



Tracking the morphological diversity of *Bucephalandra motleyana* Schott (1858 (Araceae) using its commercial name in the proximities of Jakarta, Indonesia

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ABSTRACT

Bucephalandra Schott, Gen. Aroid. (1858) is a genus within Araceae family and assigned to some aquatic plants endemic to Borneo Island, currently representing 31 species. *Bucephalandra* species are known as ornamental aquatic plants and common for aquascaping. These aquatic plants are highly valued, approximately € 300 in European ornamental aquatic markets and Rp 50,000–700,000 in local markets. We collected 195 specimens of *Bucephalandra* from 5 ornamental aquatic plant markets in the proximity of Jakarta City, Indonesia. This study is based on repeated confusion with overwhelmed vernacular names assigned for *Bucephalandra* in the markets. Therefore, the aims of this study are to collect and to identify of *Bucephalandra* offered in the aquatic plant markets with emphasis on *Bucephalandra motleyana* Schott 1858. Specimen identification are mostly based on reference specimens stored in the Herbarium Bogoriense Botany Division – Research Centre for Biology – Indonesian Institute of Sciences (LIPI) Cibinong. As result, this study collected 110 specimens belonged to *Bucephalandra motleyana* Schott 1858 and 85 specimens identified as other species within this genus.

INTRODUCTION

Borneo, in which the Kalimantan portion of Indonesia lies, is one of the equatorial islands in the globe with the richest aroid flora, supporting many floral genera and species in the world. Taxonomy outline for this aquatic aroid plant as below

Kingdom : Plantae
Phylum : Tracheophyta
Class : Liliopsida
Order : Alismatales
Family : Araceae
Genus : *Bucephalandra* Schott
(<http://gbif.org/species/2869473>)

Aroid is occupied by 31 species, one of them is *Bucephalandra motleyana* Schott 1858 (Schott 1858; Bogner and Hay 2000). *Bucephalandra motleyana* is the first species described for *Bucephalandra* genus in 1858 by Schott, who found it among James Motley's collection from Borneo. After its first description

160 years ago, many species of *Bucephalandra* are currently traded branded with its commercial name, *Rheophyte*. Rheophytic plants are characterized by good adaptability, perennial, fibrous roots, and rough leaves with streamlined general appearance. *Bucephalandra motleyana* is found to grow in river banks, on rocks in rivers and jungle streams, as well as in the floodplains (Boyce 1995; Boyce *et al.* 1995).

Purportedly, *Bucephalandra motleyana* was originated from Banjarmasin, South Kalimantan, Indonesia. It was introduced for the first time by James Motley in 1854 and included in his plant collections. Motley was a ruler of the coal mine within the cycle of Julia J. Hermina, whose hobby collecting wild plants. Motley repeatedly shipped plant specimens from Labuan, including *Bucephalandra*, to Europe. The Motleys, himself and four spouses, were killed in early May 1859 during a local uprising that triggered the war in Banjarmasin. Therefore, in reminiscence of James Motley, *Bucephalandra motleyana* was named after the

first collector of this aquatic plant that endemic to South Kalimantan (Boyce 1995). In 1984, the second species was identified by Bogner, named as *Bucephalandra gigantea* (Bogner, 1984). It is endemic to Kiau river in Central Kalimantan and identification used materials taken from the F. H. Endert's collection, which made in 1925.

The margin of *Bucephalandra motleyana* leaves are morphologically vary from the influence of several factors, such as plant age, the growth substrates (e.g. ground soil, on rock, or in fresh water) and light intensity. Leaf form ranges from slender to rather broad with smooth to strongly undulate margin. Leaf margin morphologically varies from lean to slightly wide with leaf fringes smooth to very bumpy, and great variation in height (Boyce, 1995). The systemic identification key for its floral morphology is arranged as follow; 1) morphology of the appendix staminodes, particularly with the presence and nature of any surface ornamentation; 2) morphology of flower's staminode, notably the plan and three-dimensional shape of the filament; 3) insertion, orientation, and shape of thecae, including any of its superficial ornamentation; 4) orientation, posture, shape, and relative length (related to thecae and filament) of thecae horns; 5) morphology of the shield-shaped staminodes, notably overall (plan) shape, and topology of ventral surface; 6) shape and colour of pistils; 7) shape of sub-pistillar staminodes (Bogner and Hay 2000; Boyce and Yeng 2012).

