



A monograph of the *Nengella* group of *Hydriastele* (Arecaceae)

Charlie D. Heatubun^{1,2,3,*}, Peter Petoe^{3,*} & William J. Baker³

Summary. A taxonomic revision is presented of the *Nengella* group of the palm genus *Hydriastele* (Arecaceae: Arecoideae) in New Guinea, which comprises slender understorey or midstorey palms with small, protandrous inflorescences. Seven species are accepted: *Hydriastele aprica*, *H. divaricata* sp. nov., *H. flabellata*, *H. montana*, *H. pinangoides*, *H. simbiakii* sp. nov., and *H. splendida* sp. nov. All species are illustrated and their distributions are mapped. In addition, a key to species and preliminary IUCN Red List Assessments are provided.

Key Words. Arecaceae, Arecoideae, *Gronophyllum*, Indonesia, Palmae, Papua New Guinea, taxonomy.

Introduction

Hydriastele H. Wendl. & Drude (Arecoideae: Arecaceae) is a highly variable palm genus that comprises 49 accepted species (Govaerts *et al.* 2017), distributed from Sulawesi in Indonesia, through Papuasias to northern Australia, Fiji and Palau (Dransfield *et al.* 2008). The genus is most diverse in New Guinea where some 30 species are reported to occur (Baker & Couvreur 2012), including minute, understorey species, through midstorey palms to canopy emergents. In this paper, as part of ongoing research on New Guinea palms, we present a taxonomic revision of one lineage of *Hydriastele* in New Guinea, a monophyletic group (Loo *et al.* 2006), termed here the *Nengella* group.

The *Nengella* group consists of slender palms (stem diameter 0.5–7.5 cm), typically of the understorey and midstorey (up to 10 m height) of lowland to lower montane rainforests. They have protandrous inflorescences that are spicate or branched to one order with up to 6 rachillae (usually fewer), bearing triads that are usually spirally arranged. The male flowers tend to be showy, displaying shades of scarlet, pink, purple and lavender, and in some species even the inflorescence branches are brightly coloured. The female flowers have free sepals and petals, the petals bearing a triangular limb at the tip. The leaves often have conspicuously cuneate leaflets with prominent praemorse distal margins, although this is not universally the case, and young leaves are often bronze-coloured on emergence. Prior to this treatment, the *Nengella* group consisted of 11 accepted species, including one of the commonest understorey species in New Guinea, *Hydriastele pinangoides* (Becc.) W. J. Baker & Loo (Young 1985; Dowe & Ferrero 2000a;

Baker & Loo 2004). Our monograph reduces these 11 species to four (*H. aprica* (B. E. Young) W. J. Baker & Loo, *H. flabellata* (Becc.) W. J. Baker & Loo, *H. montana* (Becc.) W. J. Baker & Loo and *H. pinangoides*); and includes three further species described as new here (*H. divaricata*, *H. simbiakii* and *H. splendida*).

Taxonomic history

Beccari erected the genus *Nengella* Becc. in 1877 when he described the species *Nengella montana* Becc. and *Nengella flabellata* Becc., along with *Nenga pinangoides* Becc. and *Nenga affinis* Becc. The genus *Nenga* H. Wendl. & Drude had already been established in 1875 (Wendland & Drude 1875), and to reflect the distinctive morphology in flowers and foliage displayed by *Nenga pinangoides* and *Nenga affinis*, Beccari further classified these taxa within ‘Subgenus II *Gronophyllum* Scheff.’ along with a species from Sulawesi, *Nenga selebica* Becc. *Gronophyllum* Scheff., which had been described as a genus in 1876 by Scheffer, was thus given infra-generic status by Beccari (1877). In 1885, *Leptophoenix* Becc. was erected and combined with *Nenga pinangoides* and *Nenga affinis*, whilst *Nenga selebica* was recombined in *Gronophyllum*, which was reassigned generic status (Beccari 1885). In the following decades, new species were described in either *Leptophoenix* or *Nengella*, until Burret (1936) eventually sank the former into the latter. Burret regarded the main difference between the genera, the condition of the seed endosperm (ruminate in *Leptophoenix*, homogeneous in *Nengella*), too trivial to

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warrant a generic distinction. Essig & Young (1985), encouraged by John Dransfield (pers. comm.), later sunk *Nengella* into *Gronophyllum* noting that a continuum of variation connected the two genera and that their circumscriptions had a geographical bias, meaning that the name *Nengella* seemed to be applied only to New Guinea species, despite *Nengella*-like palms being known from outside New Guinea in Sulawesi and the Moluccas. We here define the 'Nengella group' nomenclaturally to comprise all species that were referred to the genus *Nengella* immediately before Essig & Young (1985) recombined it, plus two further species that were described directly in *Gronophyllum* after this point, *G. apricum* B. E. Young (1985) and *G. cariosum* Dowe & M. D. Ferrero (2000a).

