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The Diversity of Tropical Orchids of South Papua

VERENA AGUSTINI[1]*, SUHARYANTO[2], SUHARNO[1], LISIARD DIMARA[1], AND CHRIS D. SEMBAY[3]

[1]*Department of Biology, Faculty of Math. and Sciences, Cenderawasih University, Jayapura*
[2]*Faculty of Biology, Gadjah Mada University, Yogyakarta*
[3]*Balai Besar Konservasi Sumber Daya Alam (BBKSDA), Papua*

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ABSTRACT

Papua is an area with very wide range, from lowland with altitude 0 m to highland area with 4730 m above sea level. Orchids species constitute the greater part of orchids diversity, which can grow on the bare branches of tall trees, or embedded in moss dripping in wet and cool mountain forests, as well as in the eternal shade of tropical rain forest. Numerous plants world-wide are threatened with extinction because of degradation or destruction of their habitat. Orchids are among the most threatened plants of all, especially when pressure from dealers and collectors aggravales the problems. South Papua is a lowland area with the elevation around 0-7 m above sea level, temperature 23-30^0 C, and 1500 m rainfall per year. The aims of these investigations were to explore the diversity of tropical orchids in South Papua. The exploration and collection were done in Asmat, Boven Digul, Mappi, and Merauke. The study found 22 genera and 75 species, mostly are epiphytic.

Key words: orchids, exploration, diversity, South Papua.

INTRODUCTION

Tropical orchids constitute the greater part of orchid diversity,that can be found in anywhere in the world. It is the world's largest plant family and contains over 25.000 species, and 5.000 species were found in Indonesia. Comber (1990) reported that in Java there are more than 731 species orchids which almost 231 species are endemic. For the rest areas of Indonesia, information about orchids remained uncompleted. It is not about their biology that attracts people to orchids, but above all their beauty, strangeness, the wonderful diversity in shape and colour of their flowers that enchants people. Beside that the chemical constituent of orchids like alkaloid, flavonoid, terpenoid and steroid were used in chinese medicines (Kenneth,1987; Bulpitt *et.al*. 2007; Kong *et al*, 2003). Therefore cultivated orchids are more attractive for many people (Moelyono, 1999).

In Papua, about 3000 orchids species are found. The two genera are the biggest, Bulbophyllum is about 569 species and Dendrobium 512 species (Millar, 1978). The exploration of orchids in Papua remains uncompleted due to a complicated geographic mosaic. Some orchid species have restricted ranges as a consequence of the complex geologic history of the island and its numerous barriers to dispersals. South Papua namely Merauke (city and regency) and the establishment of new regencies Asmat, Mappi, and Boven Digul are the large areas share a similar monsoon, 0 to 7 m altitude and soil type.

*Corresponding author:
Jl. Kamp Wolker, Kampus FMIPA Uncen Waena,
Jayapura, Papua. Pos Code: 99581. Telp. +62 967572115.
e-mail: verena_agustini@yahoo.com

Information about the orchids of Papua including these areas is currently scattered in a small number of publications, and rather difficult to obtain in Papua. This research intend to provide a basic tools to residents of the four regencies to assist them recognizing and identifying the local orchids in the wild. And also make local people aware of the treasures that are still living in their

Table 1. List of genera, species, synonym and section of the orchids of South Papua.

