Exploration and Inventory of Native Orchid Germplasm in West Borneo, Indonesia

Chairani Siregar¹

Department of Horticulture, College of Agriculture, University of Tanjungpura, Jln. Ahmad Yani Pontianak 78124, Kalimantan Barat, Indonesia

Additional index words. orchid species, germplasm

Abstract. Borneo (Kalimantan) is the third largest island in the world. It is rich with various indigenous orchid species that grow epiphytically, terrestrially, or saprophytically in the forests. Its rain forests are also home to some rare species such as some *Aërides* sp., *Bulbophyllum* sp., *Cymbidium* sp., *Dendrobium* sp., *Dimorphorchis* sp., *Grammatophyllum* sp., *Paphiopedilum* sp., *Phalaenopsis* sp., *Paraphalaenopsis* sp., and *Vanda* sp., all of which have a very high economic value. These species are endangered and some of them may have not yet been found or discovered, because of the loss of habitat resulting from fire, forest damage, illegal logging, and orchid hunting either by domestic or foreign collectors. Until recently, there are only a few records on the orchid native to West Borneo. For this reason, a research was conducted to identify and create an inventory of all orchid species that exist in West Borneo before they become extinct along with their habitat and to conserve them ex situ. This research was conducted in 10 counties and one municipal city in West Borneo, and inventory was done through exploration. Orchids found were recorded and identified into their genera and their species by visual examination of vegetative and floral characteristics, respectively. A total of 197 species of orchids from 66 genera were identified, and among those, 27 species live as terrestrials, 169 species live as epiphytes, and one species lives as both an epiphyte and terrestrial.

Orchids are members of the Orchidaceae, the largest family among flowering plants, which includes 25,000 species from 850 genera. It is estimated that 2500 to 3000 orchid species grow in the forests of Borneo (Irawati, 2002).

In their natural habitats, most orchids live as epiphytes in the forest trees. Increasing forest exploitation, either legally or illegally, and excessive logging have caused damage to the forests of West Borneo. Gold mining, wild forest fires, and illegal burning to establish a new agriculture land occur often and are some of the reasons orchids are becoming extinct. There are also economic factors contributing to the endangerment of Borneo's orchids such as illegal collecting and selling of wild orchids by collectors (orchid lovers) and the increasing demand for orchids by neighboring countries such as Malaysia and Brunei Darussalam. These conditions point to the urgency of the need to conserve native orchids in West Borneo.

Conservancy efforts should be conducted in accordance with the following Indonesian legislations: UU No. 5 ratified in 1990, The Conservation of Biological Natural Resources and Its Ecosystem (Indonesian Ministry

of the Environment, 1990); UU No. 5 ratified in 1994, The Conservation of Biological Diversity (Indonesian Ministry of the Environment, 1994); and PP No. 7 ratified in 1999, The Conservation of Flora and fauna (Indonesian Ministry of the Environment, 1999).

According to *Global Forest Watch* (2002), Indonesia is one of the countries experiencing the most drastic loss of forestland in the world. It was estimated in 1996 that ≈1 million ha of Indonesian forestland was being destroyed every year, including ≈1.7 million ha every year during the 1990s such that it was estimated that the forests in Borneo will have completely vanished by 2010. It is as a result of these figures that the author tries to promote conservation efforts, which include conserving native orchids by ex situ processes and making an inventory and identifying native orchids in West Borneo in accordance with the legislation mentioned previously.

Materials and Methods

Time and location. The research was conducted in 3 years, from 2002 to 2005. The author explored forests in all 10 counties and one municipal city in West Borneo. The counties were Sambas, Bengkayang, Pontianak, Sekadau, Sanggau, Kapuas Hulu, Singtong, Landak, Malawi, and Ketapang and the municipal city was Pontianak City.

Materials and tools. Materials used for this research were orchid plant guidebooks.