Following detailed molecular phylogenetic studies, which found *Gronophyllum* not to be monophyletic, Loo *et al.* (2006) placed *Gronophyllum* with *Gulubia* Becc. and *Siphokentia* Burret in synonymy within a greatly broadened genus *Hydriastele* H. Wendl. &

Drude (Baker & Loo 2004). In addition, this study indicated that the *Nengella* group is monophyletic and that its closest relatives may be *Hydriastele brassii* (Burret) W. J. Baker & Loo, which resembles a very large species of the *Nengella* group, and *H. beguinii* (Burret) W. J. Baker & Loo and *H. dransfieldii* (Hambali, Maturb., Wanggai & W. J. Baker) W. J. Baker & Loo, which were formerly placed in the genus *Siphokentia* (Baker *et al.* 2000). It should be noted that species from Sulawesi (*H. selebica* (Becc.) W. J. Baker & Loo, *H. nannostachys* W. J. Baker & Loo, *H. kjellbergii* (Burret) W. J. Baker & Loo, *H. sarasinorum* (Burret) W. J. Baker & Loo,) and the Moluccas (*H. microcarpa* (Scheff.) W. J. Baker & Loo, *H. oxypetala* (Burret) W. J. Baker & Loo) that may belong to the *Nengella* group were not sampled by Loo *et al.* (2006). These species remain under-collected and very poorly known, and in the absence of further evidence, we exclude them from this revision, treating the *Nengella* group here as restricted to New Guinea and immediately adjacent islands.

Key to the species of the *Nengella* group

1. Triads spirally arranged with distinct alternating verticils of 3; rachillae often displaying shades of pink; endosperm ruminant 2
Triads spirally arranged with more or less well-defined verticils, or opposite and decussately arranged; rachillae normally yellow to green; endosperm homogeneous 5
2. Bearing c. 4–5 leaves per crown; leaf lamina entire bifid; inflorescence with 3–4 rachillae **7. *H. splendida***
Bearing 5–10 leaves per crown; leaf lamina pinnately compound; inflorescence with 2–5 (–6) rachillae 3
3. Clustering palm; stem pliable and often leaning; leaflets 14–16 per side, regularly arranged, linear; restricted to river banks **6. *H. simbiakii***
Clustering or solitary palm; stem rigid and erect; leaflets 4–13 per side, regularly or irregularly arranged, linear or cuneate; occurrence not limited to river banks 4
4. Clustering palm to 4.5 m tall; stem diam. 0.9–1.7 cm; leaflets 9–12 per side, rather uniform in shape and size, linear and sub-regularly arranged, never grouped, basal and middle leaflets divaricate, i.e. appearing to be extending nearly perpendicular to the leaf rachis; inflorescence spicate or with 2 rachillae **2. *H. divaricata***
Clustering or solitary palm to 7 (–10) m tall; stem diam. 1.5–7.5 (rarely thinner in some high-altitude forms); leaflets 5–13 per side, very variable in shape and size, broadly cuneate and irregularly arranged with several distinct groups usually present or more rarely narrowly cuneate and ± regularly arranged; inflorescence with 2–5 (–6) rachillae **5. *H. pinangoides***
5. Solitary palm; stem diam. c. 3 cm; lamina with 15–23 cuneate leaflets per side, leaflets abaxially with ramenta on midrib; inflorescence 15–26 cm long, with 4–6 rachillae; triads opposite and decussate; fruits subglobose **1. *H. aprica***
Clustering or gregarious palm; stem diam. 0.5–2 cm; lamina entire bifid or pinnate with 2–6 cuneate leaflets or c. 9–11 leaflets per side, ramenta apparently lacking; inflorescence 7–15 cm long, spicate (more rarely with 2 rachillae); triads spirally arranged; fruits ellipsoid to fusiform 6
6. Gregarious palm; stem 5–8 mm in diam.; petiole c. 3–8 cm long; lamina with c. 9–11 regularly arranged, narrowly linear leaflets; rachilla bracts ± conspicuous **4. *H. montana***
Clustering palm; stem 1–2 cm in diam.; petiole 10–30 cm long; lamina entire bifid or with up to 6 regularly or irregularly arranged, cuneate leaflets; rachilla bracts often conspicuously cucullate **3. *H. flabellata***

Taxonomic treatment

1. *Hydriastele aprica* (B. E. Young) W. J. Baker & Loo (2004: 62). *Gronophyllum apricum* B. E. Young (1985: 139).

Type: Papua New Guinea, Sandaun, Telefomin, Essig & Young LAE 74082 (holotype LAE!, isotype BH).

Solitary, slender palm to 5 m tall, bearing c. 7 leaves in crown. *Stem* c. 3 cm in diam. *Leaves* 48 – 80 cm long including petiole; sheath 21 – 23 cm long, sparsely covered with small brown to purple lacerate-peltate scales; petiole 12 – 18 cm long, indumentum as sheath; rachis 36 – 62 cm long, indumentum as sheath; leaflets 15 – 23 each side of rachis, irregularly arranged and variously grouped, borne 0 – 5.5 cm apart, drooping, cuneate, praemorse apically, discolorous, with ramenta present on the abaxial side of the midrib; basal leaflets 20 – 24 × 3 – 3.5 cm; middle leaflets 12 – 13 × 2 – 2.5 cm; terminal leaflets 8 – 10 × 1 – 2 cm. *Inflorescences* 15 – 26 cm long including 3.2 – 5.5 cm peduncle, branched to 1 order; prophyll 21 – 29 cm long, purplish, indumentum as sheath; rachillae 14 – 25 × 0.1 – 0.3 cm; triads opposite and decussate. *Staminate flowers* 3 – 7 × 0.5 – 3 mm in bud (when dry), cream-coloured with purplish tips; calyx 0.5 – 1 × 0.5 – 1 mm, consisting of three basally connate sepals; petals 3 – 7 × 0.5 – 3.0 mm, lanceolate and valvate; stamens 6; anthers 0.5 – 2.5 × 0.1 – 0.5 mm, filaments up to 1 × up to 0.2 mm; pistillodes 1 – 3 lobes. *Pistillate flowers* 1.5 – 7 × 1 – 2 mm in bud (when dry), dark purple; sepals 0.5 – 2 × 0.5 – 2 mm, imbricate; petals 1 – 7 × 0.5 – 2, broadly imbricate, with long and thin, valvate tips; ovary 1 – 2.5 × 0.5 – 1.5, ellipsoidal; staminodes c. 3, tooth-like. *Fruits* c. 8 × 7 mm, subglobose, red. *Seeds* c. 5 × 4 mm; endosperm homogeneous (Fig. 1).