No	Genus	No	Species	Synonyms/Basionym	Section
1.	Acriopsis	1.	*A. javanica* Reinw ex Blume	*A. papuana* Kraenzl *A. liliifolium* J. Koeing *Epidendrum liliifolium* *Spathoglottis trivalvis* Lindl	-
2.	Acanthephippium	2.	*A. papuanum* Schltr	*A. splendidum* J.J.Sm *A. vitiense* L.O.Williams	-
3.	Agrostophyllum	3.	*A. majus* Hook.f.	-	Agrostophyllum
		4.	*A. parviflorum* J.J.Sm	-	
		5.	*A. bicuspidatum* J.J.Sm	*A. stipulatum* *A. callosum*	
4.	Bulbophyllum	6.	*B. blumei* (Lindl) J.J.Sm	*B. maxillare* (lindl) Rchb.f. *B. cuspidilingne* Rchb.f *B. epiphippium*, Rdl	-
		7.	*B. macranthum* Lindl	*Sarcopodium macranthum* (Lindl) Lindl *B. purpureum* Rchb.f *B. cochinchinense* Gagnep *Phyllorhis maeranthe* (Lindl) M.A. Clem & D.L.Jones	Sestochilos
		8.	*B. absconditum* J.J.Sm.	B. *neocaledonicum* Schltr B.*ochrochlamys* Schltr	Pelma
		9.	*B. olivinum* J.J.Sm.	-	Macrouris
		10.	*B. fractiflexum* J.J.Sm.	*Pelma fractiflexum* (J.J.Sm) Szlach & Kulak *B. effusum* Schltr *B. fractiflexoides* Schltr *B. lamprobulbon* Schltr *B. linearipitalum* J.J.Sm	Pelma
		11.	*B. maxillare* (Lindl) Rchb.f.	*Cirrhopetalum maxillare* *B. acuminatum* Schltr	Polymeres
		12.	*B. andreeae* A.D.Hawkes	-	Intervallatae
		13.	*B. nummularioides* Schltr	-	Polymeres
		14	*B. fletcherianum* Rolfe	*Cerrhopetalum fletcherianum* (Rolfe) Rolfe *B. spiesii* Garay, Haner & Siegerist	Beccariana
		15	*B.* sp	-	-
5.	Bromheadia (Lindl)	16.	*Bromheadia sp*	-	-
6.	Ceratostylis (Blume)	17.	*Ceratostylis sp*	-	-
7.	Coelogyne	18.	*C. asperata* Lindl	*Plerone asperata* (Lindl) Kuntze *C. lowii* Paxton *C. pustulosa* Ridl *C. edelfelditii* F. Muell & Kraenzl	Verrucosae

forest so it will stimulate them in trying to preserve these forests.

MATERIALS AND METHODS

Survey was done in four regencies: Asmat, Boven Digul, Mappi and Merauke. In Asmat, the samples were collected from Ewer, Agats, along the Pek river and Sawaerma. In Boven Digul, it taken in Mindiptana and Tanah Merah.

In Mappi, survey was done in Kampung Fumu, Etci, Obaa, dan Kampong Lama. Lastly in

Table 1. Continued.....

No	Genus	No	Species	Synonyms/Basionym	Section
8.	Cadetia	19.	*C. albiflora* (Ridl) Schltr	*Dendrobium albiflorum* Ridl *C. pomatophyla* Schltr *Dendrobium pomatophyla* Schltr	Cadetia
9.	Dendrobium	20.	*D. antennatum* Lindl	*Callista antennata* (Lindl) Kuntze	Spatulata
		21.	*D. agrostophyloide* Schltr	*Monanthos agrostophyloide* (Schltr)Rauschert	Biloba
		22.	*D. bifalce* Lindl	*Doritis bifalcis* (Lindl) Rchb.f. *Callista bifalcis* (Lindl) Kuntze *Sayeria bifalcis* (Lindl) Rauschert	Latouria
		23.	*D. bigibbum* Lindl	*D. phalaenopsis* Fitzg *Callista bigibba* (Lindl) Kuntze *C. phalaenopsis* (Fitzg) Kuntze	Phalaenanthe
		24.	*D. bracteosum* Rchb.f	*D. chrysolabium* Rolfe *D. novaehiberniae* Kraenzl *D. dixsonii* F.M.Bailey *D. trisaccatum* Kraenzl *D. eitapense* Schltr *Pedilonum eiapense* (Schltr) Rauschert *D. leucochrysum* Schltr *P. leucochrysum* (Schltr) Rauschert *P. bracteosum* (Rchb.f) Rauschert	Pedilonum
		25.	*D. canaliculatum* R.Br	*Callista canaliculata* (R.Br) Kuntze *D. tattonianum* Bateman	Spatulata
		26.	*D. caronii* Lavarack & P.J.Cribb	-	-
		27.	*D. discolor* Lindl	*D. undulatum* R.Br *D. undulata* (R.Br) Kuntze *D. undulans* Bakh.f. *D. arachnanthe* Kraenzl *D. elobatum* Rupp *D. fuscum* Fitzg	Spatulata
		28.	*D. johannis* Rchb.f	*Callista johannis* (Rchb.f) Kuntze	Spatulata
		29.	*D. lasianthera* J.J.Sm	*D. stueberi* Hort ex Zurowetz *D. ostrinoglossum* Rupp	Spatulata
		30.	*D. leporinum* J.J.Sm	-	Spatulata
		31.	*D. lineale* Rolfe	*D. veratrifolium* Lindl *Callista veratrifolia* (Lindl) Kuntze *D. veratrioides* Bakh.f. *D. cogniauxianum* Kraenzl *D. augustaevictoriae* Kraenzl *D. imperatrix* Kraenzl	Spatulata