Several reference books written by Banks (1999, 2004a, 2004b), Chan et al. (1994), Clayton (2002), Cribb (1997), Dixon et al. (2003), Dressler (1993), Marinelli (2004), Moeso (1988), O'Byrne (2001), Teo (1995), Vermeulen (1991), and Wood (1997, 2001, 2003) were used for orchid determination. Especially useful were *Orchids of Borneo Vol. 1* (Chan et al., 1994), *Orchids of Borneo Vol. 2* (Vermeulen, 1991), *Orchids of Borneo Vol. 3* (Wood, 1997), *Orchids of Borneo Vol. 4* (Wood, 2003), and *A to Z of South East Asian Orchid Species* (O'Byrne, 2001).

The tools used were a camera, a compass, measuring tapes, clippers, wrapping paper, plastic sacks, paper bags, ropes, and a forest map of West Borneo.

Research methods. Explorative inventory through purposive sampling was conducted to identify the native orchids into their genera and species. Purposive sampling involved choosing exploration sites based on the existence of forests, both primary and secondary, and along riverbanks within counties. Epiphytic orchids were collected from the forest by climbing the trees or from the dead plant, and terrestrial ones were dug, including the soil, surrounding the roots. They were put into paper bags, and their habitats and their locations were recorded. Then, they were taken to the nursery and grown ex situ. Fresh flowers and their pictures were also taken for identification. Genus and species identifications were determined by visual examination of vegetative and floral characteristics, respectively. Identification was accomplished using the reference guidebooks mentioned previously. The average temperature in the forests of West Borneo is 24 to 33 °C, relative humidity 60% to 80%, light intensity is 7000 to 8000 lx, soil types are organic soil (peat) and mineral soils (yellowish red podzolic and alluvial), and pH of the soil is 4.0 to 5.5 (soil information needed for terrestrial orchids only). This information was recorded to grow the orchids ex situ.

Results and Discussion

One hundred ninety-seven orchid species from 66 genera have been identified, including some with high economic value and others with low economic value. Among these orchids, 27 species live as terrestrials, 169 species live as epiphytes in the forest, and one species lives as both an epiphyte and terrestrial (Table 1). In addition, the identification of 200 taxa is still pending, because these plants have not flowered at the time this article was written. The author found that orchid species were not uniformly distributed in West Borneo. Some species have become vulnerable, some have become endangered, whereas others have become almost extinct. Some vulnerable species such as *Aërides odorata* is still abundant, especially in Sambas, Landak, and Bengkayang counties. Similarly, *Arundina graminifolia* and *Bromheadia finlaysoniana* are easily found in their habitats in many counties.

Received for publication 9 July 2007. Accepted for publication 10 Oct. 2007.

I thank Deliana Siregar McCreary and Rieza Soelaeman for reviewing and editing this paper.

¹To whom reprint requests should be addressed; e-mail chairani8@yahoo.com

Table 1. List of orchid species found in West Borneo, Indonesia.