DISTRIBUTION. Known from a few localities in a remote part of northern central New Guinea (Map 1).

SPECIMENS EXAMINED. PAPUA NEW GUINEA. Sandaun Province: Telefomin Subprovince, on ridge above junction of “clear-water” stream with Frieda R., c. 2 km upstream from Carpentaria Exploration Company airstrip camp, 300 m, 26 April 1978, *Essig & Young* LAE 74049 (BH, LAE!, USF); Telefomin Subprovince, Rainforest below Carpentaria Exploration Co. helipad K-27 on exposed ridge, [4°45'S 141°50'E], 900 m, 1 May 1978, *Essig & Young* LAE 74082 (BH; LAE!); On exposed ridge near Carpentaria Exploration Co. “Antap Mt” helipad, [4°45'S 141°50'E], 1200 m, 29 April 1978, *Essig & Young* LAE 74072 (BH, LAE!, USF).

HABITAT. Sun-exposed limestone ridges in montane forest; 300 – 1200 m elevation.

VERNACULAR NAMES AND USES. None known.

CONSERVATION STATUS. Data deficient (DD). More data are needed about the distribution and abundance of this species.

NOTES. *Hydriastele aprica* is unique within the *Nengella* group in having mostly opposite and decussate triads,

and the numerous irregularly arranged, cuneate and drooping leaflets add to the distinctiveness of this species. *H. aprica* is unlikely to be confused with other species in the group. The habitat preference is highly unusual, as noted by Young (1985).

2. *Hydriastele divaricata* Heatubun, Petoe & W. J. Baker sp. nov. Type: Indonesia, Papua Province, Mimika Regency (Previously Fakfak Regency), Timika, PT. Freeport Indonesia Area of Work, Mile 39, 23 Feb. 1998, *Baker et al.* 876 (holotype K!, isotypes BH!, BO!, L!, MAN!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77175849-1>

Clustering, very slender palm with c. 5 stems per clump, to 4.5 m tall. *Stem* c. 9 – 17 mm in diam.; internodes 6 – 15 cm long, smooth, green, with small purple to black lacerate-peltate scales. *Leaves* to c. 80 cm long including petiole; sheath c. 25 cm long, indumentum as upper internodes and additionally coated with larger white to black scurfy scales, crownshaft c. 50 cm long; petiole c. 27 – 30 cm long, indumentum as sheath; rachis c. 46 cm long, indumentum as sheath; leaflets 9 – 12 each side of rachis, sub-regularly arranged with some divaricate pairs, borne 2 – 7.5 cm apart, narrowly linear, praemorse apically, slightly discolorous, papery; basal leaflets c. 30 – 33 × 1 cm, single-fold; middle leaflets 37 – 38 × 1 – 1.5 cm, single-fold; terminal leaflets 19 – 20 × 0.5 – 1.5 cm, comprising c. 2 folds. *Inflorescences* 10 – 12 cm long including 2 – 2.5 cm peduncle, pendent, spicate or branched to 1 order; prophyll not seen; rachillae 9 – 10 × 0.2 – 0.3 cm, 1 – 2 per inflorescence; triads spirally arranged with alternating verticils of 3. *Staminate flowers* not seen. *Pistillate flowers* 4 – 4.5 × 3 – 3.3 mm at fruiting stage; sepals c. 1.5 – 2 × 3 mm; petals 3 – 3.5 × 3 – 3.3 mm with conspicuous triangular tips; ovary c. 4.5 × 3 mm, ovoid; staminodes not seen. *Fruits* c. 12 × 3 mm, cylindrical, pale green to pinkish. *Seeds* c. 8 × 2 mm, elongate-cylindrical; endosperm shallowly ruminant (Fig. 2).

RECOGNITION. Distinguished by its sub-regularly arranged, narrowly linear leaflets which are divaricate in the basal and middle section of the leaf.

DISTRIBUTION. Known only from the type locality near to Timika in Papua Province (Indonesia) on the lower slopes of the Mt Jaya region (Dransfield *et al.* 2000; Map 2).

SPECIMENS CITED. INDONESIA. Papua Province: Mimika Regency (Previously Fakfak Regency), Timika, PT.