Being ornamental element in the aquariums, *Bucephalandra* plants can be grown within small pot of moist sand and with frequent watering to accelerate adaptation. *Bucephalandra* plants can also live on watery and humid soil such as rice fields, as long as its roots remain moist and wet (Boyce 1995). With possible greater genetic diversity of *Bucephalandra* unexplored, it stores potential use for the wealth of natural biodiversity as well as for the economic prosperity and fulfilment of human needs. Unfortunately, it can only be achieved with proper understanding on species identity or the type of biota. As massive *Bucephalandra* species traded in current global markets, it is necessary to study its diversity through exploration on species offered, continued with its identification and characterization. *Bucephalandra* plants are traded with various vernacular names, partially as gimmick to lure the hobbyists to collect them.

Vernacular names may also occur in responding to morphological variations appeared in the new plant breeds. While morphological variations are induced through ecological factors mentioned above.

This study aimed to inventory *Bucephalandra* species traded in a freshwater ornamental plant markets, with emphasis on *Bucephalandra motleyana*. The study on genetic diversity is important baseline for further breeding and quality improvement programs to these ornamental aquatic plants. The hitherto study on *Bucephalandra* diversity was only the one carried out by Peter Boyce, a specialist on Araceae family on 1995. With more reliable information regarding genetic variation of *Bucephalandra* obtained, the development of germplasm for *Bucephalandra* and its conservation are achievable.

RESEARCH METHODOLOGY

Bucephalandra specimens were freshly collected from 5 ornamental aquatic plant markets and other sellers within the proximity of Jakarta City, Indonesia. Specimens were then identified in the Herbarium Bogoriense, the Botany Division Research Center for Biology, Indonesian Institute of Science or LIPI. Species identifications were based on reference specimens stored in herbarium and further validated through literature studies for each species. Morphological description and terminology are in accordance with related literatures (Boyce, 1995; Bogner and Hay 2000).

RESULTS AND DISCUSSION

As many as 195 *Bucephalandra* specimens sampled and identified from Jakarta and its surrounding areas with 110 specimens confirmed as *Bucephalandra motleyana*. The identification aspects of *Bucephalandra motleyana*, are pooled in Table 1 below.

Verification on species names, especially those widely traded is deemed crucial to establish species identity. In trading practice, a plant is often sold under many different names to yield massive sales opportunity in addition to add value on it. Currently, ornamental aquatic plants are named following the ongoing dynamics in the global markets for aquatic animals. Such dynamics present real-time competition,

challenges and even opportunities for domestic and international marketers. Hence, the customers are targeted from all levels, by following their desire on certain products or brands, including in this ornamental aquatic plant products (Klein *et al.* 1998).

Consumers behaviour that driven by the product branding, satisfaction upon purchased products, the popularity of labelled products or merely seek exclusivity in their purchased products can also be seen happened in aquatic ornamental plant markets (Mitchell, 1992). It should be noted that some consumers also purchase goods for levelling their "prestige." Given this case, the relationship between price and objective quality no longer matters (Yin *et al.*, 2014). Consumers who interested in buying these ornamental aquatic plant products have steadily increased due to the constant variations propagated and offered in the markets. While for marketing purpose this variation serves well, yet in the field of biology or botany tend to create confusion or errors in identifying species. It is palpated that hidden reason to create various trading names for a marketed organism is to raise consumer interest to it. Yet, it obscures the actual abundance of that organism, due to its superficial variations. Hence, it demands constant use of scientific name for a traded organism in the markets, not only to alleviate above problem but also to appreciate the taxonomist(s) who have described it.

