. and *Aglaonema simplex* Bl. These species can be found in Silui Mountain and Uluisimbone forest which have many river flows. These species usually grow at tropical humid forest, terrestrial on humid forest floor, limestone, and river flows (Backer and

Bakhuizen, 1965; Mayo *et al.*, 1997; Tsukaya *et al.*, 2004). *S. calyprata* generally grows in lowland and lower mountain rain forest (Hay, 1996).

Table 1. The *Araceae* collections from Silui Mountain and Uluisimbone Forest, Kolaka Regency.

Name	Sub Family	Origin
<i>Aglaonema simplex</i> Bl.	<i>Aroideae</i>	
<i>Alocasia</i> sp.	<i>Aroideae</i>	
<i>Amorphophallus plicatus</i> Bok & H.J.Lam.	<i>Aroideae</i>	
<i>Amorphophallus</i> sp.	<i>Aroideae</i>	
<i>Amydrium</i> sp.	<i>Monsteroideae</i>	
<i>Anadendrum montanum</i> Schott	<i>Monsteroideae</i>	
<i>Anadendrum montanum</i> Schott	<i>Monsteroideae</i>	
<i>Epipremnum nobile</i> Engl.	<i>Monsteroideae</i>	Silui Mountain, at Silui village, Uluiwoi sub district, Kolaka regency
<i>Homalomena</i> sp.	<i>Aroideae</i>	
<i>Homalomena</i> sp 1	<i>Aroideae</i>	
<i>Homalomena</i> sp 2	<i>Aroideae</i>	
<i>Pothoidium lobbianum</i> Schott	<i>Pothoideae</i>	
<i>Pothoidium</i> sp	<i>Pothoideae</i>	
<i>Pothos junghuhnii</i> De Vriese.	<i>Pothoideae</i>	
<i>Rhaphidopora celebica</i> K.Krause	<i>Monsteroideae</i>	
<i>Schismatoglottis calyprata</i> Zoll.&Mor.	<i>Aroideae</i>	
<i>Schismatoglottis</i> sp 1	<i>Aroideae</i>	
<i>Schismatoglottis</i> sp.	<i>Aroideae</i>	
<i>Scindapsus</i> sp 1	<i>Monsteroideae</i>	
<i>Scindapsus</i> sp 2	<i>Monsteroideae</i>	
<i>Scindapsus</i> sp.	<i>Monsteroideae</i>	
<i>Spathiphyllum commutatum</i> Schott	<i>Monsteroideae</i>	
<i>Typhonium roxburghii</i> Baker	<i>Aroideae</i>	
<i>Scindapsus</i> sp 3	<i>Monsteroideae</i>	Uluisimbone forest at
<i>Homalomena</i> sp 3	<i>Monsteroideae</i>	Lalingato village,
<i>Homalomena</i> sp 4	<i>Aroideae</i>	Tirauta sub
<i>Homalomena</i> sp 5	<i>Aroideae</i>	district, Kolaka
<i>Spathiphyllum</i> sp	<i>Monsteroideae</i>	regency
<i>Alocasia</i> sp 1	<i>Aroideae</i>	
<i>Homalomena</i> sp 6	<i>Aroideae</i>	

In Silui Mountain, *S. calyprata* becomes dominant plant of *Araceae* species. It usually grows along the river flow or the wall of the river and waterfall r. The growth of *Araceae* is dependent on abundant available water and prevailing atmospheric humidity. They are not well adapted structurally and physiologically for growth in arid or cold conditions. Hence here, they do not occur in the most extreme environments. *Araceae* are most diverse and abundant in the humid tropics and it is there that richest variety of their life forms is found (Mayo *et al.*, 1997)

In Uluisimbone forest, *A. simplex* becomes dominant species in the undergrowth of the forest and only found in lowland forest, no more than 200 m above sea level (asl). This species can grow in primary, secondary and teak forest, shady and humid location, and limestone. In Seram, the density of *A. simplex* is 680 plants/ha (Backer and Bakhuizen, 1965; Setyowati, 2003).

Climbing *Araceae* species that easily found in Silui Mountain and Uluisimbone forest is *Scindapsus* genera. This species usually climbs in the tree with mid light intensity and not be found at more than 700 m asl altitude. The *Scindapsus* genera occurs in tropical humid forest or dry, deciduous or evergreen forest, lowland and lower mountain, as climbing hemiepiphyte (Darmakusuma, 2003; Mayo *et al.*, 1997). *Pothoidium* is also dominates for climbing *Araceae*, especially in Silui mountain. They can be

found in tropical humid forest as climbing hemiepiphyte (Mayo *et al.*, 1997).

The entire *Araceae* collections were found below of 700 m asl altitude. The very few genera of *Araceae* were found at high altitudes exist in a warm temperate climatic regime and are also geophytic. The species can be found at high altitudes are *Gorgonidium*, (c. 3000 m asl), *Arisaema ruwenzoricum* (occurs at up to 3000 m asl), and *A. flavum*, *A. jacquemontii*, *A. lobatum* (at 4400-4500 m asl) (Mayo *et al.*, 1997).

Some species have been identified and become dominant species are:

***Aglaonema simplex* Bl.**

Synonyms: *Aglaonema angustifolium* N.E.Br., *Aglaonema latius* Aldrew.