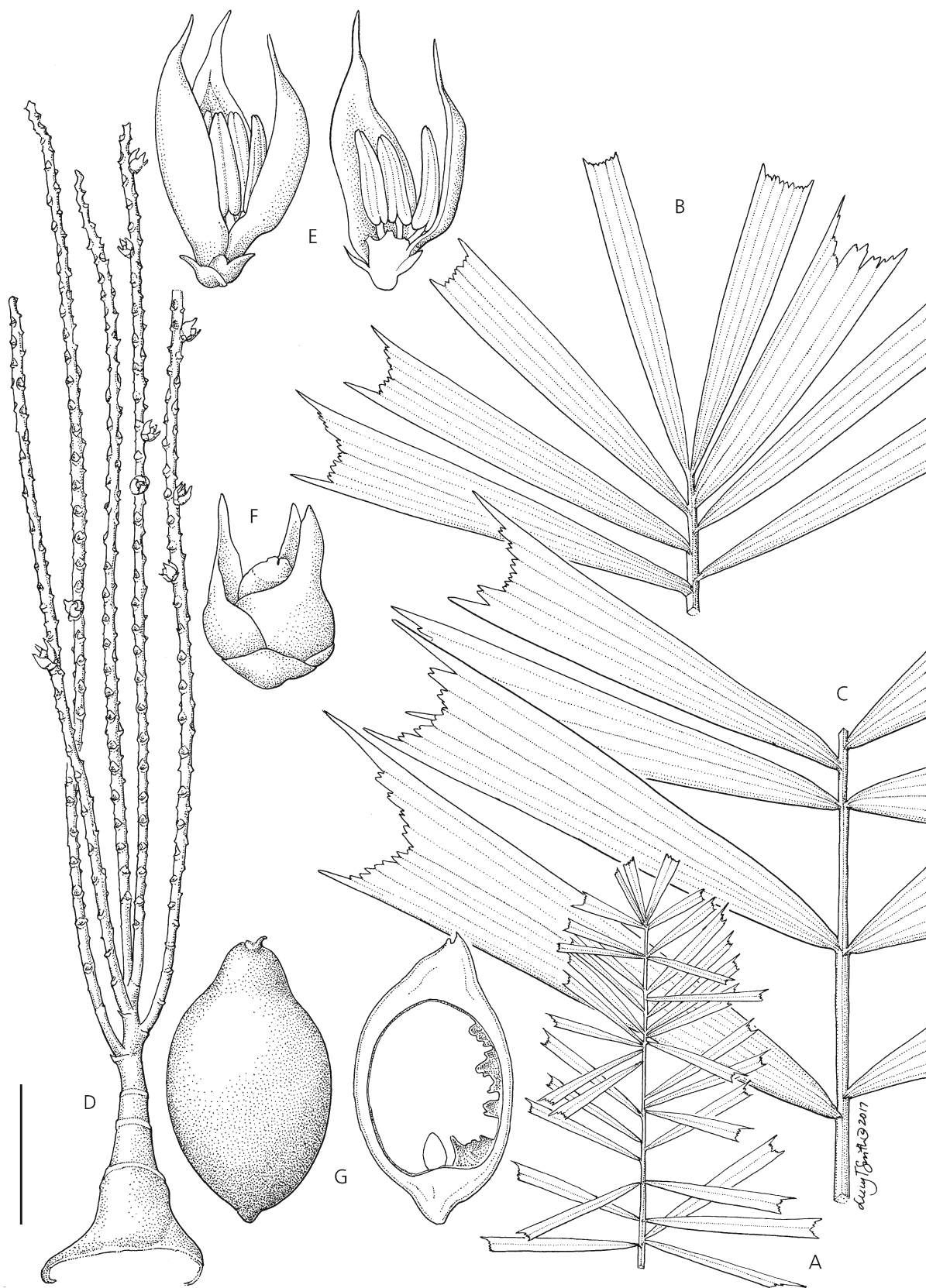
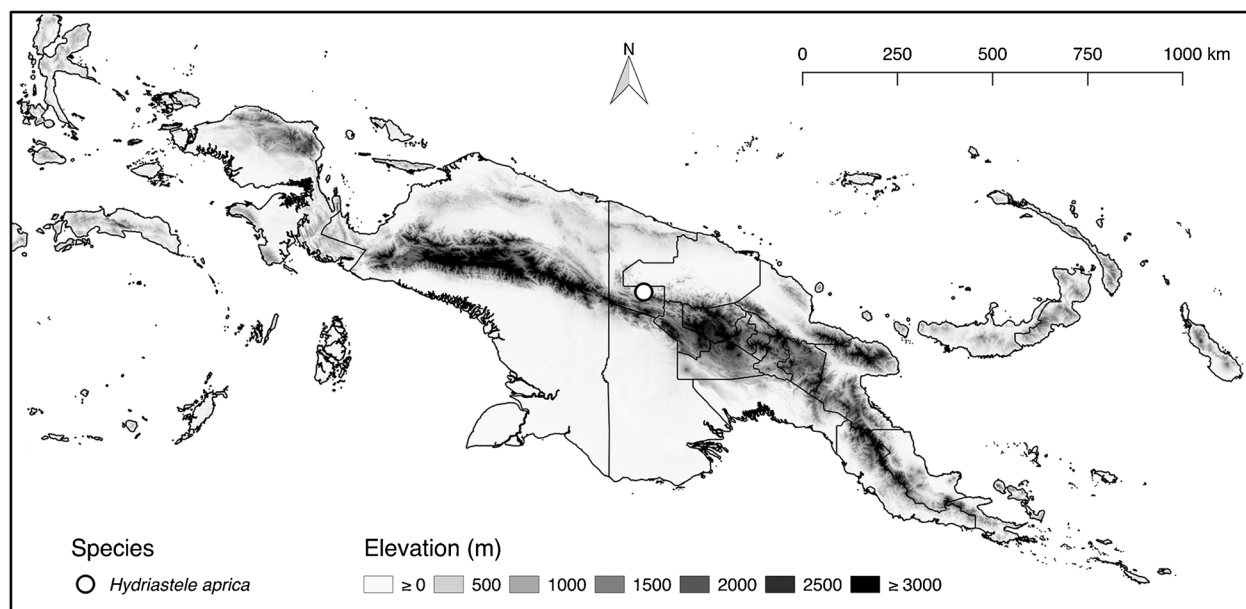