Overall recognized species of *Bucephalandra* since *B. motleyana* firstly described by Peter Boyce in 1995 detailed as follow; *B. akantha* S.Y. Wong & P. C. Boyce, *B. aurantiithecra* S.Y. Wong & P. C. Boyce, *B. belindae* S.Y. Wong & P. C. Boyce, *B. bogneri* S.Y. Wong & P. C. Boyce, *B. catherineae* P. C. Boyce, Bogner & Mayo, *B. chimaera* S.Y. Wong & P. C. Boyce, *B. chrysokoupa* S.Y. Wong & P. C. Boyce, *B. diabolica* S.Y. Wong & P. C. Boyce, *B. elliptica* S.Y. Wong & P. C. Boyce, *B. filiformis* S.Y. Wong & P. C. Boyce, *B. forcipula* S.Y. Wong & P. C. Boyce, *B. gigantea* Bogner, *B. goliath* S.Y. Wong & P. C. Boyce, *B. kerangas* S.Y. Wong & P. C. Boyce, *B. kishii* S.Y. Wong & P. C. Boyce, *B. magnifolia* H. Okada & Y. Mori, *B. micrantha* S.Y. Wong & P. C. Boyce, *B. minotaur* S.Y. Wong & P. C. Boyce, *B. motleyana* Schott, *B. muluensis* (M. Hotta) S.Y. Wong & P. C. Boyce, *B. oblanceolata* (M. Hotta) S.Y. Wong & P. C. Boyce, *B. oncophora* S.Y. Wong & P. C. Boyce, *B. pubes* S.Y. Wong & P. C. Boyce, *B. pygmaea* (Becc.) P. C. Boyce &

S.Y. Wong, *B. sordidula* S.Y. Wong & P. C. Boyce, *B. spathulifolia* Engl. ex S.Y. Wong & P. C. Boyce, *B. tetana* S.Y. Wong & P. C. Boyce, *B. ultramafica* S.Y. Wong & P. C. Boyce, *B. vespula* S.Y. Wong & P. C. Boyce, *B. yengiae* S.Y. Wong & P. C. Boyce, *B. danumensis* S.Y. Wong & P. C. Boyce (Yeng and Boyce. 2014 a; 2014 b; [https:// gbif.org/species/2869473](https://gbif.org/species/2869473)).

All species above was identified by *Araceae*-specific botanists, by following taxonomy and nomenclature. Scientific names are correlated with the nomenclature system and preferably in use to address *Bucephalandra* plants traded. Hence, confusion or doubt about species identity can be lessened.

CONCLUSION

There were 110 specimens *Bucephalandra motleyana* out of 195 total *Bucephalandra* specimen collected from the markets. The variability of *B. motleyana* morphology observed from the array of collected specimens should not diminish the important of using its scientific name in the markets. It is necessary to ease species identification and at the same time perceived as respectful gesture to the scientists who discovered those species.

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Table 1. Tabulation of morphological features of *Bucephalandra motleyana* sampled in ornamental aquatic plant markets.