Merauke, samples were taken from district Semangga, Tanah Miring, and Salor. The common geographical position of Merauke is $0^{0}19'$–$10^{0}45'$ LS and $130^{0}45'$–$141^{0}48'$ BT. The elevation 0–7 m asl, and temperature is 23,2–30,8 ^{0}C. Rainfall is 1558 mm per year, humidity 78-81%. Soil type of areas is mostly swamp which are organosol, alluvial, and hydromorf.

Identification of natural orchids using Flora Malesiana Orchids of New Guinea series I-VI. *Orchids of Papua New Guinea an Introduction.* (Millar, 1978), *Orchid of Java* (Comber, 1990), *Key to*

Table 1. Continued .....

No	Genus	No	Species	Synonyms/Basionym	Section
9.	Dendrobium	32.	*D. macrophyllum* A Rich	*D. veitchianum* Lindl *Callista veitchiana* (Lindl) Kuntze *D. ferox* Hassle *D. sarcostoma* Teijsm & Binn ex Miq *D. gordonii* S.Moore, J.Linn *C. gordonii* (S.Moore) Kuntze *D. brachythecum* F.Muller & Kraenzl *D. ternatense* J.J.Sm *D. psyche* Kraenzl *D. tomohonense* Kraenzl *D. musciferum* Schltr *Latourorchis muscifera* (Schltr) Breiger	Latouria
		33.	*D. mirbelianum* Gaudich	*D. rosenbergii* Teijsm & Binn *D. polysarcum* Rchb.f. *Callista mirbeliana* (Gaudich) Kuntze *D. ginlianetti* F.M.Bailey *D. aruanum* Kraenzl *D. buluense* Schltr *D. wilkianum* Rupp	Spatulata
		34.	*D. nindii* W.Hill	*D. tofftii* F.M.Bailey *D. ionoglossum* Schltr	Spatulata
		35.	*D. spectabile* (Blume) Miq	*Latouria spectabilis* Blume *Callista spectabilis* (Blume) Brieger *Sayeria spectabilis* (Blume) Rauschert *D. tigrinum* Rolfe	Latouria
		36.	*D. smillieae* F.Muell	*Coelendria smillieae* (F.Muell)Fitzg *Callista smillieae* (F.Muell) Kuntze *Pedilonum smillieae* (F.Muell) Rauschert *D. hollrungii* Kraenzl *Pedilonum hollrungii* (Kraenzl) Rauschert *D. kaernbachii* Kraenzl *D. pachyceras* F.Muell & Krraenzl *Pedilonum pachyceras* (F.Muell & Kraenzl) Rauschert	Pedilonum
		37.	*D. strebloceros*	-	-
		38.	*D. trilamellatum* J.J.Sm	*D.semifuscum* (Rchb.f) Lavarack & P.J.Cribb	Spatulata
		39.	*D. capituliflorum* Rolfe	*Pedilotum capituliflorum* (Rolfe) Breiger *D. confusum* J.J.Sm	Pedilonum

the genera of Orchidaceae of New Guinea. (Schuiteman, 1995), *Orchid of Malaya.* (Segerback, 1992), *Flora of Java* (Backer, & van de Brink), *Jenis–Jenis Anggrek Taman Nasional Halimun* (Mahyar & Sadili, 2003), *Handy pocket Guide to the Orchids of Indonesia* (Banks, 2004), *Mengenal Anggrek Alam Papua.* Seri Pertama (Dinas Kehutanan, PAI-PAPUA dan WWF Papua, 2003).