An erect herb up to 120 cm tall; leaves obtuse, rounded or subtruncate at base, not variegated, margin of petiole usually with a membranous margin; peduncle 2-6 cm, fruiting ones up to 11 cm. Stalk of the spadix 0.5-1 cm, after anthesis slightly elongate; spadix erect, 2.5-4 cm. Fruit ellipsoid, obtuse, crowned by persistent stigma, ripe 1.5-1.75 cm, orange to red; pericarp thin; well developed fruits in each spadix 2 to many; staminodes with a roundish upper surface (Backer and Bakhuizen, 1965; Setyowati, 2003).

***Schismatoglottis calyptrata* Zoll. & Mor.**

Peduncle (5-10-17 cm; spathe when still enroled constricted distinctly below the middle, 8-11 cm the part enclosing the male flowers narrowly lanceolate, acuminate, 5.75 cm long, 0.75 cm diameter, yellow. Leaves elongate-ovate-triangular in outline from a contracted base, with subpatent basal lobes 1.5-4.5 cm long, 3.5-9 cm broad, green, rarely maculate or flushed with reddish brown beneath, 11-33 cm by 7.5-24 cm; petiole slenderish to rather stout, 12-56 cm; superterranean stem-part elongate, 1.5-1.75 cm diameter (Backer and Bakhuizen, 1965).

***Spathiphyllum commutatum* Schott**

Evergreen herbs usually with short, erect to creeping stem. Spathe at first white on both sides, at last becoming entirely green, narrowly ovate, with decurrent base, acutely acuminate, 15-20 cm by 6-8 cm; ovary cells containing more than 2 ovules; peduncle 60-70 cm or longer; spadix cylindrical, obtuse, white and afterwards becoming greenish, 3.5-10 cm; stalk of the spadix 2.5-4 cm; stigma flat; berry white, c. 2 mm; seeds c. 1.5 cm. Leaves broadly elliptic - oblong, with acutely decurrent base, shortly acutely acuminate, with numerous side nerves, widely cancellate-veined on lower surface, rather thin when dry, 36-45 cm by 17-26 cm; petiole 45-50 cm, about as long as leaf blade; sheath extending upwards to far beyond the middle of the petiole (Backer and Bakhuizen, 1965).

***Amorphophallus* spp.**

Seasonally dormant (sometimes irregularly so) or rarely semi-evergreen herbs, often large, sometimes gigantic, tuber usually depressed-globose, sometimes irregularly elongate-cylindrical, rarely rhizomatous or stoloniferous. Leaves usually solitary (rarely 2-3) in adult plants, sometimes 2-3 in seedlings. Petiole long, degree of asperity similar to the peduncle, usually smooth, sometimes very thick, usually conspicuously spotted and marked in a variety of patterns, sheath very short. Blade dracontioide. Inflorescence always solitary, preceded by cataphylls, usually flowering without leaves, rarely with the leaves. Peduncle is very short to long, similar to petiole. Spathe

variously colored, marcescent and finally deciduous. Seed ellipsoid, testa smooth, thin, endosperm absent (Backer and Bakhuizen, 1965).

***Scindapsus* spp.**

Evergreen climbing herbs, sometimes very robust, sometimes producing flagelliform shoots. Leaves spirally arranged, undivided, pinnately nerved, with very numerous, parallel, thin lateral nerves, juvenile plants often of single form. Petiole geniculate apically, sheath usually broad, rarely decomposing to form persistent net-fibrous mass with abundant, stinging sclereids. Blade always entire, lanceolate, elliptic or ovate to obovate, acuminate. Inflorescence always solitary. Peduncle shorter than petiole. Spathe boat-shaped, gaping only slightly, caduceous to deciduous. Spadix sessile to shortly stipitate, cylindrical. Stamens 4, free, filaments oblong, flattened, broadish, connective slender. Pollen fully zonate. Seed rounded, subreniform, compressed, testa thickish, endosperm presents (Backer and Bakhuizen, 1965).

***Pothodium* spp.**

Climbing herbs, stems somewhat woody, flowering branches free and hanging. Leaves distichous. Petiole oblong, entirely flattened, resembling blade, venation parallel. Blade much shorter than petiole, triangular-lanceolate, midrib absent, no primary veins differentiated, veins parallel, running into apex. Inflorescence borne in the terminal branching system, lower inflorescence axillary to a foliage leaf. Peduncle slender, composed of one to several internodes. Spathe occurrence irregular, often absent, linear-lanceolate, widely spreading. Spadix apparently often functionally unisexual, cylindrical. Flowers apparently usually unisexual, sometimes bisexual, perigoniate, male flowers with well developed anthers and apparently sterile ovary, female flowers with large fertile ovary and lacking stamens, tepals 6, fornicate. Stamens 3-6 free. Seed ellipsoid, testa smooth, endosperm absent (Mayo *et al.*, 1997).

CONCLUSION

The *Araceae* genera in Silui Mountain and Uluisimbone forest consist of 30 numbers, 24 species and 14 genera, included to 3 sub families (*Aroideae*, *Monsteroideae* and *Pothoideae*). The most *Araceae* were found at humid location along the river flows. *Schismatoglottis calyptrata* and *Aglaonema simplex* are dominant species for terrestrial *Araceae*, where as *Scindapsus* spp and *Pothodium* spp are dominant species for climbing *Araceae*.

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