Fig. 1. *Hydiastele aprica*. A leaf diagram; B leaf apex; C mid-leaf portion; D inflorescence; E staminate flower whole and in longitudinal section; F pistillate flower; G fruit whole and in longitudinal section. Scale bar: A = 18 cm; B – C = 4 cm; D = 3 cm; E – G = 4 mm. A, F – G from Essig & Young LAE 74049; B – E from Essig & Young LAE 74072. DRAWN BY LUCY T. SMITH.



Map 1. Distribution map of *Hydrastele aprica*.

Freeport Indonesia Area of Work, Mile 39, [4°20'S 136°58'E], 100 m, 23 Feb. 1998, *Baker et al.* 876 (BH!, BO!, K!, L!, MAN!).

HABITAT. The transition zone between lowland alluvial rain forest and heath forest; 100 m elevation.

VERNACULAR NAMES AND USES. None recorded.

CONSERVATION STATUS. Data deficient (DD). More data are needed about the distribution and abundance of this species.

NOTES. *Hydrastele divaricata* is readily distinguished by its leaves with widely spreading, narrowly linear leaflets (hence the choice of species epithet). The limited available material displays inflorescences consisting of just one (spicate) or two rachillae, prompting comparison with *H. flabellata* and *H. montana*, but these two species have homogeneous endosperm and spirally arranged triads with more or less well-defined verticils, whereas *H. divaricata* has ruminant endosperm and triads spirally arranged with distinct alternating verticils of three, like *H. pinangoides*. Vegetatively, *H. divaricata* is highly distinct from *H. pinangoides*, which typically bears irregularly arranged, cuneate leaflets. Rare forms of *H. pinangoides* display regularly arranged, narrowly cuneate leaflets, but these are never narrowly linear and divaricate.

3. *Hydrastele flabellata* (Becc.) W. J. Baker & Loo (2004: 64). *Nengella flabellata* Becc. (Beccari 1877: 34). *Gronophyllum flabellatum* (Becc.) Essig & B. E. Young (1985: 134). Type: Indonesia, Papua Barat, Sorong, Ramoi, Beccari 427 (holotype FI!).

Nengella calophylla var. *montana* Becc. (Beccari 1914: 27).

Nengella pleurocarpa Burret (1936: 314). *Gronophyllum*

pleurocarpum (Burret) Essig & B. E. Young (1985: 136). *Hydrastele pleurocarpa* (Burret) W. J. Baker & Loo (2004: 67). Type: Papua New Guinea, Madang, *Schlechter* 16251 (holotype B†, isotype FI!). **synon. nov.**

Nengella calophylla var. *rhopalocarpa* Becc. (Beccari 1914: 28). *Nengella rhopalocarpa* (Becc.) Burret (1936: 314). *Gronophyllum rhopalocarpum* (Becc.) Essig & B. E. Young (1985: 136). *Hydrastele rhopalocarpa* (Becc.) W. J. Baker & Loo (2004: 67). Type: Papua New Guinea, Morobe, Waria R., *Schlechter* 17466 (holotype B†, isotypes FI!, K!). **synon. nov.**

Nengella gracilis Burret (1939: 206). *Gronophyllum gracile* (Burret) Essig & B. E. Young (1985: 134). *Hydrastele gracilis* (Burret) W. J. Baker & Loo (2004: 65). Type: Papua New Guinea, Western, Palmer R., *Brass* 7083 (holotype A!). **synon. nov.**

Gronophyllum cariosum Dowe & M. D. Ferrero (2000a: 161). *Hydrastele cariosa* (Dowe & M. D. Ferrero) W. J. Baker & Loo (2004: 63). Type: Papua New Guinea, Sandaun, Bewani Mts, *Dowe et al.* 514 (holotype BRI). **synon. nov.**

Clustering, very slender palm forming clumps of up to 6 stems, to 4 m tall, bearing 4 – 8 leaves per crown. *Stem* 1 – 2 cm in diam., shiny green and becoming dark and dull brown; internodes 3 – 15 cm long. *Leaves* 35 – 90 cm long including petiole; sheath 8 – 23 cm long, green with small dark scales densest towards the apex, crownshaft 14.5 – 40 × 1.5 – 1.8 cm; petiole 10 – 30 cm, indumentum as sheath, sometimes with additional scurfy scales; rachis 5 – 30 cm long, indumentum as petiole; lamina 20 – 65 cm long,

