

The Araceae of Malesia III: *Bakoa* P.C.Boyce & S.Y.Wong

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A review of the genus *Bakoa* P.C.Boyce & S.Y.Wong is presented. Three species are recognized, of which one (*B. nakamotoi* S.Y.Wong) is described as new to science. A key to species is provided and all species are illustrated.

Keywords. Araceae, Hestia, *Bakoa*, Schismatoglottideae, Malesia, Borneo

INTRODUCTION

Bakoa is a Bornean endemic genus of three species of obligate rheophytes of lowland perhumid tropical broadleaf forest, either occurring on bare rock along forest streams and waterfalls, or deeply rooted into river sandbanks

Two species of *Bakoa* [*B. lucens* (Bogner) P.C.Boyce & S.Y.Wong and *B. brevipedunculata* (H. Okada & Y. Mori) S.Y.Wong,] have a chequered taxonomic and

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nomenclatural history. Both were first published in *Hottarum* (Bogner, 1983; Okada & Mori, 2000), and next moved to *Piptospatha* (Bogner & Hay, 2000), before a combination of molecular and morphological analyses revealed that together they fell outside either genus and must be accommodated in a new genus (Boyce & Wong, 2008; Wong, 2009; Wong et al., 2010).

Bakoa is defined by the combination of ligular petiolar sheathes, the spadix partially (pistillate zone only) to almost entirely dorsally adnate to the spathe limb, staminate flowers mostly sterile with only a narrow zone of fertile flowers exposed by the spathe opening, thecae lacking a horn- or needle-like structure, basal placentation, and seeds with a blunt micropyle.

BAKOA

Bakoa P.C.Boyce & S.Y.Wong, Bot. Stud. (Taipei) 49(4): 398 (2008); Wong, Acta Phytotax. Geobot. 61 (3): 127–129 (2011).

Type: *Bakoa lucens* (Bogner) P.C. Boyce & S. Y. Wong

Small rheophytic herbs. Stem condensed. Leaves several to many together; petiole sheathing only at the extreme base, thence extended into a very narrowly triangular soon-marcescent ligular portion; blade very narrowly elongate-elliptic, rather coriaceous, shiny deep green, arching (*B. lucens* & *B. nakamotoi*) or stiffly erect (*B. brevipedunculata*), with a conspicuous terminal tubule; midrib abaxially prominent with 4–6 very fine but generally well-differentiated (darker than surrounding tissue) primary lateral veins on each side, these hardly differentiated in thickness from the secondary venation and diverging at ca. 30°; secondary veins adaxially usually more or less obscure, running to a somewhat thicker marginal vein, abaxially fine and very faint; tertiary venation forming an inconspicuous tessellate reticulum. Inflorescence solitary to three or occasionally more together on a single shoot; peduncle short and erect or elongated and arching at anthesis, subtended by one or more dark brown cataphylls, spathe slightly down-turned and the spathe opening ventral, where known declinate post anthesis and during fruiting. Spathe weakly nodding or erect; more or less oblanceolate, hardly constricted, with a long apiculate tip. Spadix adnate to the spathe in the lower 1/2–4/5 or more; pistillate zone completely adnate to the spathe on the dorsal side; ovary depressed globose and weakly angular, placentation basal, ovules orthotropous, long-beaked; stigma sessile, narrower than, or overtopping the ovary, button-like, papillate; interpistillar staminodes absent from the pistillate zone; sterile interstice somewhat thicker than the female zone, dorsally adnate to the spathe, composed of large truncate mostly irregularly polygonal staminodes; staminate zone subcylindric-ellipsoid, apically narrowly acute and sometimes sterile, basally free or adnate to the spathe on the dorsal side; stamens crowded, truncate, dumb-bell-shaped to irregularly rectangular from above, often with the connective irregularly broadened on one side; thecae each opening through a conspicuous, broad-rimmed pore. Fruiting spathe either with the upper 1/3 shedding post anthesis or fully persistent, and then at fruit maturity very swiftly drying and thence by reflexing of the spadix the spathe recurving and opening basally and also tearing at the peduncle insertion to expose the fruits, at the same time spathe limb remaining distally convolute and still clasping the spadix appendix remains; fruiting peduncle initially declinate, later twisting through 180° and becoming arching-erect; berry depressed-globular; seed ellipsoid, micropyle blunt, testa slightly ribbed.