No	COMMERCIAL NAME	APEX FOLII	MARGO FOLII	COLOR LEAF		LEAF SIZE		LEAF SURFACE	LEAF HOLDER	SHORT LEAF	LEAF SHAPE	MIDRIB
				OLD	YOUNG	LONG	WIDE					
1	Red Scorpio	obtutus	(repandus)	8159	4619	4	1	laefis	Roset	Acutus	Lanceolate	Penninervis
2	Peacock	obtutus	(integer)	4609	4608	2,5	0,6	laefis	Roset	Acutus	Lanceolate	Penninervis
3	Browni purple	acuminatus	(repandus)	4419	4407	2,7	1,1	laefis	Roset	Acutus	Oblong	Penninervis
4	Purple lis adori	obtutus	(integer)	4219	4409	3,5	1	laefis	Roset	Acutus	Lanceolate	Penninervis
5	Royce	obtutus	(integer)	8159	8089	3,2	1	laefis	Roset	Acutus	Obovate	Penninervis
6	Bronze red	acuminatus	(repandus)	8179	1209	3,5	1,2	laefis	Roset	Acutus	Lanceolate	Penninervis
7	Hades	acuminatus	(repandus)	4819	4918	3	1,4	laefis	Roset	Obtutus	Oblong	Penninervis
8	Velvet tree color	obtutus	(repandus)	4609	1112	3	1	laefis	Roset	Acuminatus	Oblong	Penninervis
9	Hiperion	acuminatus	(repandus)	4619	4616	1,5	0,5	laefis	Roset	Acutus	Oblong	Penninervis
10	Kribbas	obtutus	(repandus)	4619	4616	2,2	0,7	laefis	Roset	Acuminatus	Oblong	Penninervis
11	Arogan blue	obtutus	(repandus)	4609	4608	1,5	0,7	laefis	Roset	acutus	Elliptical	Penninervis
12	Kedaung round	acuminatus	(integer)	8159	4409	1,8	0,7	laefis	Roset	acutus	Obovate	Penninervis
13	Gozila	acuminatus	(repandus)	5706	4619	4	1,4	laefis	Roset	acutus	Elliptical	Penninervis
14	Narcicus melawi	obtutus	(repandus)	8159	4409	4	1	laefis	Roset	acutus	Oblong	Penninervis
15	Melawi blue	acuminatus	(repandus)	5808	4708	2,5	1	laefis	Roset	acutus	Oblong	Penninervis
16	Browni iris	acuminatus	(repandus)	4619	5905	3	1,4	laefis	Roset	acutus	Obovate	Penninervis
17	Titan I	obtutus	(repandus)	4619	4929	2,2	1	laefis	Roset	acutus	Oblong	Penninervis
18	Black fanti	acutus	(repandus)	4219	8156	4	1,2	laefis	Roset	acutus	Lanceolate	Penninervis
19	Browni grande	acuminatus	(integer)	4219	1119	4,5	2,7	laefis	Roset	obtutus	Obovate	Penninervis
20	Browni Brown	acuminatus	(integer)	1116	4219	4,5	1,5	laefis	Roset	acutus	Elliptical	Penninervis
21	Browni red	acuminatus	(repandus)	4609	1116	2,7	0,8	laefis	Roset	acutus	Oblong	Penninervis
22	Browni blue	acuminatus	(repandus)	4618	1116	3,2	1,2	laefis	Roset	acutus	Oblong	Penninervis
23	Thea brown	acuminatus	(repandus)	8159	4817	3	1,5	laefis	Roset	obtutus	Obovate	Penninervis
24	Red ren	acuminatus	(integer)	4619	1208	2	1	laefis	Roset	obtutus	Obovate	Penninervis
25	Kayu manis brown	acuminatus	(repandus)	4719	1419	2,7	1	laefis	Roset	obtutus	Oblong	Penninervis
26	Ketrin green	acuminatus	(repandus)	4609	4707	2	0,8	laefis	Roset	acutus	Oblong	Penninervis
27	Browni ghost	acuminatus	(repandus)	8159	1319	3,1	1,2	laefis	Roset	acutus	Obovate	Penninervis
28	Metalic wep	acuminatus	(integer)	8179	1417	2	0,9	laefis	Roset	acutus	Oblong	Penninervis
29	Sokan	acuminatus	(repandus)	4619	4006	2	1	laefis	Roset	obtutus	Obovate	Penninervis
30	Rainbow cross	acuminatus	(repandus)	5007	8163	3	1	laefis	Roset	acutus	Oblong	Penninervis
31	Fixy red	obtutus	(integer)	4929	4509	2,4	1,1	laefis	Roset	acutus	Obovate	Penninervis
32	Cherry	acuminatus	(integer)	4609	5717	2,5	1,1	laefis	Roset	obtutus	Obovate	Penninervis
33	Marbel O2	acuminatus	(integer)	4419	1114	2,2	0,8	laefis	Roset	acutus	Obovate	Penninervis
34	KIR kompari	acuminatus	(integer)	4719	8119	2	0,9	laefis	Roset	obtutus	Obovate	Penninervis
35	Narcicus	acuminatus	(integer)	8169	8169	3	1	laefis	Roset	acutus	Lanceolate	Penninervis
36	Pitik koprol	acuminatus	(integer)	4419	1318	4,7	2,6	laefis	Roset	acutus	Obovate	Penninervis
37	Thea 9	acuminatus	(repandus)	4609	1319	2,5	1,6	laefis	Roset	obtutus	Obovate	Penninervis
38	Thea 1	acuminatus	(repandus)	4309	4705	4	2	laefis	Roset	acutus	Obovate	Penninervis
39	Poenic flamingo	acuminatus	(integer)	4509	1119	4,2	1,4	laefis	Roset	acutus	Lanceolate	Penninervis
40	Ulisise	acuminatus	(integer)	4509	1319	5	1,7	laefis	Roset	acutus	Lanceolate	Penninervis

