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Studies on Schismatoglottideae (Araceae) of Borneo LXVIII: *Bucephalandra adei*, a new species from Kalimantan, Indonesian Borneo

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Abstract. *Bucephalandra adei* S.Y.Wong, P.C.Boyce & A.Y.M.Hii, is described as new additional the six already known species in which the spadix appendix exceeds the length of the fertile portion of the spadix. All are endemic to Borneo. An key to identification for the seven species and a distribution map is provided. Recognition of *B. adei* takes *Bucephalandra* to 32 described species.

Keywords: *Bucephalandra*, Kalimantan, Borneo, geology.

INTRODUCTION

Since being monographed by Bogner and Hay (2000) the genus *Bucephalandra* Schott has expanded from two to 31 accepted species. Twenty of these occur exclusively in Kalimantan, while eight are restricted to Sarawak, one occurs in both Sarawak and Brunei, and two are endemic to Sabah (Boyce et al. 1995; Boyce and Wong 2012, 2014; Okada and Mori 2000, Wong and Boyce 2014, 2016; Wong et al. 2018).

Most species of *Bucephalandra* have geographically restricted ranges, occasionally acutely so, and almost all are obligated to a particular geology such that that the actual total of *Bucephalandra* species is very likely significantly more than the current number of described species. We have incomplete sets of data for more than twenty taxa still impossible to place to species from which, as more data becomes available, we are describing novelties (Wong and Boyce 2016; Wong et al. 2018). Here we continue this process with the description of a highly distinctive species from Kalimantan Barat belonging to an un-named informal group of species wherein the spadix appendix is longer than the fertile portion of the spadix. Geology in this paper is specified based on Hutchison (1989, 2005) and Tate (2001).

Bucephalandra adei S.Y.Wong, A.Y.M.Hii & P.C.Boyce, sp. nov.

Type: Indonesia, Kalimantan Barat, Ngabang, Landak, Riam Desa Sungai Durian, 0°31'41"N 109°47'39"E, 45 m asl, 27 July 2017, *Ade Agus Setiawan* AR-2766 (holotype SAR + spirit; isotype BO + spirit). (Figures 1 and 7A).

Diagnosis

The papillate staminodes of *Bucephalandra adei* distinguish it from all other *Bucephalandra* species in which the length of the spadix appendix exceeds that of fertile portion of the spadix

Description

Small to moderate obligate rheophytic herbs averaging 10 cm tall but ranging from 5 to 15 cm tall. Stem initially sub-erect, later much-elongating and becoming decumbent and rooting from behind active tip, with active portion sub-erect, oldest stems up to 6 cm long × 1 cm in diam., light green. Leaves c. 7 together; petiole 3–6 cm long × c. 1–2 mm in diam., adaxially canaliculate, brownish red, sheathing at leaf base, wings extended into a very narrowly triangular ligular portion to 3–5 cm long; blade elliptic 7–10–(13.5) cm long × 2.2–3.7 cm wide, slightly coriaceous, glossy medium green with major veins darker adaxially, pale and reddish abaxially, base cuneate, apex rounded and apiculate for c. 2–3 mm, margin smooth; midrib abaxially and adaxially prominent, strongly reddish abaxially; primary lateral veins 3–6 on each side, diverging at 20° and running to a marginal vein; interprimary veins finer; secondary venation adaxially ± obscure, abaxially faint; tertiary vein adaxially obscure, forming a faint tessellate reticulum. Bloom solitary; peduncle exceeding petioles, 5.5–8.5 cm long × 1.6–2 cm diam., conspicuously longitudinally ribbed, reddish green. Spathe oblong-ovate, not constricted, 5.5 cm long; lower spathe funnel-form, 0.5 cm tall, lime-green, persistent; limb inflating and gaping distally to form a narrow opening at pistillate anthesis, caducous during staminate anthesis, glistening white tinged with pink, apiculate for c. 3 mm, apiculum green. Spadix 2.3–3 cm long; pistillate zone c. 2.6–5 mm long × c. 2.6–2.8 mm in diam., with c. 3 or 4 spirals of pistils; pistils polygonal-globose, c. 0.8 mm long × 0.9 mm in diam., lime-green; stigma sessile, umbonate, c. ½ diameter of ovary, impressed with edges of pistil forming a raised rim, papillate and with a conspicuous stigmatic droplet at anthesis; pistillodes very small, in a single incomplete row at base of pistillate zone, 'u'-shaped, in all c. 0.2 mm in diam.; interstice with two rows of scale-like staminodes, these 2.5–

3.3 mm long × c. 2 mm wide, staminodes initially erect (pistillate anthesis), later reflexing to seal off persistent lower spathe, green; staminate zone 5–5.2 mm long × 4–4.7 mm in diam., consisting of four or five rows of florets; staminate florets upward-directed during pistillate anthesis, reflexing to almost perpendicular with spadix axis during staminate anthesis, creamy white, rather distant; stamen c. 1–1.5 mm across; filament short, stout; connective arching, strap-like, pink; thecae inserted ventrally on connective, paler cream, ellipsoid, c. 1 mm long × c. 0.4 mm wide, smooth; thecae horns c. 1/5 length of associated theca, pointing horizontally, stiffly setaceous. Appendix blunt cylindrical, 13–18 mm long × 5–6.3 mm in diam., bright yellow; appendix staminodes mostly obpyramidal with the top surfaces papillate, those of basal 1/3 of spadix larger, 2–3 mm in diam., the rest 1–2 mm in diam., densely arranged. Fruiting spathe broadly funnel-form, c. 1 cm in diam., medium green. Fruit and seed not seen.