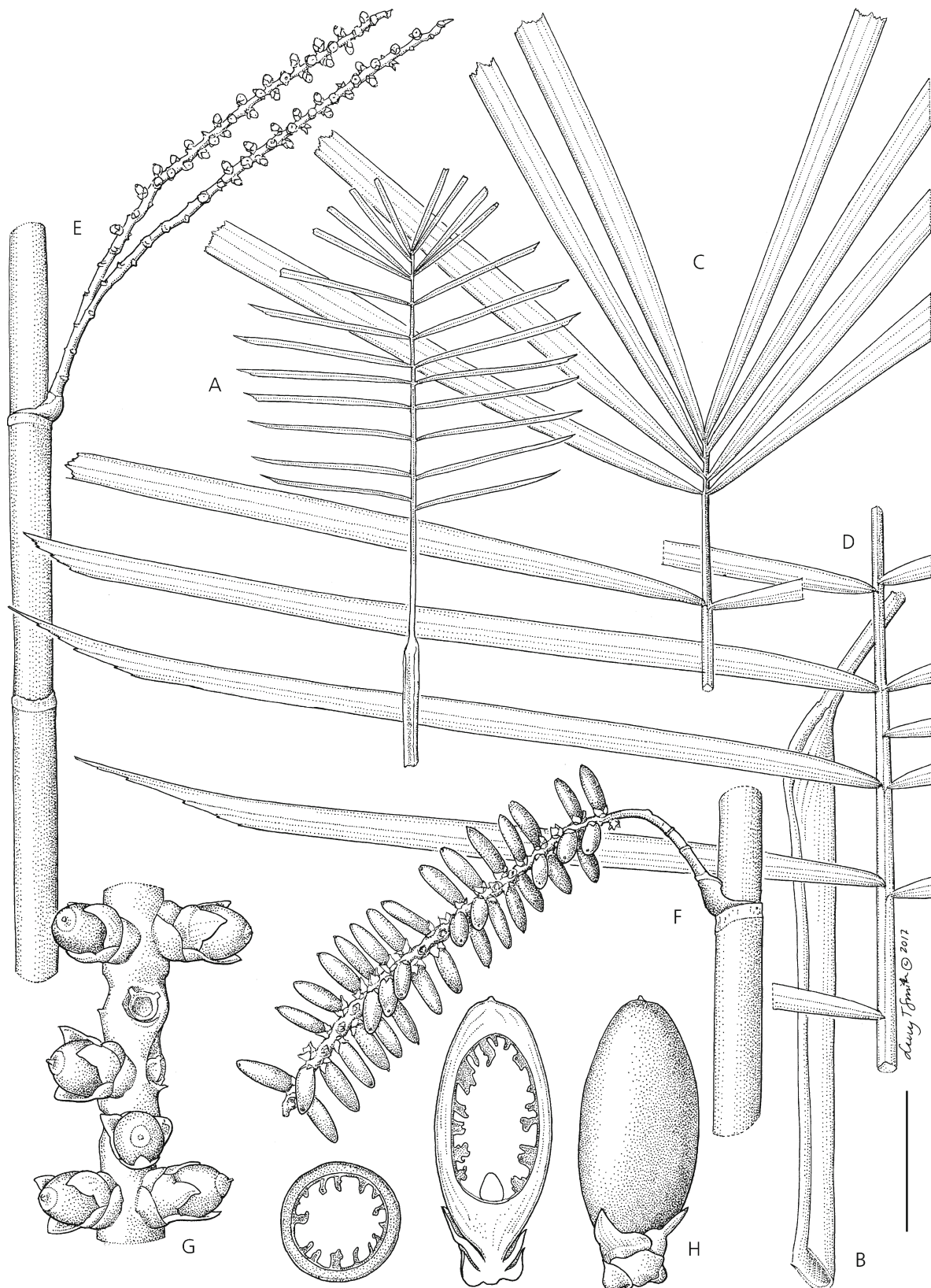
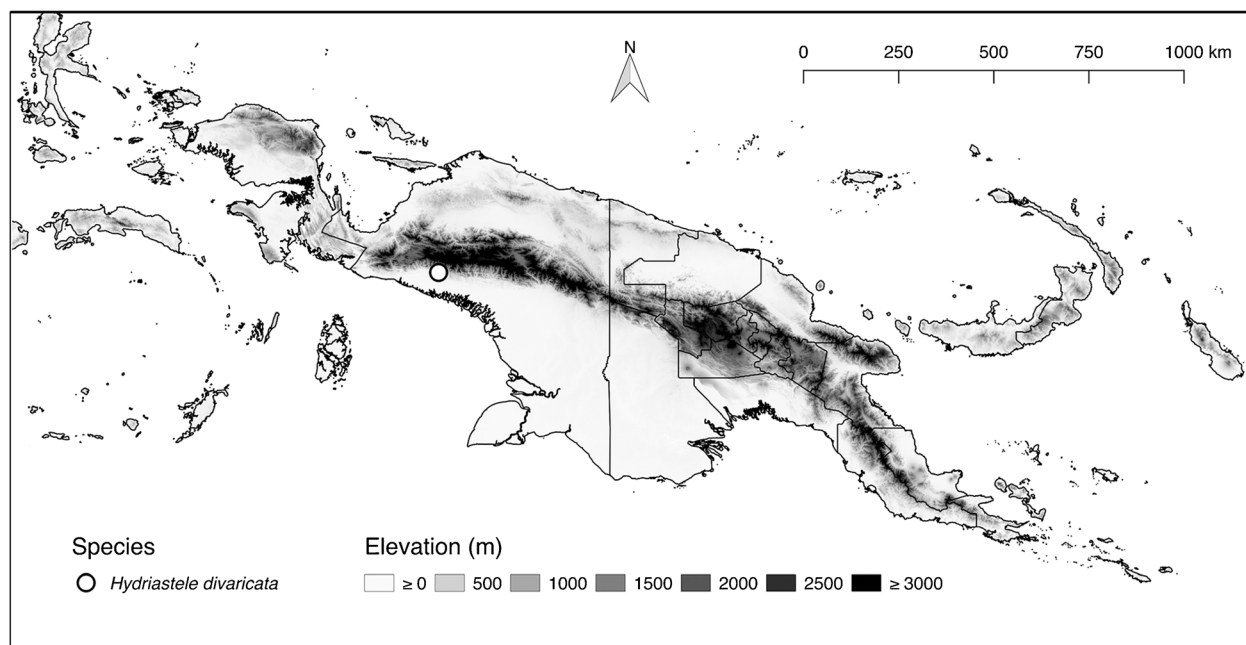