KEY TO BAKOA

1a. Spathe fully persistent until fruit dispersal; dorsal side of spadix adnate to the spathe for least half the length of the staminate flower zone; only ventral stamens (i.e., those exposed by gaping spathe limb) fertile; stigma button-like, ca. 1/3 diam. of gynoecium; peduncle long-slender, arching

2a. Spadix adnate to spathe for more than 4/5 of its length; thecae pores conspicuously annulate; lower part of spathe not noticeably constricted, pure white; leaf blade adaxially with a conspicuous marginal vein. Kalimantan Barat (Sanggau).....**B. nakamotoi**

2b. Spadix adnate to spathe for ca 2/3 of its length; thecae pores flush with anther; lower part of spathe noticeably constricted, white with conspicuous green veins; leaf blade adaxially without a conspicuous marginal vein. Bako N.P. (NW Sarawak).....**B. lucens**

1b. Upper 1/3 of spathe shedding (deliquescing) post-anthesis; spadix adnate to the spathe on the dorsal side onto[onto what?] until the top of the pistillate flower zone; staminate flower zone fully fertile; stigma disc-like, reaching the edge or even slightly overhanging the edge of the gynoecium; peduncle short, stout, erect *B. brevipedunculata*

Bakoa brevipedunculata (H. Okada & Y. Mori) S.Y.Wong, Acta Phytotax. Geobot. 60(3): 128 (2011). **Figure 1.**

Homotypic synonyms: *Hottarum brevipedunculatum* H. Okada & Y. Mori, Acta Phytotax. Geobot. 51: 7, figs 3 & 4C (2000).

Piptospatha brevipedunculata (H. Okada & Y. Mori) Bogner & A. Hay, Telopea 9(1): 203 (2000).

Type: Indonesian Borneo, Kalimantan Barat, Putussibau, a branch of upper stream of Sg. Kapuas, Sg. Keriaw, Salim village, 13 Jan. 1992, H.Okada & D.Komara 32321 (holo TI; iso BO!). **Fig. 1.**

Distribution

A few widely scattered localities in Kalimantan Barat & Kalimantan Tengah.

Ecology

Rheophytic, deeply rooted into sandbars along and in swift-flowing rivers under evergreen perhumid lowland forest.