Eponymy

The species is named for the collector of the type material, Mr Ade Agus Setiawan.

Distribution

Known only from the type locality where it is locally abundant.

Ecology

Riverside Cretaceous hard sandstone rocks and boulders under open perhumid lowland forest between 45 and 90 m asl.

Notes

Six other *Bucephalandra* possess a sterile appendix longer than the fertile portion of the spadix (see key below): *Bucephalandra aurantiitheca* S.Y.Wong & P.C.Boyce (Fig. 7B), *B. chimaera* S.Y.Wong & P.C.Boyce (Fig. 7C), *B. elliptica* (Eng.) S.Y.Wong & P.C.Boyce (7D), *B. minotaur* S.Y.Wong & P.C.Boyce (Fig. 7E), *B. oncophora* S.Y.Wong & P.C.Boyce (Fig. 7F) and *B. vespula* S.Y.Wong & P.C.Boyce (Fig. &G). From all these *B. adei* differs by the papillate, not smooth appendix staminodes. *Bucephalandra adei* and *B. elliptica* occur on sandstone boulders, *B. aurantiitheca*, *B. chimaera*, *B. minotaur* and *B. vespula* on granites, and *B. oncophora* is restricted to nickel-bearing Pentlandite (Map 1).

1. Appendix staminode tops papillate ***Bucephalandra adei***
- Appendix staminode tops glabrous..... 2

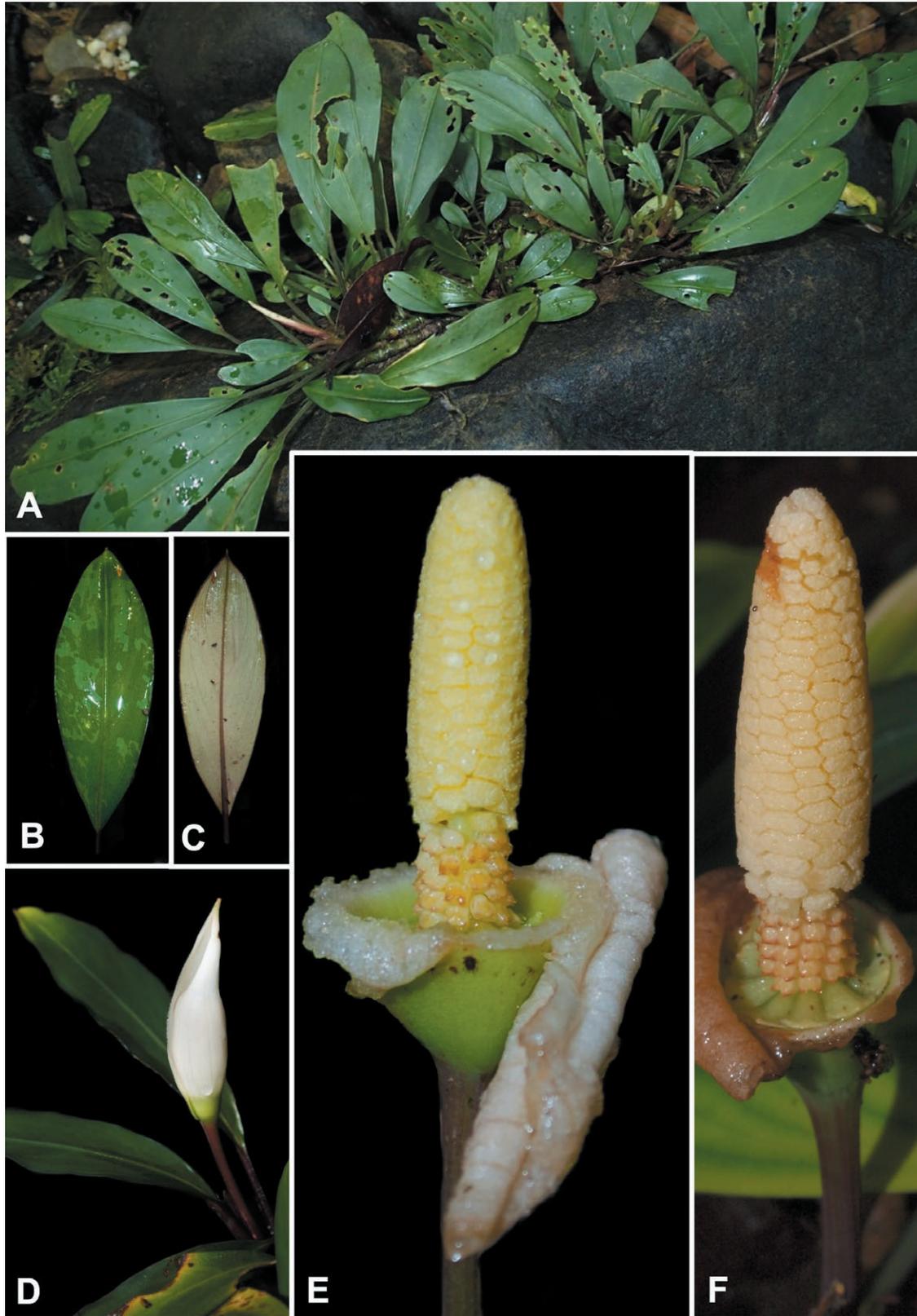


Figure 1. *Bucephalandra adei* (A) Plants in habitat. (B & C) Leaf blade adaxial and abaxial views. (D) Bloom at pistillate anthesis. (E) Bloom post staminate anthesis with spathe limb largely shed and interstice staminodes reflexed to seal off the lower spathe. (F) Bloom post staminate anthesis with spathe limb largely shed and interstice staminodes reflexed to seal off the lower spathe. All from AR-4782.