Fig. 2. *Hydrastele divaricata*. A leaf diagram; B leaf sheath with portion of petiole; C leaf apex; D mid-leaf portion; E attached inflorescence with pistillate flowers; F attached infructescence; G portion of rachilla with developing fruit; H fruit whole, in longitudinal section, and in transverse section. Scale bar: A = 30 cm; B – D = 6 cm; E – F = 3 cm; G – H = 7 cm. All from Baker et al. 876. DRAWN BY LUCY T. SMITH.



Map 2. Distribution map of *Hydiastele divaricata*.

entire bifid, bijugate or more finely dissected with up to 6 leaflets each side of rachis, pale to mid green sometimes with a metallic quality, slightly discolourous, \pm papery, ramenta not seen; leaflets (when present) regularly or irregularly arranged, single- or multi-fold, borne 2 – 13 cm apart, c. 9 – 24 \times 0.8 – 15 cm, cuneate and praemorse apically. *Inflorescences* 8 – 15 cm long including 1 – 3 cm peduncle, spicate or branched to 1 order, pendent or erect; prophyll 8.5 – 15 \times 1.5 – 3 cm, cream to light green; rachillae 7 – 12 cm long, 1 – 2 per inflorescence (up to 3 in one cultivated specimen), somewhat stiff, green to yellow; rachilla bracts often rather conspicuous (at least when dry) and cucullate; triads spirally arranged with \pm well-defined verticils. *Staminate flowers* 8 – 10 \times 2 – 3 mm in bud, cream-coloured to violet; calyx 1 – 2 \times 2 – 3 mm consisting of three basally connate sepals; petals, 7 – 9 \times 2 – 3 mm, lanceolate, valvate; stamens 6; anthers c. 3 – 6 \times 1 mm: filaments c. 1 \times 0.1 mm, variously epipetalous; pistillodes 1 – 3 lobes. *Pistillate flowers* 3 – 5 \times 2 – 3.5 mm in bud, cream to light green or lavender; sepals 0.5 – 2 \times up to 3 mm; petals 3 – 4 \times 2 – 3 mm, with conspicuous triangular tips; ovary 1 – 1.5 \times 1 mm; staminodes not seen. *Fruits* 12 – 15 \times 5 – 8 mm, ellipsoid to fusiform, red, smooth or striate, glossy. *Seeds* 10 – 12 \times 4 – 7 mm, ellipsoid; endosperm homogeneous (Fig. 3).

DISTRIBUTION. Scattered across New Guinea with collections known from parts of Papua Barat Province (Indonesia), the area around Timika in Papua Province (Indonesia), and from several major areas in

Papua New Guinea south and north of the central New Guinea highlands (Map 3).