No.	Orchid name	Growth classification
1	<i>Acanthephippium eburneum</i> Kraenzl.	Terrestrial
2	<i>Acanthephippium lilacinum</i> J.J. Wood & C.L. Chan	Terrestrial
3	<i>Acriopsis densiflora</i> Lindley	Epiphyte
4	<i>Acriopsis liliifolia</i> (Koen.) Ormerod	Epiphyte
5	<i>Adenoccos parviflora</i> Ridl.	Epiphyte
6	<i>Aërides odorata</i> Lour.	Epiphyte
7	<i>Agrostophyllum laxum</i> J.J. Sm.	Epiphyte
8	<i>Anoetochilus albolineatus</i> Par. et Rchb. f.	Terrestrial
9	<i>Appendicula anceps</i> Bl.	Epiphyte
10	<i>Appendicula elegans</i> Rchb. f.	Epiphyte
11	<i>Appendicula torta</i> Bl.	Epiphyte
12	<i>Appendicula undulata</i> Bl.	Epiphyte
13	<i>Arachnis breviscapa</i> (J.J. Sm.) J.J. Sm.	Epiphyte
14	<i>Arachnis flosaeris</i> (Lind.) Rchb. f.	Epiphyte
15	<i>Arachnis hookeriana</i> (Rchb.f.) Rchb. f.	Epiphyte
16	<i>Arundina graminifolia</i> (D. Don.) Hochr.	Terrestrial
17	<i>Brachypeza indusiata</i> (Rchb. f.) Garay	Epiphyte
18	<i>Brachypeza zamboangensis</i> (Ames) Garay	Epiphyte
19	<i>Bromheadia finlaysonianana</i> (Lind.) Rchb. f.	Terrestrial
20	<i>Bulbophyllum acuminatum</i> (Ridl.) Ridl.	Epiphyte
21	<i>Bulbophyllum anceps</i> J.J. Sm.	Epiphyte
22	<i>Bulbophyllum auratum</i> (Lindl.) Rchb. f.	Epiphyte
23	<i>Bulbophyllum beccarii</i> Rchb. f.	Epiphyte
24	<i>Bulbophyllum blumei</i> (Lindl.) J.J. Sm.	Epiphyte
25	<i>Bulbophyllum brienianum</i> (Rolfe) Ames	Epiphyte
26	<i>Bulbophyllum cirlihanensis</i> Schltr.	Epiphyte
27	<i>Bulbophyllum connatum</i> Carr.	Epiphyte
28	<i>Bulbophyllum dearei</i> (Hort.) Rchb. f.	Epiphyte
29	<i>Bulbophyllum epicratanthes</i> Hook. f.	Epiphyte
30	<i>Bulbophyllum flavescens</i> (Bl.) Lindl.	Epiphyte
31	<i>Bulbophyllum gracillimum</i> (Rolfe) Rolfe	Epiphyte
32	<i>Bulbophyllum lepidum</i> (Bl.) J.J. Sm.	Epiphyte
33	<i>Bulbophyllum lobbiai</i> Lindl.	Epiphyte
34	<i>Bulbophyllum macranthum</i> Lindl.	Epiphyte
35	<i>Bulbophyllum macrochillum</i> Rolfe.	Epiphyte