No	COMMERCIAL NAME	APEX FOLII	MARGO FOLII	COLOR LEAF		LEAF SIZE		LEAF SURFACE	LEAF HOLDER	SHORT LEAF	LEAF SHAPE	MIDRIB
				OLD	YOUNG	LONG	WIDE					
41	Tik brown	acuminatus	(integer)	4509	1319	4,2	2	laefis	Roset	acutus	Obovate	Penninervis
42	Sangaria	acuminatus	(integer)	8159	1509	4,3	1,3	laefis	Roset	acutus	Obovate	Penninervis
43	Sintang	acuminatus	(repandus)	4608	4608	4,6	1,6	laefis	Roset	acutus	Oblong	Penninervis
44	Thea 4	acuminatus	(repandus)	4609	4807	4	1,9	laefis	Roset	acutus	Obovate	Penninervis
45	Black karpet	obtutus	(integer)	4619	4616	2,2	1,5	laefis	Roset	acutus	Lanceolate	Penninervis
46	Palem tree	acuminatus	(repandus)	4418	4418	4,6	0,8	laefis	Roset	acutus	Lanceolate	Penninervis
47	Censau	acuminatus	(repandus)	4509	1319	4,5	1	laefis	Roset	obtutus	Oblong	Penninervis
48	Red paint	acutus	(repandus)	4509	4509	4	1	laefis	Roset	acutus	Oblong	Penninervis
49	Pink biblis	acuminatus	(repandus)	4619	4706	2,5	0,5	laefis	Roset	acuminatus	Oblong	Penninervis
50	Biblis blue sky	obtutus	(repandus)	4419	4717	2,1	0,6	laefis	Roset	acutus	Oblong	Penninervis
51	Red biblis	acuminatus	(repandus)	4619	1319	2,8	1	laefis	Roset	acutus	Oblong	Penninervis
52	Red type	acuminatus	(repandus)	8159	917	1,5	0,6	laefis	Roset	acutus	Oblong	Penninervis
53	Montelena brown red silver	obtutus	(repandus)	4709	1319	3,2	1,1	laefis	Roset	acutus	Lanceolate	Penninervis
54	Sweet angel	obtutus	(repandus)	4409	4707	3	1,2	laefis	Roset	obtutus	Obovate	Penninervis
55	Undulata	obtutus	(repandus)	4619	1319	4,2	1,4	laefis	Roset	acutus	Oblong	Penninervis
56	Nangga taman	acutus	(repandus)	4309	4605	3,5	1	laefis	Roset	acutus	Oblong	Penninervis
57	Cherys 4	obtutus	(integer)	4309	4617	2,5	1,1	laefis	Roset	acutus	Obovate	Penninervis
58	Black leaf	acuminatus	(repandus)	8159	1119	3	1	laefis	Roset	acutus	Oblong	Penninervis
59	Black rizart	obtutus	(repandus)	4509	1319	3,2	1,1	laefis	Roset	obtutus	Oblong	Penninervis
60	Dark velvet	acuminatus	(repandus)	1118	1113	2,3	1	laefis	Roset	acutus	Oblong	Penninervis
61	Thea black	acuminatus	(repandus)	1713	1708	2,6	1,4	laefis	Roset	obtutus	Obovate	Penninervis
62	Phoebi	obtutus	(repandus)	5109	1318	2,2	1	laefis	Roset	acutus	Obovate	Penninervis
63	Helias	acuminatus	(repandus)	1119	1319	3	1	laefis	Roset	acutus	Oblong	Penninervis
64	Wiset black green	acuminatus	(repandus)	4509	1118	2	0,8	laefis	Roset	acutus	Oblong	Penninervis
65	Red shoot 2	acuminatus	(repandus)	8159	1119	2,6	1	laefis	Roset	acutus	Oblong	Penninervis
66	Red shoot	acuminatus	(repandus)	4717	1119	2,6	1,2	laefis	Roset	acutus	Obovate	Penninervis
67	Litle danger	acuminatus	(repandus)	1109	1114	4,7	1,6	laefis	Roset	acutus	Obovate	Penninervis
68	Browni march	acuminatus	(repandus)	4718	1118	2	1	laefis	Roset	obtutus	Obovate	Penninervis
69	Kedagang old version	acuminatus	(repandus)	5917	1118	2,6	1	laefis	Roset	acutus	Oblong	Penninervis
70	Entikong	acuminatus	(repandus)	4419	1119	4,8	2,5	laefis	Roset	obtutus	Obovate	Penninervis
71	Thea 6	acuminatus	(repandus)	4419	1118	4,6	1,8	laefis	Roset	acutus	Lanceolate	Penninervis
72	Vina	obtutus	(repandus)	8179	4507	3,5	1,8	laefis	Roset	acutus	Obovate	Penninervis
73	Sakadau	obtutus	(repandus)	4717	4706	5,5	2,1	laefis	Roset	acutus	Lanceolate	Penninervis
74	Nanga pino Ulises	acutus	(repandus)	5908	4708	5,5	2	laefis	Roset	acutus	Lanceolate	Penninervis
75	Green sokan	obtutus	(integer)	4508	4508	2,8	1,5	laefis	Roset	obtutus	Obovate	Penninervis
76	Dang sokan	acuminatus	(integer)	4509	4507	3	1,4	laefis	Roset	obtutus	Obovate	Penninervis
77	Lamandau green	acuminatus	(integer)	8169	4908	2,5	1,1	laefis	Roset	acutus	Obovate	Penninervis
78	Liliana blava	acuminatus	(integer)	5009	1117	4,3	2	laefis	Roset	acutus	Obovate	Penninervis
79	Liliana green	obtutus	(integer)	8169	1119	3,2	1,3	laefis	Roset	acutus	Obovate	Penninervis
80	Sp rujak	obtutus	(integer)	5906	1119	2	1	laefis	Roset	acutus	Obovate	Penninervis
81	Browni selena	obtutus	(integer)	8179	4716	3	1,5	laefis	Roset	obtutus	Obovate	Penninervis