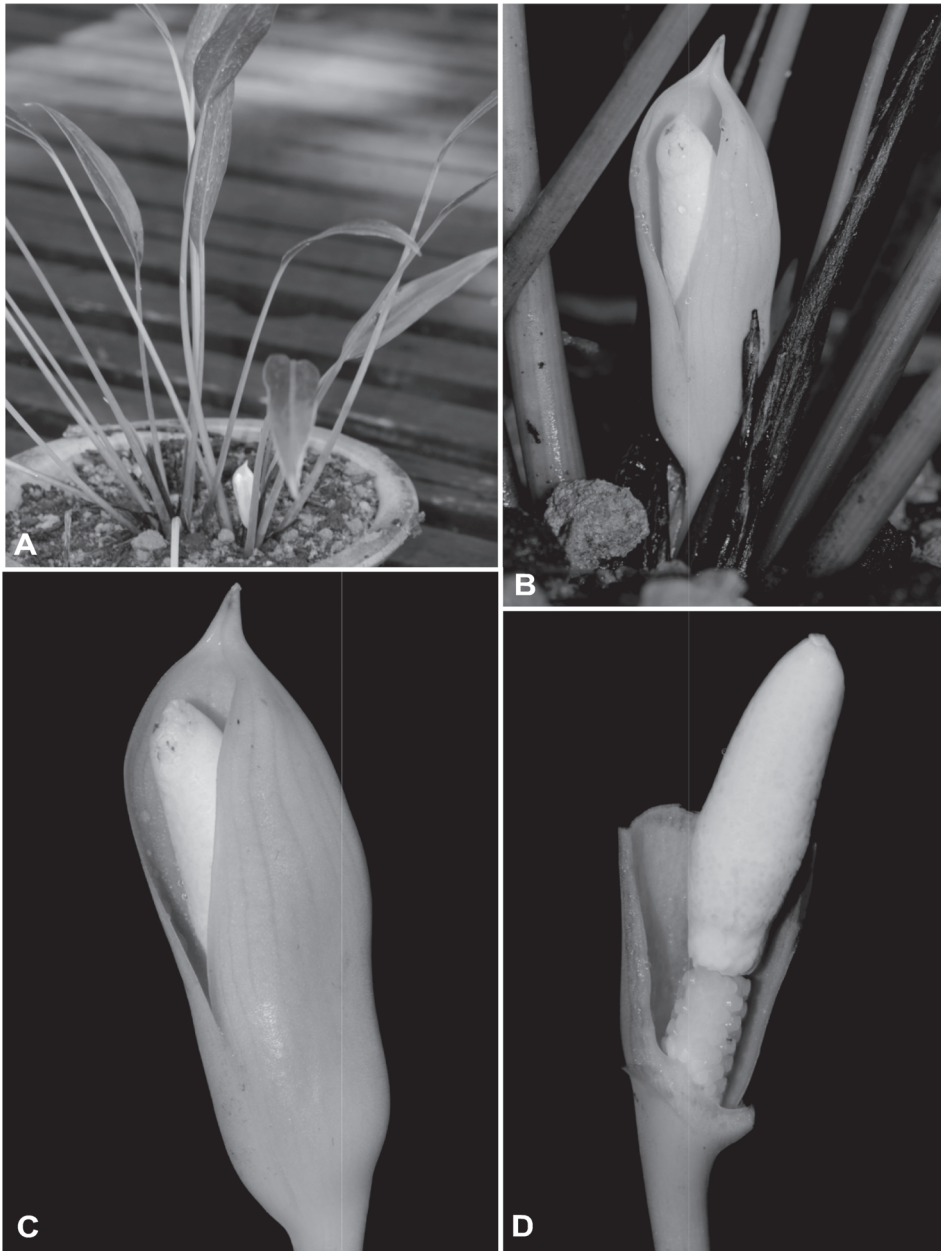


Figure 1. *Bakoa brevipedunculata* (H. Okada & Y. Mori) S.Y.Wong.

A. Flowering cultivated plant. **B.** Inflorescence at pistillate anthesis. Note the erect petioles and the deep brown, free ligules. **C.** Inflorescence at pistillate anthesis. The upper spathe opens more than in other species. **D.** Inflorescence with spathe partially artificially removed.

Note the pistillate flower zone partially adnate to the spathe.

All from K.Nakamoto AR-3562.

Etymology

Latin, brevis (short) + Neo-Latin pedunculus [equivalent to Latin ped- (a foot) + -unculus (the diminutive suffix); thus peduncle = a small foot]. The species name formed to describe the inflorescence carried on a very short peduncle, in marked contrast to the other two *Bakoa* species.

Bakoa brevipedunculata is strikingly different in both habit and ecology to the other species. In habitat the plant forms dense swards on sandbanks, with the stout roots penetrating deeply into the sand. The species also differs in having the upper spathe deliquescent post-anthesis. Although not confirmed it seems probable that the persistent lower spathe functions as a splash-cup to disperse the fruits and/or seeds. More observations are needed.

Bakoa lucens (Bogner) P.C.Boyce & S.Y.Wong, Bot. Stud. (Taipei) 49(4): 398. (2008); Boyce et al., Aroideana 33: 41, Pl.17 & 18 (2010). **Figure 2.**

Homotypic synonyms: *Hottarum lucens* Bogner, Pl. Syst. Evol. 142: 49, fig. 1-3 (1983).

Piptospatha lucens (Bogner) Bogner & A.Hay, Telopea 9(1): 217 (2000).

Type: Malaysian Borneo, Sarawak, Kuching Division, Bako National Park, Sg. Tajor, 19 Sept. 1978, J.Bogner 1439 (holo K; iso K, M, US).

Distribution

Known only from Bako National Park, NW Sarawak, where it is restricted to a single waterfall cascade.

Ecology

Obligate rheophyte on exposed, bare sandstone river rocks and waterfalls in lowland perhumid evergreen forest.

Etymology

From Latin, lucis (light) via Neo-Latin lucens (shiny) owing to the shiny upper surface of the leaf blade.

The dispersal mechanics of *Bakoa lucens* are unique for the Araceae; see Boyce & Wong (2008) for a detailed discussion.