36	<i>Bulbophyllum medusae</i> (Lindl.) Rchb. f.	Epiphyte
37	<i>Bulbophyllum mirum</i> J.J. Sm.	Epiphyte
38	<i>Bulbophyllum mirabile</i> (Bl.) Lindl.	Epiphyte
39	<i>Bulbophyllum patens</i> King ex Hk. f.	Epiphyte
40	<i>Bulbophyllum pileatum</i> Schltr.	Epiphyte
41	<i>Bulbophyllum purpurascens</i> T. & B.	Epiphyte
42	<i>Bulbophyllum refractilingue</i> J.J. Sm.	Epiphyte
43	<i>Bulbophyllum reticulatum</i> Batem ex Hook. f.	Epiphyte
44	<i>Bulbophyllum uniflorum</i> Hook.	Epiphyte
45	<i>Bulbophyllum vaginatum</i> (Lidl.) Rchb. f.	Epiphyte
46	<i>Bulbophyllum vanvuurenii</i> J.J. Sm.	Epiphyte
47	<i>Calanthe vestita</i> Lindl.	Terrestrial
48	<i>Chelonistele sulphurea</i> (Bl.) Pfitz.	Epiphyte
49	<i>Chroniochilus virescens</i> (Ridl.) Holttum	Epiphyte
50	<i>Cladonia viridiflora</i> Hook. f.	Terrestrial
51	<i>Cleisostoma scortechinii</i> (Hook. f.) Garay	Epiphyte
52	<i>Cleisostoma simondii</i> (Gagnep.) Seidenf.	Epiphyte
53	<i>Cleisostoma subulatus</i> Rchb. f.	Epiphyte
54	<i>Coelogyne asperata</i> Lindl.	Epiphyte
55	<i>Coelogyne eberhardtii</i> Gagnep.	Epiphyte
56	<i>Coelogyne foerstermannii</i> Rchbf.	Epiphyte
57	<i>Coelogyne mayeriana</i> Rchbf.	Epiphyte
58	<i>Coelogyne pandurata</i> Lindl.	Epiphyte
59	<i>Coelogyne rochussenii</i> De Vr.	Epiphyte
60	<i>Coelogyne rumphii</i> Rchb. f.	Epiphyte
61	<i>Coelogyne speciosa</i> Lindl.	Epiphyte
62	<i>Coelogyne squamulosa</i> J.J. Sm.	Epiphyte
63	<i>Coelogyne swaniana</i> Rolfe	Epiphyte
64	<i>Coelogyne verrucosa</i> S.E.C. Sierra	Epiphyte
65	<i>Cordiglottis filiformis</i> (Hk. f.) Garay	Epiphyte
66	<i>Cymbidium bicolor</i> Lindl.	Epiphyte
67	<i>Cymbidium finlaysonianum</i> Lindl.	Epiphyte
68	<i>Dendrobium acerosum</i> Lindl.	Epiphyte
69	<i>Dendrobium anosmum</i> Lindl.	Epiphyte
70	<i>Dendrobium babiense</i> J.J. Sm.	Epiphyte
71	<i>Dendrobium cinerium</i> J.J. Sm.	Epiphyte
72	<i>Dendrobium compressistylum</i> J.J. Sm.	Epiphyte