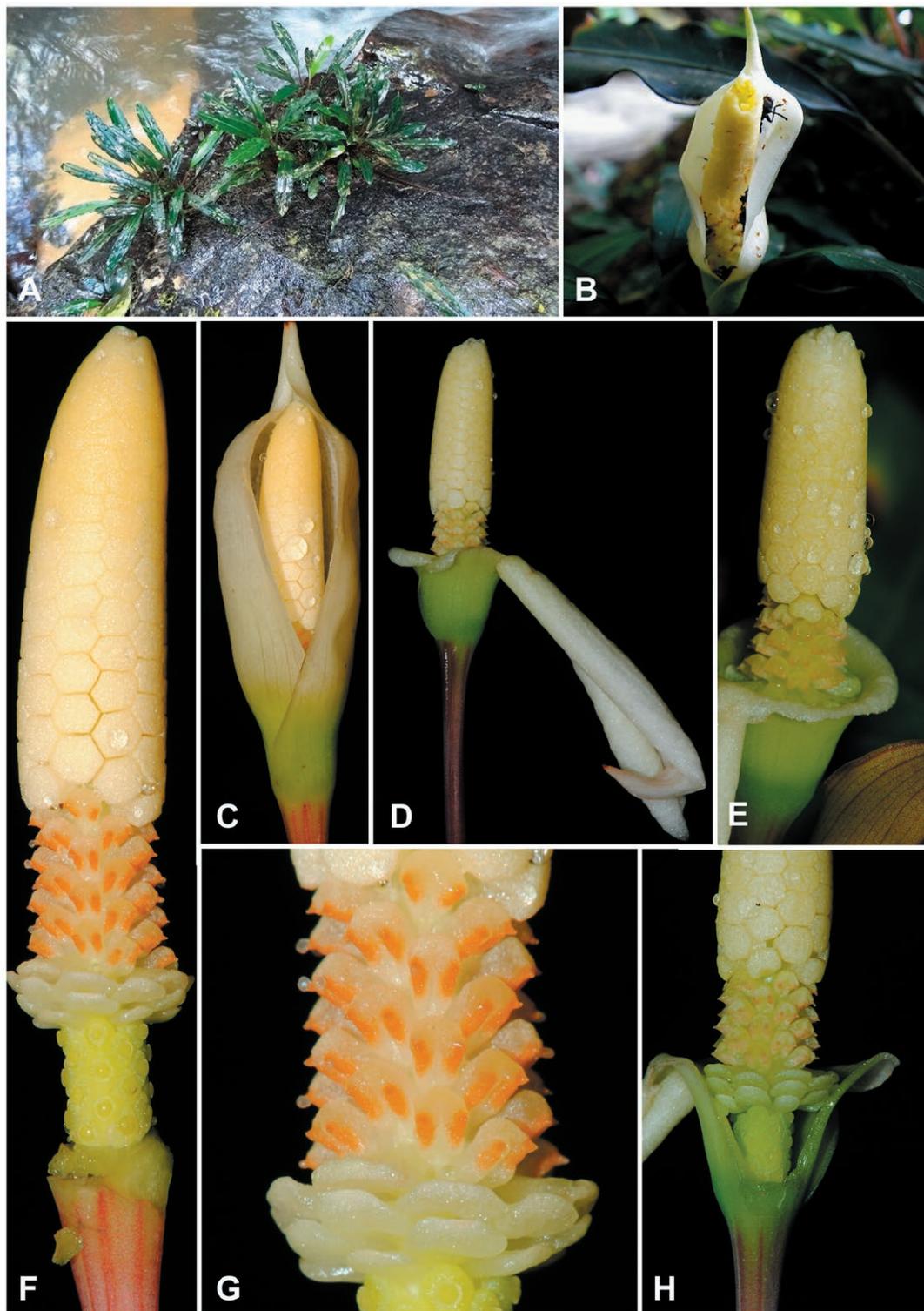


Figure 2. *Bucephalandra aurantiitheca* (A) Plants in habitat. (B) Bloom in habitat; note the presence of several chrysomelid beetles, the suspected pollinator. (C). Bloom at early pistillate anthesis. (D) Bloom at staminate anthesis; the spathe limb is about to fall. (E) Bloom at staminate anthesis, the reflexed interstice staminodes are just visible blocking the entrance of the persistent lower spathe. (F) Bloom at staminate anthesis; spathe artificially removed. (G) Detail of staminate floret zone at staminate anthesis; note the pollen droplet at the tips of the thecae horns. (H). Spadix at staminate anthesis, spathe limb fallen naturally, nearside of lower spathe artificially removed; note that the interstice staminodes have reflexed to seal the lower spathe entrance. All from AR-3937; A & B by K. Nakamoto; C–H by P.C. Boyce.