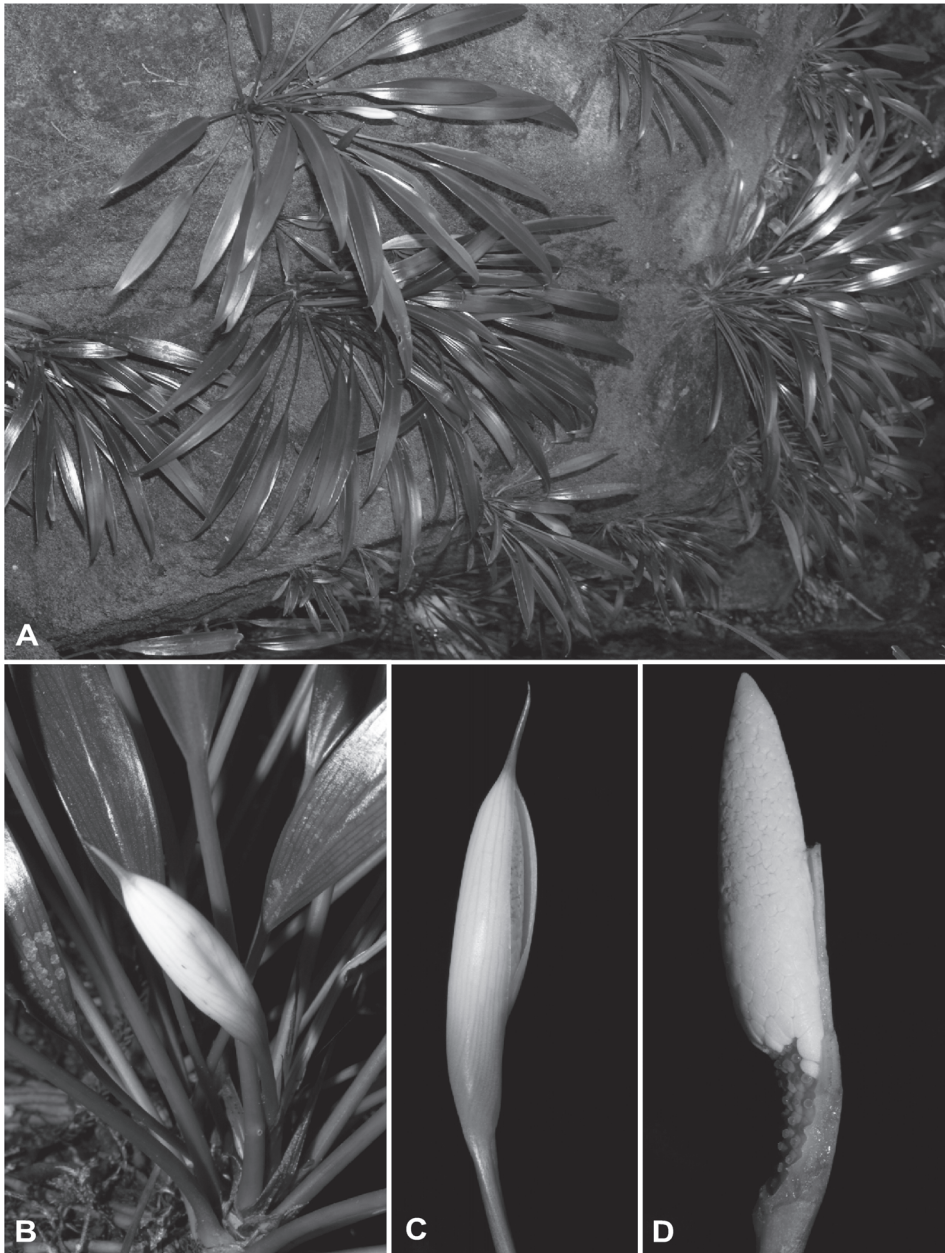


Figure 2. *Bakoa lucens* (Bogner) P.C.Boyce & S.Y.Wong.

A. Plants in habitat, Bako N.P., NW Sarawak. **B.** Plant with inflorescence at the onset of pistillate anthesis. Note that spathe opening is facing downwards.

C. Inflorescence at female anthesis. Note that the spathe barely opens.

D. Inflorescence, spathe artificially removed. Note that the greater portion of the spadix is adnate to the spathe.

B–D from P.C.Boyce & S.Y.Wong AR-2097.