(Continued)

Table 1. (Continued) List of orchid species found in West Borneo, Indonesia.

No.	Orchid name	Growth classification
73	<i>Dendrobium crumenatum</i> Sw.	Epiphyte
74	<i>Dendrobium distichum</i> Rchb. f.	Epiphyte
75	<i>Dendrobium endertii</i> J.J. Sm.	Epiphyte
76	<i>Dendrobium grande</i> Hook. f.	Epiphyte
77	<i>Dendrobium hallieri</i> J.J. Sm.	Epiphyte
78	<i>Dendrobium hepaticum</i> J.J. Sm.	Epiphyte
79	<i>Dendrobium lamellatum</i> Bl.	Epiphyte
80	<i>Dendrobium leonis</i> (Lindl.) Rchb. f.	Epiphyte
81	<i>Dendrobium linearifolium</i> Hook. f.	Epiphyte
82	<i>Dendrobium macrophyllum</i> A. Rich.	Epiphyte
83	<i>Dendrobium microglaphys</i> Rchbf.	Epiphyte
84	<i>Dendrobium moquetteanum</i> J.J. Sm.	Epiphyte
85	<i>Dendrobium oblongum</i> Ames & C. Schweinf	Epiphyte
86	<i>Dendrobium pachyphyllum</i> (Kuntz) Bakh. f.	Epiphyte
87	<i>Dendrobium pandaneti</i> Ridl.	Epiphyte
88	<i>Dendrobium patentilobum</i> Ames & C. Schweinf	Epiphyte
89	<i>Dendrobium sanguinolentum</i> Lindl.	Epiphyte
90	<i>Dendrobium secundum</i> (Bl.) Lindl.	Epiphyte
91	<i>Dendrobium singaporense</i> Hawkes & Heller	Epiphyte
92	<i>Dendrobium singkawangense</i> J.J. Sm.	Epiphyte
93	<i>Dendrobium smithianum</i> Schltr.	Epiphyte
94	<i>Dendrobium spurium</i> (Bl.) J.J. Sm.	Epiphyte
95	<i>Dendrobium subulatum</i> (Bl.) Lindl.	Epiphyte
96	<i>Dendrobium uniflorum</i> Griff.	Epiphyte
97	<i>Dendrochilus pallidiflavens</i> Bl.	Epiphyte
98	<i>Dimorphorchis lowii</i> (Lindl.) Rolfe	Epiphyte
99	<i>Dimorphorchis rossii</i> Fowlie	Epiphyte
100	<i>Dipodium ensifolium</i> F. Muell.	Epiphyte
101	<i>Dipodium pictum</i> (Lindl.) Rchb. f.	Epiphyte
102	<i>Dipodium scandens</i> (Bl.) J.J. Sm.	Epiphyte
103	<i>Doritis pulcherrima</i> Lindl.	Epiphyte
104	<i>Dyakia hendersoniana</i> (Rchb. f.) Christenson	Epiphyte
105	<i>Eria biglandulosa</i> J.J. Sm.	Epiphyte
106	<i>Eria bractescens</i> Lindl.	Epiphyte
107	<i>Eria braddonii</i> Rolfe.	Epiphyte
108	<i>Eria citrina</i> Ridl.	Epiphyte
109	<i>Eria javanica</i> (Sw.) Bl.	Epiphyte
110	<i>Eria jenseniana</i> J.J. Sm.	Epiphyte
111	<i>Eria leiophylla</i> Lindl.	Epiphyte
112	<i>Eria longissima</i> Rchb. f.	Epiphyte
113	<i>Eria ornata</i> (Bl.) Lindl.	Epiphyte
114	<i>Eria pannea</i> Lindl.	Epiphyte
115	<i>Eria pulchella</i> Lindl.	Epiphyte
116	<i>Eria quadricolor</i> J.J. Sm.	Epiphyte
117	<i>Eria xanthocheila</i> Ridl.	Epiphyte
118	<i>Eulophia graminea</i> Lindl.	Terrestrial
119	<i>Eulophia spectabilis</i> (Dennst.) Suresh	Terrestrial
120	<i>Flickingeria aurieloba</i> (J.J. Sm.) J.J. Wood.	Epiphyte
121	<i>Flickingeria bicostata</i> (J.J. Sm.) Hawkes	Epiphyte
122	<i>Flickingeria fimbriata</i> (Bl.) Hawkes.	Epiphyte
123	<i>Flickingeria xantholeuca</i> (Rchb. f.) Hawkes.	Epiphyte
124	<i>Gastrochilus patinatus</i> (Ridl.) Schltr.	Epiphyte
125	<i>Grammatophyllum speciosum</i> Bl.	Epiphyte
126	<i>Grammatophyllum stapeliiflorum</i> (T. & B.) J.J. Sm.	Epiphyte
127	<i>Grosourdya appendiculata</i> (Bl.) Rchb. f.	Epiphyte
128	<i>Grosourdya muscosa</i> (Rolfe) Garay.	Epiphyte
129	<i>Liparis compressa</i> (Bl.) Lindl.	Terrestrial
130	<i>Liparis condylobulbon</i> Rchb. f.	Terrestrial
131	<i>Liparis elegans</i> Lindl.	Terrestrial
132	<i>Liparis lacerata</i> Ridl.	Terrestrial
133	<i>Ludisia discolor</i> (Ker-Gawl.) A. Rich.	Terrestrial
134	<i>Luisia curtisii</i> Seidenfaden	Epiphyte
135	<i>Macodes petola</i> (Bl.) Lindl.	Terrestrial
136	<i>Malaxis latifolia</i> (Lindl.) Garay.	Terrestrial
137	<i>Micropera fuscolutea</i> (Lindl.) Garay	Epiphyte
138	<i>Micropera callosa</i> Garay.	Epiphyte
139	<i>Nephelaphyllum pulchrum</i> Bl.	Terrestrial
140	<i>Nervilia discolor</i> (Bl.) Schltr.	Terrestrial
141	<i>Nervilia uniflora</i> (F. Muell.) Schltr.	Terrestrial

(Continued on next page)

Table 1. (Continued) List of orchid species found in West Borneo, Indonesia.