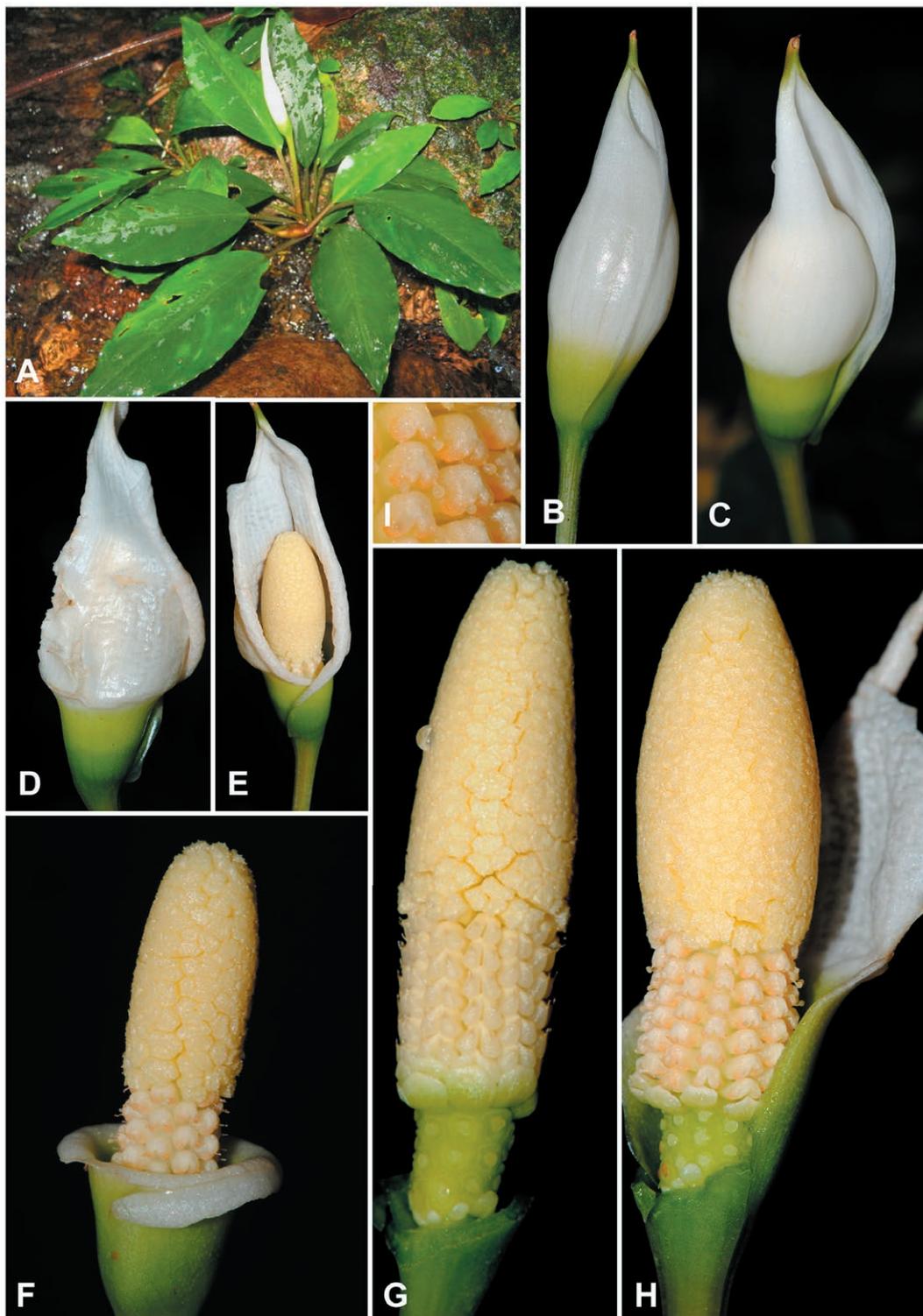


Figure 3. *Bucephalandra elliptica* (A) Plants in habitat. (B & C) Bloom at early (B) and mid (C) pistillate anthesis; note the changes in spathe limb shape; (D & E) Bloom at staminate anthesis, with the spathe limb beginning to deliquesce (F) bloom at peak of staminate anthesis; note that the spathe limb is mostly now separated from the lower, persistent part. (G) Spadix at pistillate anthesis, spathe limb; note that the interstice staminodes are still erect and that the staminate floret thecae have yet to reflex. (H) Spadix at onset of staminate anthesis, spathe partially artificially removed; note that the interstice staminodes have lowered and that the thecae of the staminate flowers have reflexed. All from AR-3564.