Bakoa nakamotoi S.Y.Wong, sp. nov. Type: Indonesian Borneo, Kalimantan Barat, Sanggau, 1 July 1968, A.Elsener 164 (holo L; iso BO). **Figure 3.**

Bakoa nakamotoi is differentiated from the morphologically similar *B. lucens* but differentiated by the leaf blade with a prominent marginal vein, the lower part the more slender spathes not green and the spathe unconstricted, and in the much longer proportion of the spadix adnate to the spathe, and also the conspicuous annulate anther pores.

Small usually pendulous rheophytic herbs to c. 20 cm tall. Stem highly condensed, with thin stiff roots 1-1.5 mm diam. adhering very strongly to rocks. Leaves many together; petiole 2-6 cm long, ca 0.2-0.3 cm diam., rounded abaxially and flattened adaxially with weakly raised margins, sheathing only at the extreme base, the wings extended into a narrowly triangular soon marcescent ligular portion ca 4 cm long and drying dark brown; blade very narrowly elliptic, coriaceous, 9-25 cm long × 1-1.5 cm wide, very shiny dark green adaxially, abaxially much paler, the base cuneate, the apex very narrowly acute, tubular-apiculate for ca 1.5 mm; midrib adaxially prominent with 4 very fine primary but well-differentiated (darker than surrounding tissue) lateral veins on each side, these hardly differentiated in thickness from the secondary venation and diverging at c. 30° from the midrib; secondary veins adaxially more or less obscure when dry but slightly conspicuous in living material, abaxially fine and rather faint, running to a thicker marginal vein; tertiary venation forming an flush tessellate reticulum abaxially. Inflorescences several together on a single shoot; peduncle 4-11 cm long, arching, white; spathe slightly downturned, with the opening ventral. Spathe 3.5-4 cm long, very slender oblanceolate, not constricted, white; spathe limb apiculate for ca 0.3 cm, apicule green. Spadix 3-3.5 cm long, adnate to the spathe for 4/5 of its length from the base; pistillate zone completely adnate to the spathe on the dorsal side, ca 5 mm long, 3 mm diam.; pistillate flowers rather few, somewhat lax; ovary depressed-globose, ca 1.5 mm diam., medium green; stigma sessile, narrower than the ovary, ca 0.5 mm diam., button-like, papillate, green; sterile interstice robust, 4-5 mm long, thicker than the pistillate zone, ca 3 mm diam., dorsally adnate to the spathe, composed of large truncate mostly irregularly polygonal staminodes 0.8-1 mm diam. and these also distributed up the dorsal side of the staminate zone to the spadix apex; staminate zone subcylindric-ellipsoid, to ca 2.5 cm long, apically narrowly acute and sterile, adnate to the spathe on the dorsal side except for the distal-most portion, only the ventral stamens (exposed by gaping spathe limb) fertile; stamens crowded, truncate, dumbbell-shaped to irregularly rectangular from above, often with the connective irregularly broadened on one side, 0.9-1.2 mm across; thecae each opening through a conspicuous, annulate pore. Fruiting spathe not seen.

Distribution

Kalimantan Barat, so far known only from Putusibbau and Sanggau.

Ecology

Rheophyte on slightly shaded to fully exposed sandstone rocks of waterfalls, mainly along the edges of the primary cascades but in wet weather subjected to full spate (see Figure 3 A,B).

Eponymy

Named for Kazuya Nakamoto, an indefatigable explorer for, and excellent grower of, aquatic aroids.