No.	Orchid name	Growth classification
142	<i>Oberonia ciliolata</i> Hook.f.	Epiphyte
143	<i>Oberonia patentifolia</i> Ames & C. Schwenf.	Epiphyte
144	<i>Paphiopedilum hookerae</i> Rchb.f.	Terrestrial
145	<i>Paphiopedilum kolopakingii</i> Fowlie	Terrestrial
146	<i>Paphiopedilum lowii</i> (Lind.) Stein.	Terrestrial
147	<i>Papilionanthe hookeriana</i> (Rchb. f.) Schltr.	Terrestrial
148	<i>Paraphalaenopsis denevei</i> (J.J. Sm.) Hawkes	Epiphyte
149	<i>Paraphalaenopsis serpentilingua</i> (J.J. Sm.) A.D. Hawkes	Epiphyte
150	<i>Phalaenopsis amabilis</i> (Lindl.) Bl.	Epiphyte
151	<i>Phalaenopsis bellina</i> (Rchb. f.) E.A. Cristenson	Epiphyte
152	<i>Phalaenopsis cornucervi</i> (Breda) Bl. & Rchb. f.	Epiphyte
153	<i>Phalaenopsis gigantea</i> J.J. Sm.	Epiphyte
154	<i>Phalaenopsis maculata</i> Rchb. f.	Epiphyte
155	<i>Phalaenopsis manii</i> Rchb. f.	Epiphyte
156	<i>Phalaenopsis modesta</i> J.J. Sm.	Epiphyte
157	<i>Phalaenopsis pantherina</i> Rchb. f.	Epiphyte
158	<i>Phalaenopsis sumatrana</i> Korth. & Rchb. f.	Epiphyte
159	<i>Pholidota imbricata</i> Lindl.	Epiphyte
160	<i>Pholidota ventricosa</i> (Roxb.) Lindl.	Epiphyte
161	<i>Plocoglottis acuminata</i> Bl.	Terrestrial
162	<i>Plocoglottis lowii</i> J.J. Sm.	Terrestrial
163	<i>Pomatocalpa kunstleri</i> (Hk. f.) J.J. Sm.	Epiphyte
164	<i>Pomatocalpa latifolia</i> J.J. Sm.	Epiphyte
165	<i>Pomatocalpa naevata</i> J.J. Sm.	Epiphyte
166	<i>Pomatocalpa spicata</i> Breda	Epiphyte
167	<i>Porphyroglottis maxwelliae</i> Ridl.	Epiphyte
168	<i>Pteroceras cladostachyum</i> (Hk. f.) H. Ae. Peders	Epiphyte
169	<i>Pteroceras pallidum</i> (Bl.) Holtt.	Epiphyte
170	<i>Renanthera elongata</i> (Hk. f.) Lindl.	Epiphyte
171	<i>Robiquetia spathulata</i> (Bl.) J.J.Sm.	Epiphyte
172	<i>Schoenorchis micrantha</i> Reinw.	Epiphyte
173	<i>Schoenorchis secundiflora</i> (Ridl.) J.J. Sm.	Epiphyte
174	<i>Spathoglottis plicata</i> Bl.	Terrestrial
175	<i>Taeniophyllum obtusum</i> Bl.	Epiphyte
176	<i>Tainia paucifolia</i> J.J. Sm.	Terrestrial
177	<i>Thecopus secunda</i> (Ridl.) Seidenf.	Epiphyte
178	<i>Thecostele alata</i> (Roxb.) Par. & Reichb. f.	Epiphyte
179	<i>Thelasis carinata</i> Bl.	Epiphyte
180	<i>Thelasis micrantha</i> (Brogn.) J.J. Sm.	Epiphyte
181	<i>Thelasis obtusa</i> Bl.	Epiphyte
182	<i>Thrixspermum acuminatissimum</i> Rchb. f.	Epiphyte
183	<i>Thrixspermum amplexicaule</i> (Bl.) Rchb. f.	Epiphyte and terrestrial
184	<i>Thrixspermum centipeda</i> Lour.	Epiphyte
185	<i>Trichoglottis bipenicillata</i> J.J. Sm.	Epiphyte
186	<i>Trichoglottis cirrhifera</i> Teijsm & Binn.	Epiphyte
187	<i>Trichoglottis geminata</i> (T. & B.) J.J. Sm.	Epiphyte
188	<i>Trichoglottis retusa</i> Bl.	Epiphyte
189	<i>Trichoglottis smithii</i> J.J. Sm.	Epiphyte
190	<i>Trichoglottis uexkulliana</i> J.J. Sm.	Epiphyte
191	<i>Trichotosia aporina</i> (Hk. f.) Krzl.	Epiphyte
192	<i>Trichotosia ferox</i> Bl.	Epiphyte
193	<i>Trichotosia gracilis</i> Lindl.	Epiphyte
194	<i>Vanda scandens</i> Holttum	Epiphyte
195	<i>Vanda dearei</i> Rchb. f.	Epiphyte
196	<i>Vanilla diabolica</i> O'Byrne.	Epiphyte
197	<i>Vanilla griffithii</i> Rchb. f.	Epiphyte