No	COMMERCIAL NAME	APEX FOLII	MARGO FOLII	COLOR LEAF		LEAF SIZE		LEAF SURFACE	LEAF HOLDER	SHORT LEAF	LEAF SHAPE	MIDRIB
				OLD	YOUNG	LONG	WIDE					
82	Neo alamanda	acuminatus	(repandus)	8159	1109	3	1	laefis	Roset	acutus	Oblong	Penninervis
83	Black marbel	acuminatus	(integer)	8169	1117	2,6	1,1	laefis	Roset	acutus	Obovate	Penninervis
84	Melawi green	acuminatus	(repandus)	4618	5008	3,5	1,2	laefis	Roset	acutus	Oblong	Penninervis
85	Red cherry bens	acuminatus	(repandus)	4619	1409	3,5	1,5	laefis	Roset	acutus	Obovate	Penninervis
86	Super blue	acuminatus	(repandus)	4609	4718	4	1,8	laefis	Roset	acutus	Lanceolate	Penninervis
87	Black rose	acutus	(repandus)	8159	1117	2,7	1,2	laefis	Roset	acutus	Lanceolate	Penninervis
88	Blue & green	acuminatus	(repandus)	4719	1118	2,1	1	laefis	Roset	acutus	Obovate	Penninervis
89	Kapuas hulu	obtutus	(repandus)	8179	4707	3	1	laefis	Roset	acutus	Lanceolate	Penninervis
90	Nekan	acuminatus	(repandus)	4509	5107	3,3	1	laefis	Roset	acutus	Oblong	Penninervis
91	Blue bell	acuminatus	(repandus)	4707	4927	2,4	1,1	laefis	Roset	obtutus	Oblong	Penninervis
92	Batang lamande	acuminatus	(integer)	4409	1114	1,8	1	laefis	Roset	acutus	Lanceolate	Penninervis
93	Enty red	acuminatus	(repandus)	8159	1116	2,2	0,8	laefis	Roset	acutus	Oblong	Penninervis
94	Ara	acuminatus	(repandus)	8159	1116	2,6	1	laefis	Roset	acutus	Obovate	Penninervis
95	Thea 10	acuminatus	(repandus)	5809	4706	3,5	1,3	laefis	Roset	acutus	Obovate	Penninervis
96	Brown helena	acuminatus	(repandus)	8159	4706	3,5	1,2	laefis	Roset	acutus	Lanceolate	Penninervis
97	Black gaya	obtutus	(repandus)	8159	4718	5,7	1,5	laefis	Roset	acutus	Lanceolate	Penninervis
98	centipent red blue	acuminatus	(repandus)	8179	1409	4	1,5	laefis	Roset	acutus	Oblong	Penninervis
99	Montelena blue emerald	acuminatus	(repandus)	8179	4715	4	1,3	laefis	Roset	acutus	Lanceolate	Penninervis
100	Kedagang mini	acuminatus	(repandus)	4509	4507	2	0,8	laefis	Roset	acutus	Oblong	Penninervis
101	Ceinza 32 B	acutus	(repandus)	8159	8156	3	1	laefis	Roset	acutus	Lanceolate	Penninervis
110	Little red star	acutus	(repandus)	8158	4706	2	0,6	laefis	Roset	acutus	Oblong	Penninervis
103	Titan 2	obtutus	(repandus)	4619	4929	2,2	1	laefis	Roset	acutus	Oblong	Penninervis
104	No name (A)	Acumitus	integer	4619	8159	6	2,5	5leafis	Roset	Acutus	Oblong	Penninervis
105	No name (B)	Acumitus	integer	5906	1119	4,9	2	leafis	Roset	Acutus	Oblong	Penninervis
106	No name (C)	Acumitus	Repandus	4609	1114	2	0,8	leafis	Roset	Acutus	Oblong	Penninervis
107	No name (D)	Acutus	Repandus	4219	4604	5,8	1,4	leafis	Roset	Acutus	Oblong	Penninervis
108	No name (E)	Acuminatus	Repandus	8159	1119	3,3	1	Leafis	Roset	Obtutus	Obovate	Penninervis
109	No name (F)	Acutus	Repandus	8159	4706	3,5	1,5	Leafis	Roset	Acutus	Oblong	Penninervis
110	No name (G)	Acumitus	Integer	4509	1118	2,9	1	Leafis	Roset	Acutus	Oblong	Penninervis