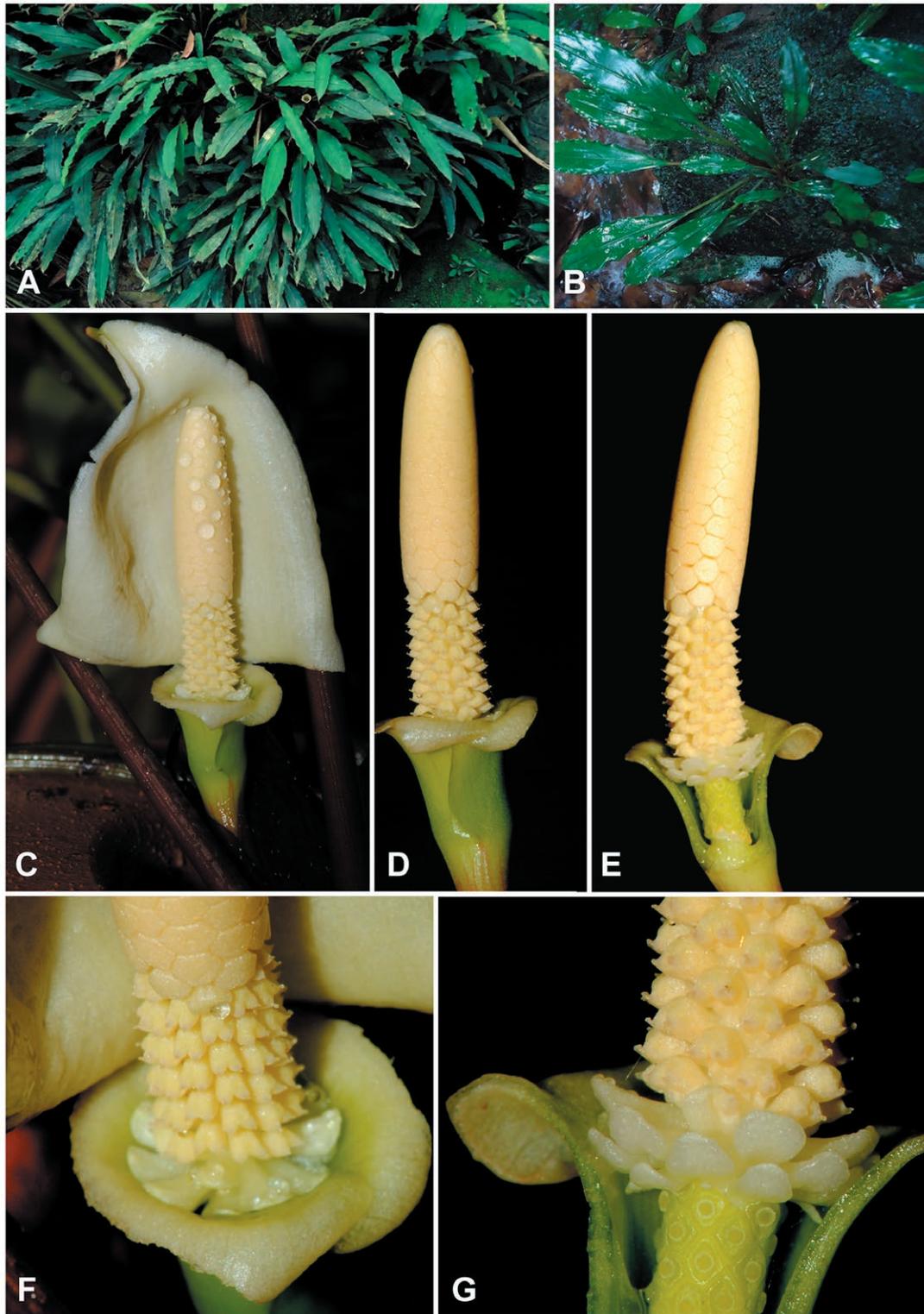


Figure 4. *Bucephalandra minotaur* (A & B) Plants in habitat. (C) Bloom at staminate anthesis, with the spathe limb nearly shed. (D) Bloom at staminate anthesis, spathe limb shed. (E) Bloom at staminate anthesis; spathe limb fallen naturally, nearside part of lower spathe removed artificially; note that the interstice staminodes have reflexed to close the entrance of the lower spathe. (F) Detail of the interstice staminodes sealing the lower spathe. (G) Detail of lower spathe and fertile portions of staminate phase spadix, nearside part of spathe artificially removed. All from AR-3951.