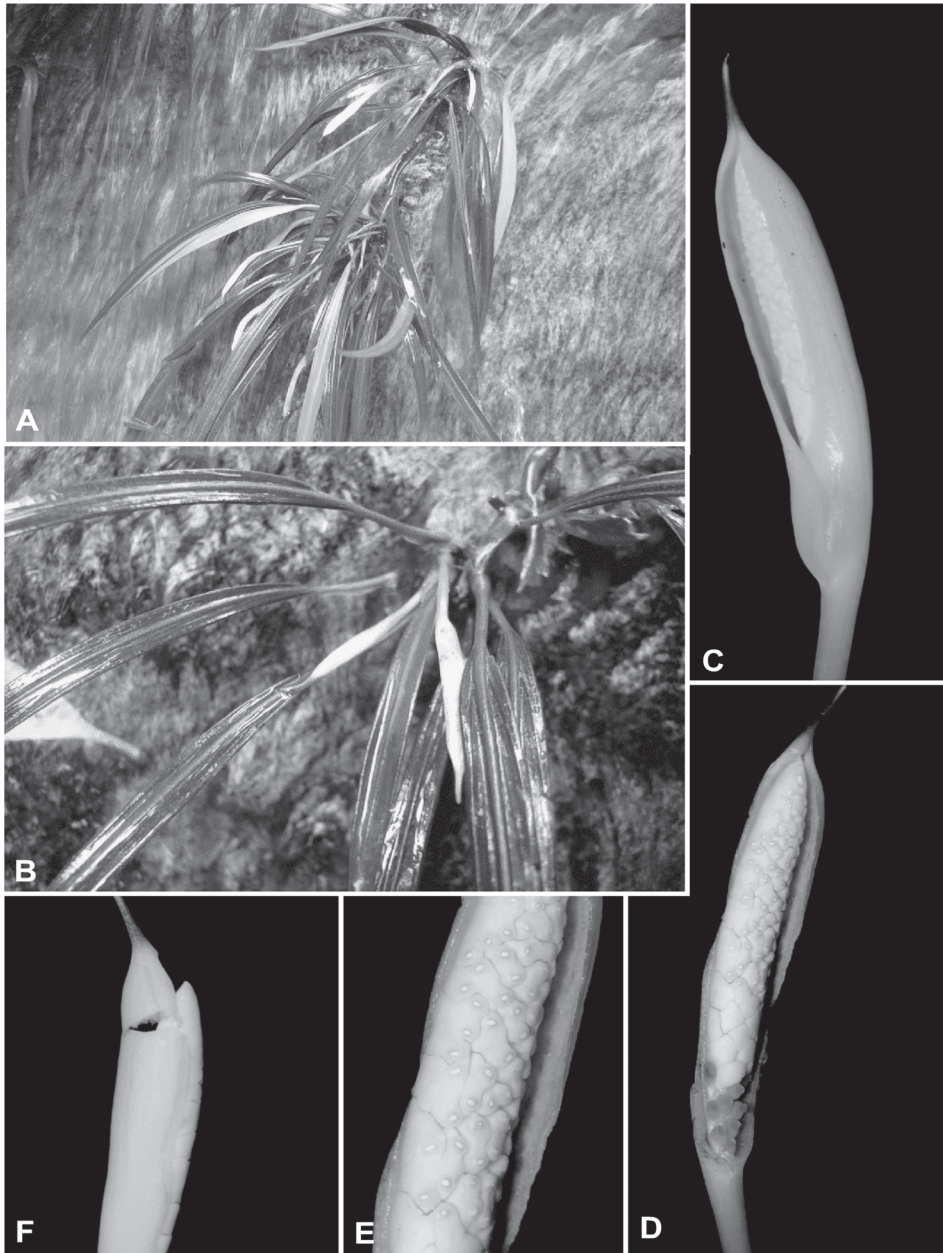


Figure 3. *Bakoia nakamotoi* S.Y.Wong. A & B.

Flowering plants in habitat. Note the pendent habit and leaf blade prominent marginal vein. **C.** Inflorescence at pistillate anthesis. **D.** Inflorescence at pistillate anthesis with nearside part of spathe artificially removed to reveal spadix. Note the stamens with annulate pores and the lax pistils. **E.** Detail of the staminate flowers. Note the annulate pore. **F.** Spathe artificially broken to show the extent of spadix adnation to the spathe (compare with Fig. 2D).

A & B © K. Nakamoto, used with permission. C–E from K.Nakamoto AR-3663.

Bakoa nakamotoi is superficially very similar to B. lucens, especially when examined only from herbarium material. This previously misled the authors into incorrectly treating the Elsener collection here designated the Type of B. nakamotoi, as conspecific with B. lucens (Boyce & Wong, 2008: 399).

To date fruiting material has not been studied. Post-anthesis unfertilized inflorescences indicate the spathe to be fully persistent, as too is that of B. lucens.

Piptospatha brevipedunculata (H. Okada & Y. Mori) Bogner & A.

Hay Bakoa brevipedunculata (H. Okada & Y. Mori) S.Y.Wong

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(H. Okada & Y. Mori) Bogner & A. Hay

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