Note: • Morphological characters were based on description in Tjitrosoepomo (2013).
 • Color identification for leaf is guided with the Modified Toka Color Finder Edition 1999.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this study.

REFERENCES

Bogner, J., and A. Hay. 2000. Schismatoglottideae (Araceae) in Malesia II - Aridarum, Bucephalandra, Phymatarum and Piptospatha. *Telopea*. 9 (1): 179-222.

Boyce, P. 1995. 272. *Bucephalandra motleyana*. Curtis's Botanical Magazine, 12(3): 131-134. Retrieved March 25, 2020, from www.jstor.org/stable/45065107

Boyce, P., J. Bogner., and S. Mayo. 1995. *Bucephalandra catherineae* a new species from Kalimantan. *Curtis's Botanical Magazine*. 12(3): 150-153.

Boyce, P., and W.S. Yeng. 2012. Studies on Schismatoglottideae (Araceae) of Borneo XX: Beccari's «La Più piccola delle Aracee» (*Microcasia pygmaea*) recollected and transferred to *Bucephalandra* Schott. *Webbia* 67(2): 139 -146. doi: 10.1080/00837792.2012.10670913

[https:// gbif.org/species/2869473](https://gbif.org/species/2869473). Acces 20-02-2020

Klein, J., R. Ettenson., and M.D. Morris. 1998. The Animosity Model of Foreign Product Purchase: An Empirical Test in the People's Republic of China. *Journal of Marketing*, 62(1): 89-100. doi:10.2307/1251805

Mitchell, V.W. 1992. Understanding Consumers' Behaviour: Can Perceived Risk Theory Help? *Management Decision* 30 (3): 26-36. <https://doi.org/10.1108/00251749210013050>

PT. CEMANI TOKA. TC COLOR FILE edition 1999. Jl. Landbaw Km 2.5 desa Sanja Citeureup Bogor 16810 Indonesia.

Tjitrosoepomo, B. 2013. *Morfologi Tumbuhan*. Gadjah Mada University Press. Yogyakarta. 268pp.

Yeng, W. S., and P. Boyce. 2014. Studies on Schismatoglottideae (Araceae) of Borneo XXX - New species and combinations for

Bucephalandra. *Willdenowia* 44 (2): 149–199. doi:10.3372/wi.44.44201. ISSN 0511-9618

Yeng W. S., and P. Boyce. 2014. Studies on Schismatoglottideae (Araceae) of Borneo XXXI: Additional new species of *Bucephalandra*. *Willdenowia* 44 (3): 415-421. doi:10.3372/wi.44.44312 ISSN 0511-9618

Yin J, Y. Gao., and H. Xu. 2014. Survey and analysis of consumers' behaviour of waste mobile phone recycling in China. *Journal of Cleaner Production* 65(15): 517-525. <https://doi.org/10.1016/j.jclepro.2013.10.006>

Appendix 1. Figure of variation morphology of *Bucephalandra motleyana* (Schott, 1858) in the ornamental aquatic plant market.