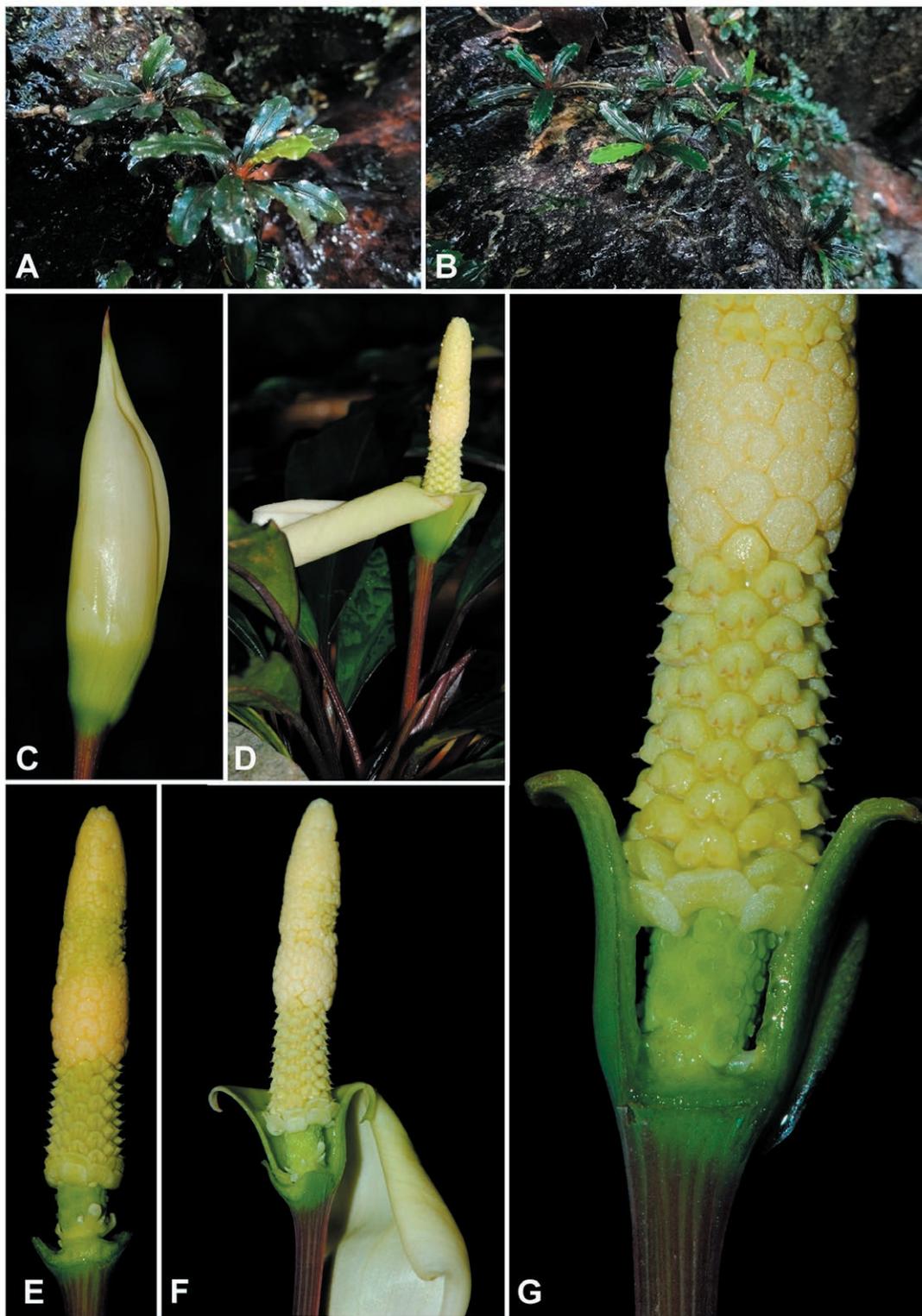


Figure 5. *Bucephalandra oncophora* (A & B) Plants in habitat. (C) Bloom at pistillate anthesis. (D) Bloom at staminate anthesis, spathe limb shedding. (E) Spadix at pistillate anthesis, spathe artificially removed; note different form of the distal and proximal appendix staminodes. (F) Spadix at staminate anthesis, spathe limb fallen naturally, nearside of lower spathe artificially removed; note interstice staminodes are beginning to reflex; compare the posture of the thecae horns with those in E. (G) Detail of staminate flowers and reflexed interstice staminodes, nearside lower spathe artificially removed. All from AR-3932.