RESULTS AND DISCUSSION

Tropical orchids found in lowland areas of Papua are 24 genera and 75 species, which genus Dendrobium is the larger number 33 species followed by Bulbophyllum 10 species (Table 1). Whereas the rest is only 1 to 2 species each genus. Only 76% among them are identified, and 24% are remained unidentified. Burok *et al* (2009) whose studied about orchid Domestication in Merauke

Table 1. Continued .....

No	Genus	No	Species	Synonyms/Basionym	Section
9.	Dendrobium	40.	*D.erosum* (Blume)Lindl	*Pedilonum erosum* Blume *Callista erosa*(Blume) Kuntze *D. aemulans* Schltr *Pedilonum asmulans* (Schltr) Rauschert	Pedilonum
		41.	*D. coeloglossum* Schltr	*Euphlebium coeloglossum* (Schltr) Brieger	Fugacia
		42.	*D. insigne* (Blume) Rchb.f ex Miq	*Dichopus insignis* Blume *Callista insignis* (Blume) Kuntze *Grastidium insigne* (Blume) M.A.Clem & D.L.Jones *D. gazellae* Kraenzl *D. lyperranthiflorum* Kraenzl *Grastidium lyperanthiflorum* (Kraenzl)Rauschert *D.pentactis* Kraenzl	Grastidium
		43.	*D. ingratum* J.J.Sm	*D. kenejianum* Schltr *Grastidium kenejianum* (Schltr) Rauschert *Grastidium ingratum* (J.J.Sm) Rauschert	Grastidium
		44.	*D. litorale* Schltr	*Aporum litorale* (Schltr) Rauschert	Crumenata
		45.	*D. pruinosum* Teijsm & Binn	*D. crispilobum* J.J.Sm *D. microglossum* Schltr *Grastidium microglossum* (Schltr) Rauschert *D. luteocilium* Rupp *Grastidium luteocilium* (Rupp) Rauschert *Grastidium pruinosum* (Teijsm&Binn) Rauschert	
		46.	*D.cancroides* T.E.Hunt	*Grastidium cancroides* (T.E.Hunt) Rauschert	
		47.	*Dendrobium* sp1	-	Grastridium
		48.	*Dendrobium* sp2	-	
		49.	*Dendrobium* sp3	-	
		50.	*Dendrobium* sp4	-	
		51.	*Dendrobium* sp5	-	
		52.	*Dendrobium* sp6	-	

Regency found only ten orchids species have been domesticated by local people. Some genera and

Table 1. Continued .....

No	Genus	No	Species	Synonyms/Basionym	Section
10.	Diplocaulobium	53.	*D. tipula* J.J.Sm.	*Dendrobium tipula* J.J.Sm	-
		54.	*D.* sp1	-	-
11.	Dipodium	55.	*D. pandanum* F.M.Bailey	-	Wailesia
12.	Eria	56.	*E. fitzalanii* F.Muell	*Pinalia fitzalanii* (F.Muell) Kuntze *Hymeneria fitzalanii* (F.Muell) MA Clem & D.L.Jones *Eria solomonensis* Rolfe *Eria indivisa* Schltr	Hymeneria
		57.	*E.* sp1	-	-
13.	Flickingeria	58.	*Flickingeria comata* (Blume) AD.Hawkes	*Desmotrichum comatum* Blume *Dendrobium comatum* (Blume) Lindl *Callista comata* Kuntze *Ephemerantha comata* (Blume) PF.Hunt & Summerh *Dendrobium criniferum* Lindl *Desmotrichum criniferum* (Lindl) Kraenzl *Ephemerantha crinifera* (Lindl) PF.Hunt & Summerh *Dendrobium fasciculatum* FM Bailey *Dendrobium thysanochilum* Schltr *Desmotrichum thysanochilum* (Schltr) Carr	-
14.	Grammato-phyllum	59.	*G. papuanum* J.J.Sm	*G. pantherinum* Rchb.f	-
		60.	*G. stapeliiflorum* J.J.Smith	*Cymbidium stapeliiflorum* Teijsm & Binn *Grammangis stapeliiflorum* (Teijsm&Binn) Schltr *Cymbidium huttonii* Hook f *Grammangis huttonii* (Hook f) Teijsm & Binn *Cymbidium stephensii* Ridl	-
		61.	*G. scriptum* BL	*G. fenzlianum* Rehb *G. quilelmi* Kranze *G.rumphianum* Miq	
15.	Grestrichium	62.	*G.* sp1	-	-
16.	Luisia	63.	*Luisia* sp1		-
		64.	*Luisia tristis* (G.Frost) Hook.f.	*Epidendrum triste* G.Frost *Luisia terestrifolia* Gaudich *Cymbidium triste* Roxb *Cymbidium terestrifolia* Wight *Luisia burmanica* Lindl *Luisia zeylanica* Lindl *Luisia macrocarpa* Schltr	-