Some species with high economic value such as *Arachnis breviscapa*, *Arachnis hookeriana*, *Bulbophyllum beccarii*, *Bulbophyllum dearei*, *Coelogyne pandurata*, *Cymbidium bicolor*, *Dendrobium hallieri*, *Dendrobium singkawangense*, *Dimorphorchis lowii*, *Vanda dearei*, *Paphiopedilum hookerae*, *Paphiopedilum kolopakingii*, and *Paphiopedilum lowii* have become endangered. Among these orchids, *Paphiopedilum lowii* still can be found in Sanggau and Sintang counties. *Bulbophyllum beccarii*

and *Bulbophyllum dearei* can be found in Landak, Kapuas Hulu, and Bengkayang counties, and only a few *Vanda dearei* can be found in Landak county. On the other hand, *Arachnis breviscapa* and *Arachnis hookeriana* are very rare. Similarly, endemic *Dendrobium* species such as *Dendrobium hallieri* and *Dendrobium singkawangense* are difficult to find as a result of high demand by the buyers. It is also difficult to cultivate these endemic species *ex situ*, perhaps because of the difficulties in copying the

exact microhabitat, which supports its specific associated mycorrhiza.

Noteworthy taxa include two species from genus *Paphiopedilum* (*Paphiopedilum hookerae* and *Paphiopedilum kolopakingii*), two species from the genus *Paraphalaenopsis* (*Paraphalaenopsis denevei* and *Paraphalaenopsis serpentilingua*), *Cymbidium bicolor*, *Dimorphorchis rossii*, and several species from genus *Phalaenopsis*, none of which are common in nature because they are highly prized by poachers or they have vanished as their habitat is destroyed. These orchids are hardly found in their habitats but are more easily found outside their habitats. They are found in Serawak (Malaysia), in nurseries in Java, and some big cities in Indonesia as well as some parts of the Western hemisphere. Especially, *Paraphalaenopsis serpentilingua* is now critically endangered, and it can only be found in Sintang county. However, the Bogor Botanical Garden in Indonesia has successfully cultivated it. Likewise, *Macodes petola*, *Anoectochilus albolineatus*, and *Ludisia discolor* have become extremely rare and critically endangered. Only a few of these plants were encountered. These orchids live in shady, moist, and humically rich habitats. Moreover, *Phalaenopsis gigantea*, *Paraphalaenopsis denevei*, and *Phalaenopsis amabilis* are also critically endangered. They have never been found in their habitats and are hardly found in the markets. The author recommends that all vulnerable, endangered, and critically endangered species should be cultivated before they become extinct. Local government intervention and participation in conservation, cultivation as well as marketing of orchids are necessary so that parties will not directly take the plants from their habitat.