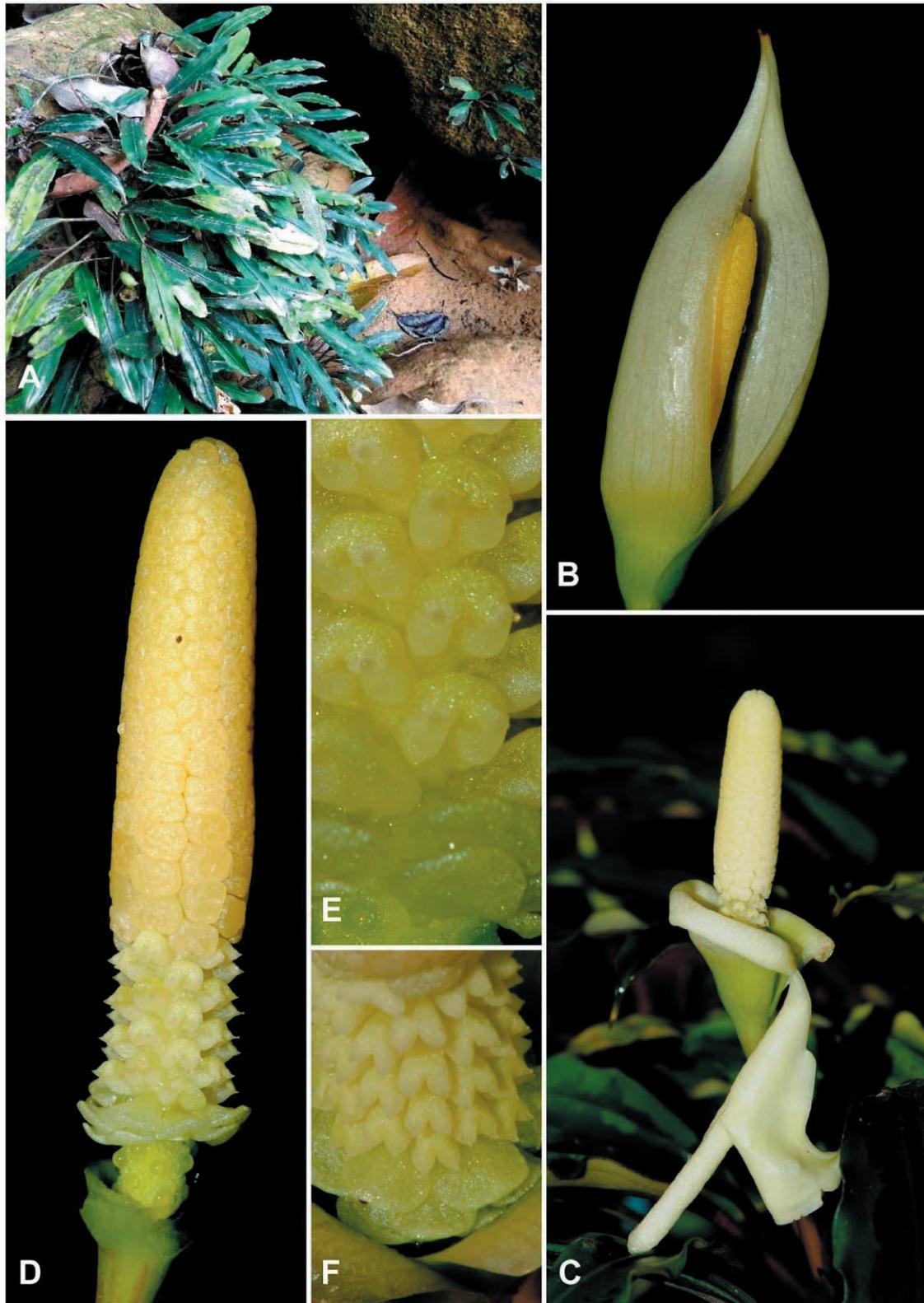


Figure 6. *Bucephalandra vespula* (A) Plants in habitat. (B) Bloom at pistillate anthesis. (C) Bloom at staminate anthesis, the spathe limb beginning to shed. (D) Spadix at staminate anthesis, spathe artificially removed; note the reflexed interstice staminodes and staminate flower thecae. (E & F) Detail of the staminate florets at staminate (E) and pistillate (F) anthesis. All from AR-3664.

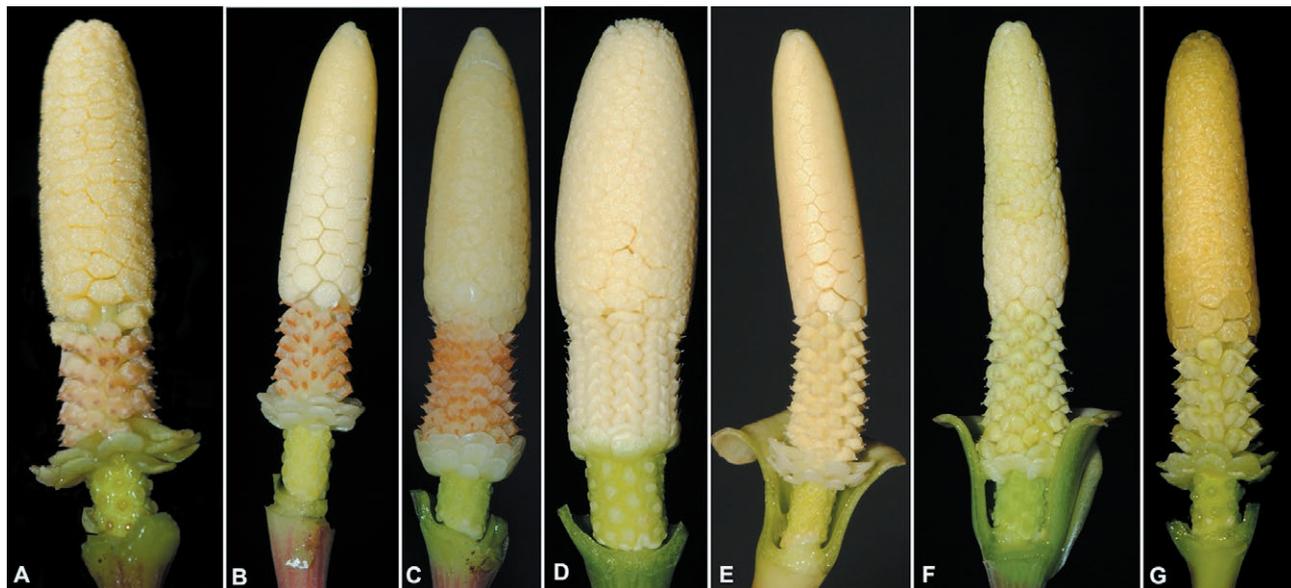


Figure 7. Spadix comparisons (spathe artificially removed). (A) *Bucephalandra adei* [AR-2766]. (B) *Bucephalandra aurantiitheca* [AR-3937]. (C) *Bucephalandra chimaera* [AR-3846]. (D) *Bucephalandra elliptica* [AR-3564]. (E) *Bucephalandra minotaur* [AR-3951]. (F) *Bucephalandra oncophora* [AR-3932]. (G) *Bucephalandra vespula* [AR-3664].