species possess no horticultural value (Figure 1), some are high sough after by dealers and collectors (Figure 2). Study on orchids in other areas of Papua were done by some researchers like

Table 1. Continued .....

No	Genus	No	Species	Synonyms/Basionym	Section
17.	Oberonia	65.	O. *pectinata* Schltr	-	Otoglossum
		66.	O. sp1	-	-
		67.	O. sp2	-	-
		68.	O. sp3	-	
18.	Phreatia	69.	*P. micrantha* (A.Rich) Lindl	*P. richardiana* (Rchb.f) Kraenzl *Oberonia micrantha* A.Rich *Eria richardiana* Rchb.f *Rhipidorchis micrantha* (A Rich) DL Jones & MA Clenn *Rhynchophreatia micrantha* (A Rich) N.Halle *Oberonia papuana* FM Bailey *Thelasis samoensis* (Kraenzl) Schltr *Phreatia macrophylla* Schltr *P. sarcothece* Schltr *P. robusta* RS Rogers *P. clivicola* W.Kittr *P. collina* Schltr *P. mollucana* J.J.Sm *P. macrophylloides* Kraenzl	Rhizophyllum
19.	Pholidota	70.	*P. pallida* Lindl	*P. imbricata* W.J.Hook *P. bractea* (D.Don) Seidenf *Ptilocnema bracteatum* D.Don *Coelogyne imbricate* (Hook) Rchb.f *Cymbidium imbricatum* Roxb *Coelogyne conchoidea* (Lindl) Rchb.f *P. conchoidea* Lindl *P. crotalina* Rchb.f. *Coelogyne crotalina* (Rchb.f) Rchb.f *Coelogyne loricata* (Rchb.f) Rchb.f *P. loricata* Rchb.f. *P. triotos* Rchb.f. *Coelogyne triotos* (Rchb.f) Rchb.f *P. assamicata* Hort *P. henryi* Kraenzl *P. becarii* Schltr *P. grandis* Kraenzl *P. spectabilis* Kraenzl *P. pygmaea* H.J.Chowdery & G.D. Pal	Pholidota
20.	Pomatocalpa	71.	*P. marsupial* (Kraenzl) J.J.Sm	*Cleistostoma marsupial* Kraenzl *P. sphaeroceras* (Schltr) J.J.Sm *Saccolabium sphaeroceras* Schltr *P. orientale* J.J.Sm	-
21.	Renanthera	72.	*R. edelfeldtii* F.Muell	-	-
22.	Robiquetia	73.	*Robiquetia* sp	-	-
23.	Sarcochillus	74.	*S. moorei* (Rchb.f.) Sclhtr	*Thrixspermum moorei* *Rhinnerhizopsis moorei* (Rchb.f)	-
24.	Vanda	75.	*Vanda* sp	-	-

Wafom (2002) worked on epiphyte orchid in some islands of Ayamaru lake. He found 5 genera and 18 species of epiphyte orchids. Sihombing & Lestari (2002) observed 35 species in many places namely Merauke, Biak, Sorong, and Paniai. These days numerous plants world wide are threatened with extinction because of degradation or even total destruction of their habitats including in South Papua. Its happened also in Cycloop Nature Reserve on Terrestrial Orchids status (Lugrayasa, 2004; Agustini *et al*., 2008). The problem is particularly acute in region with a high biodiversity like Papua. Orchids are among the most threatened plants of all, especially when pressure from collectors aggravales the problems.