Literature Cited

- Banks, D.P. 1999. Tropical orchids of Indonesia. Periplus Edition (HK) Ltd., Singapore.
- Banks, D.P. 2004a. Handy pocket guide to the orchids of Indonesia. Periplus Edition (HK) Ltd., Singapore.
- Banks, D.P. 2004b. Orchids: Cultivation, propagation and varieties. Murdoch Books Pty Ltd., Sydney, Australia.
- Chan, C.L., A. Lamb, P.S. Shim, and J.J. Wood. 1994. Orchids of Borneo Vol. 1. The Sabah Society Kota Kinabalu in association with The Royal Botanic Gardens Kew, Surrey, UK.
- Clayton, D. 2002. The genus *Coelogyne* a synopsis. Natural History Publications (Borneo) in association with The Royal Botanic Gardens Kew, Surrey, UK.
- Cribb, P. 1997. Slipper orchids of Borneo. Natural History Publications, Kota Kinabalu, Malaysia.
- Dixon, K.W., P.K. Shepagh, L.B. Russell, and J.C. Philip. 2003. Orchid conservation. Natural History Publications (Borneo), Kota Kinabalu, Malaysia.
- Dressler, R.L. 1993. Phylogeny and classification of the orchid family. Dioscorides Press, Portland, OR.
- Global Forest Watch. 2002. Indonesia: Overview. 25 Sept. 2002. 28 Apr. 2006. <<http://www.globalforestwatch.org/English/Indonesia/index.htm>>.
- Indonesian Ministry of the Environment. 1990. Undang-Undang No. 5 Tahun 1990 Tentang:

- Konservasi Sumberdaya Alam Hayati dan Ekosistemnya. 28 Apr. 2006. <http://www.menlh.go.id/i/art/pdf_1038295823.pdf>.
- Indonesian Ministry of the Environment. 1994. Undang-Undang No. 5 Tahun 1994 Tentang: Pengesahan United Nations Convention on Biological Diversity. <http://www.menlh.go.id/i/art/pdf_1038297639.pdf>.
- Indonesian Ministry of the Environment. 1999. Peraturan Pemerintah No. 7 Tahun 1999 Tentang: Pengawetan Jenis Tumbuhan dan Satwa. 28 Apr. 2006. <http://www.menlh.go.id/i/art/pdf_1038451276.pdf>.
- Irawati. 2002. Pelestarian jenis anggrek di Indonesia. Proseding Seminar Anggrek Nasional, Yogyakarta.
- Marinelli, J. 2004. Plant. Dorling Kindersley Limited, London, UK.
- Moeso, S. 1988. Mengenal anggrek alam Indonesia. Penebar Swadaya, Jakarta.
- O'Byrne, P. 2001. A to Z of South East Asia orchid species. Orchid Society of South East Asia, Singapore.
- Teo, C.K.H. 1995. Native orchids of Peninsular Malaysia. Times Book International, Singapore.
- Vermeulen, J.J. 1991. Orchids of Borneo Vol. 2. Bulbophyllum. Bentham-Moxon Trust, Royal Botanic Gardens Kew, Surrey, UK.
- Wood, J.J. 1997. Orchids of Borneo Vol. 3. The Sabah Society Kota Kinabalu in association with The Royal Botanic Gardens Kew, Surrey, UK.
- Wood, J.J. 2001. Dendrochilum of Borneo. Natural History Publications (Borneo), Kota Kinabalu in association with The Royal Botanic Gardens Kew, Surrey, UK.
- Wood, J.J. 2003. Orchids of Borneo Vol. 4. The Sabah Society Kota Kinabalu in association with Royal Botanic Gardens Kew, Surrey, UK.