- 2. Appendix staminode tops corrugated. Sarawak: Sri Aman, sandstones *Bucephalandra elliptica*
- Appendix staminode tops smooth 3
- 3. Staminate florets arching upward from spadix with thecae horns very short and downwards directed; thecae dark orange, embedded in connective and presented on exposed ventral surface of stamen at staminate anthesis. Kalimantan Barat: Sekadau and Nanga Taman, granite *Bucephalandra aurantiitheca*
- Staminate florets with filament and connective perpendicular to spadix with thecae horns upwards directed; thecae not embedded in connective and presented on dorsal surface of stamen at staminate anthesis..... 4
- 4. Appendix fusiform, base tapering; staminate florets orange. Kalimantan Barat: Nanga Taman, granite *Bucephalandra chimaera*
- Appendix cylindrical, base not tapering; staminate florets cream 5
- 5. Stamminodes of lower appendix morphologically identical to those of upper appendix. Kalimantan Barat: Sekadau/Melawi Regencies boundary, granite ... *Bucephalandra minotaur*
- Stamminodes of lower appendix irregularly rounded, markedly larger than upper appendix staminodes..... 6
- 6. Stigmas sessile; lower appendix staminodes regularly rounded, not conspicuously wider than rest of appendix, each staminode with a conspicuous shallow suture. Kalimantan Barat: Kayu Lapis, sandstone *Bucephalandra vespula*

- Stigmas stipitate; lower appendix staminodes irregularly rounded, conspicuously wider than rest of appendix, each staminode without a suture. Kalimantan Barat: Nanga Taman, Pentlandite *Bucephalandra oncophora*

Additional specimen examined (paratype)

INDONESIA: Kalimantan Barat, Ngabang, Landak, Riam Desa, Sungai Durian, 0°31'41"N, 109°47'39"E, 45 m elev., 11 June 2014, *Hiroyuki Kishi* AR-4782 (SAR).

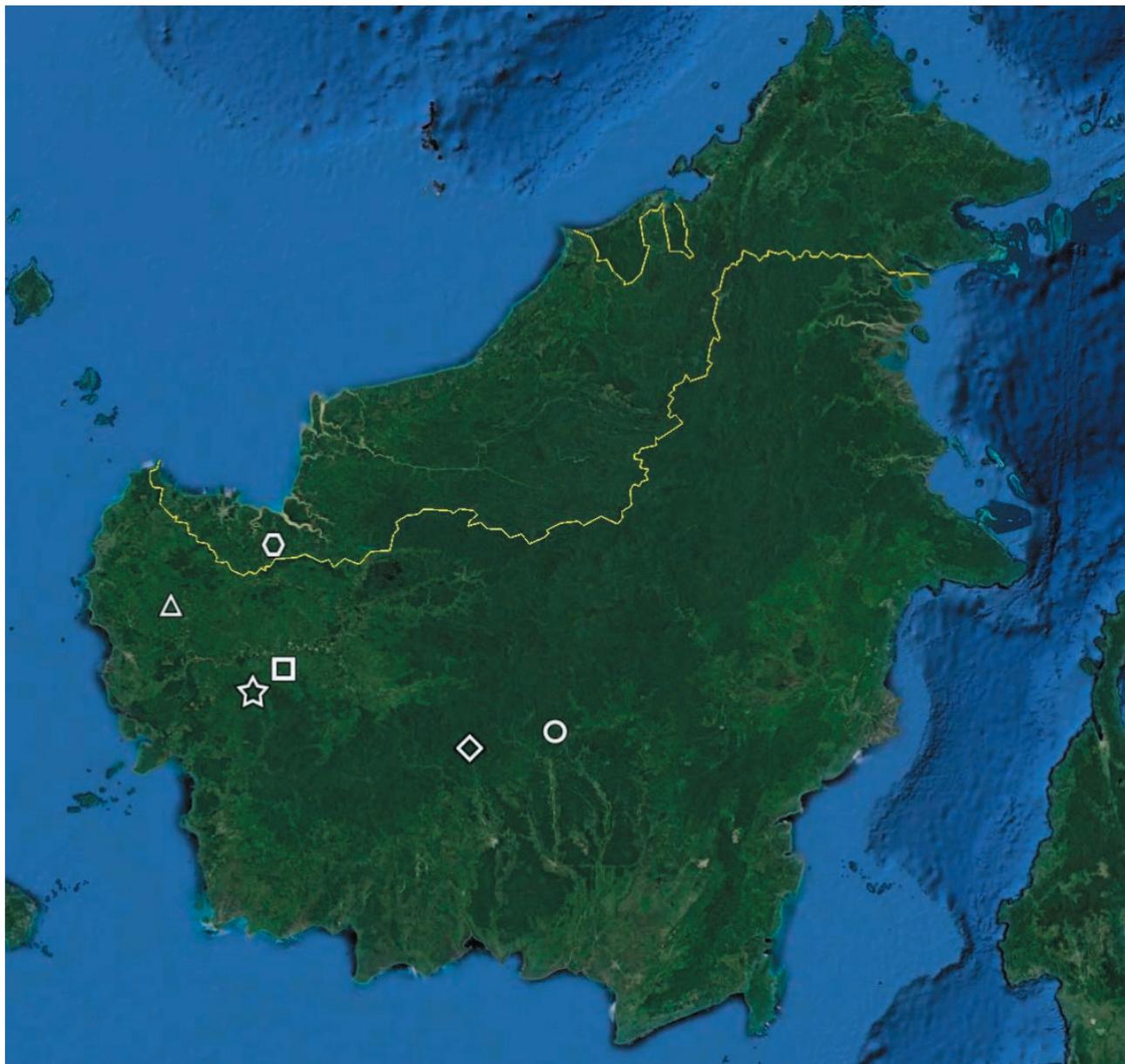
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Map 1. \triangle = *Bucephalandra adei*; \hexagon = *Bucephalandra elliptica*; \star = *Bucephalandra oncophora*; \square = *Bucephalandra aurantiitheca* and *B. chimaera*; \diamond = *Bucephalandra minotaur*; \circ = *Bucephalandra vespula*.

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