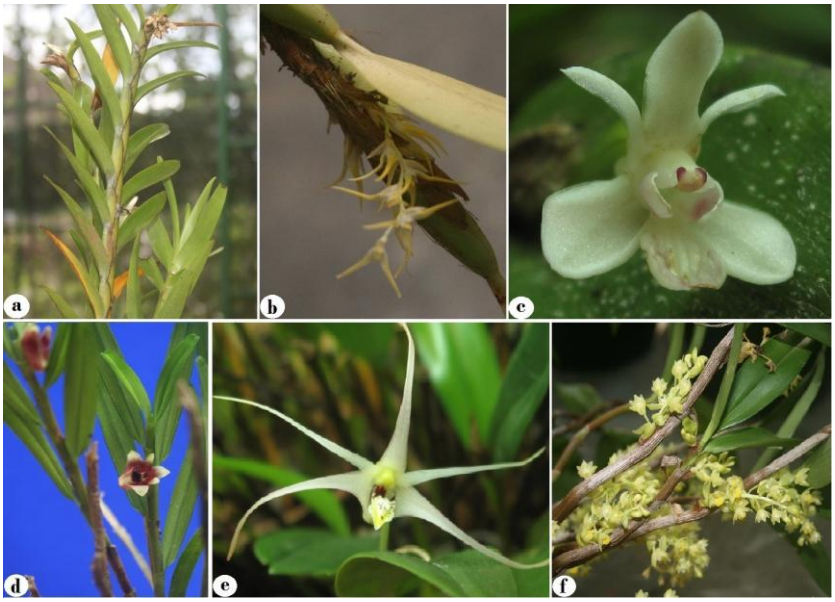

Figure 1. Species of orchids which less horticultura value. a. *Agrostophyllum parviflorum,* b. *Bulbophyllum fractiflexum*, c. *Cadetia albiflora* (small size, 1,0–2,0 cm), d. *Dendrobium agrostophyloide*, e. *Diplocaulobium tipula*, f. *Eria* sp.

Figure 2. Highly economical value of orchid species. a. *Dendrobium bracteosum*., b. *Dendrobium discolor*., c. *Dendrobium lasianthera*., d. *Dendrobium macrophyllum*., e. *Dendrobium nindii*., and f. *Dendrobium spectabile*. Figure 2. Highly economical value of orchid species. a. *Dendrobium bracteosum*., b. *Dendrobium discolor*., c. *Dendrobium lasianthera*., d. *Dendrobium macrophyllum*., e. *Dendrobium nindii*., and f. *Dendrobium spectabile*.

In the case of South Papua region, the establishment of new regencies and the future plan of being New Province even worse that might faced by diversity of orchid species. Some genera are not to everybody's taste but these are important for the ecology and the botanic point of view. These species must have caused quite a stir among orchid botanist but the sad fact is that they all perished fairly quickly.

Some of rare orchid species from South Papua became available to amateur and professional orchid growers mostly outside Papua. Some species that used to easily seen found in the wild, recently hardly seen in these areas. So many species have been removed from the wild. According to Schuiteman & de Vogel (2000) in population size, this could lead to total extinction, even if the remaining specimens were strictly protected.

From the exploration study, it is difficult to tell which particular orchid species and genera are becoming scarce in the wild and request protection, how huge the

diversity of orchid mycorrhizal in nature, and what kind of chemical constituents of orchid species we have in the wild. Our knowledge of the distribution and ecology of South Papua orchids is still highly incomplete. It is an urgent task to study and document these patterns before it is too late.

CONCLUSION

In this investigation 24 genera and 75 orchid species were collected from Asmat, Boven Digul, Mappi, and Merauke in 5 months. Among them, which species and genera are becoming scarce and require special protection are difficult to tell. Dendrobium, 32 species, and Bulbophyllum, 10 species, are the two bigger species found in the study site. Some genera and species possess no horticultural value, some are high sough after by dealers and collectors but maybe equally at risk because of exacting habitat requirements. There are still numerous undiscovered and unexplained patterns in the distribution of wild orchids in South Papua.

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