SPECIMENS EXAMINED. INDONESIA. Papua Barat Province: Sorong, Ramoi, [0°57'S 131°20'E], 1872, *Beccari* 427 (FI!); Sorong Selatan Regency, Sayal, Maampow Forest, [1°28'S 131°53'E], 10 m, 21 Feb. 2013, *Heatubun* 406 (K (spirit)!, MAN!); same locality as preceding, [1°28'S 131°53'E], 10 m, 21 Feb. 2013, *Heatubun* 426 (K (spirit)!, MAN!); Kaimana Regency, Teluk Etna, Waribun, Km-27 road to Kaltim Utama, 100 m, 31 Jan. 2001, *Heatubun* 329 (K!, MAN!); Surroundings of Ayawasi, [1°5'S 132°17'E], 450 m, 16 Jan. 1996, *Polak* 1000 (BO, L!); **Papua Province:** Maribu village, Cyclops Mts Nature Reserve, [2°29'S 140°23'E], 850 m, 21 Sept. 1998, *Maturbongs* 576 (BO, K!, MAN,); Mimika Regency, Timika, Kali Kopi, [4°26'S 136°57'E], 95 m, 24 Feb. 1998, *Baker et al.* 879 (BO!, K!, MAN!); Kuala Kencana, [4°25'S 136°51'E], 50 m, 19 Feb. 1998, *Witono* 23 (BH, BO!, K!, MAN!); Jayapura, Cyclops Mts, path to Ormu, [2°26'S 140°37'E], 700 m, 18 Aug. 1998, *Heatubun* 285 (BO, FTG, K!, L, MAN). **PAPUA NEW GUINEA. Morobe Province:** Morobe Sub-province, Mayama village, [7°35'S 147°10'E], 100 m, 17 June 1981, *Katik* LAE 74935 (BRI, L!, LAE, NSW, USF); Kamiali Wildlife Management Area, ridge to Blue Mt, near starting point of the Nembabah PABITRA plot, [7°17'S 147°5'E], 650 m, 28 Feb. 2005, *Takeuchi* 18982 (K!, LAE); Waria R., [7°58'S 147°28'E], 13 March 1908, *Schlechter* 17466 (B†, FI!, K!); **Madang Province:** 12 July 1907, *Schlechter* 16251 (B†, FI!); **Sandaun Province:** Roundhouse village, [3°2'S 141°7'E], 200 – 250 m, 27 Nov. 1996, *Barfod* 413 (AAU!, LAE); Bewani, [3°1'S 141°8'E], 0 m, 19 March 2000, *Barfod* 499

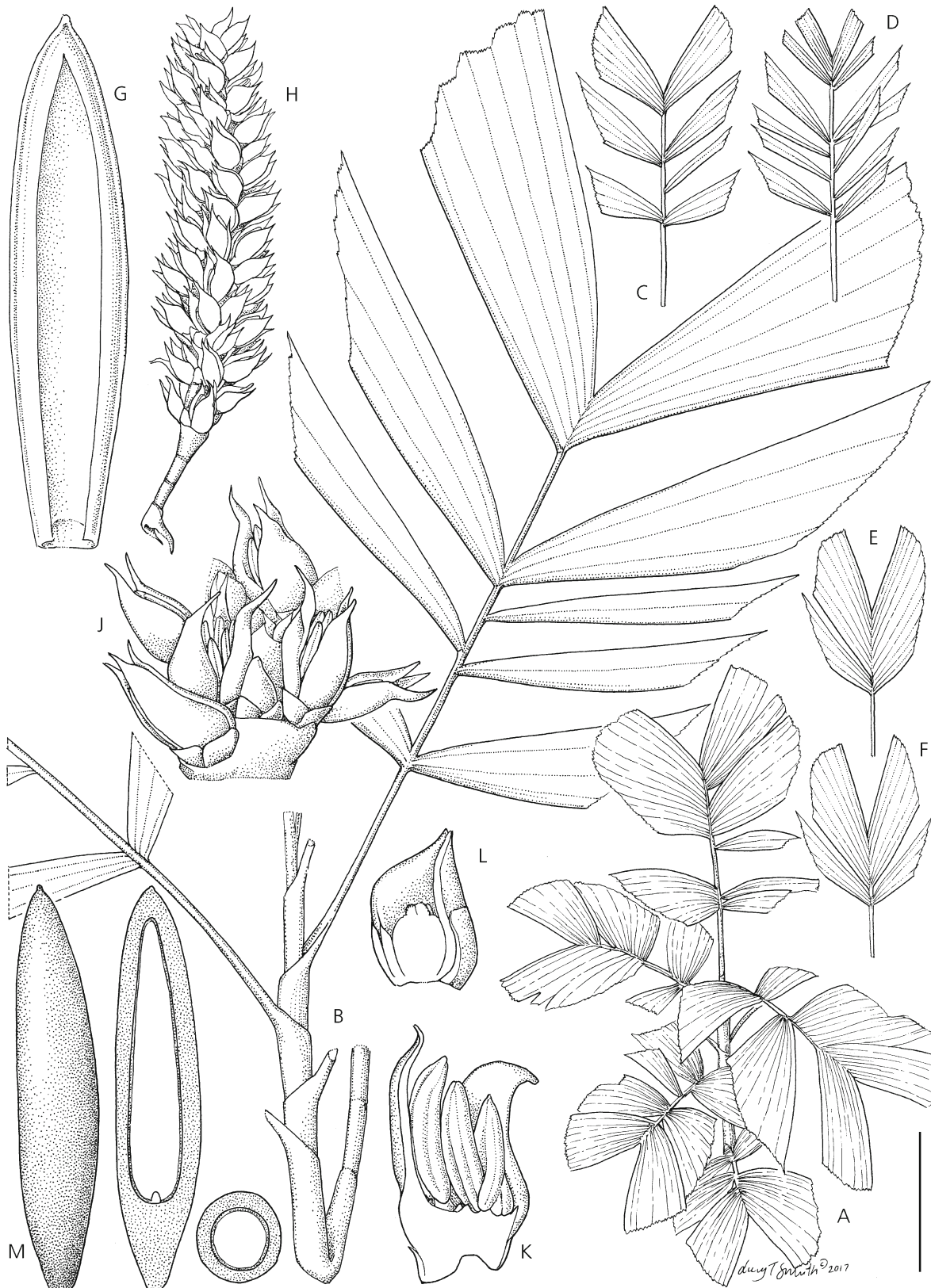
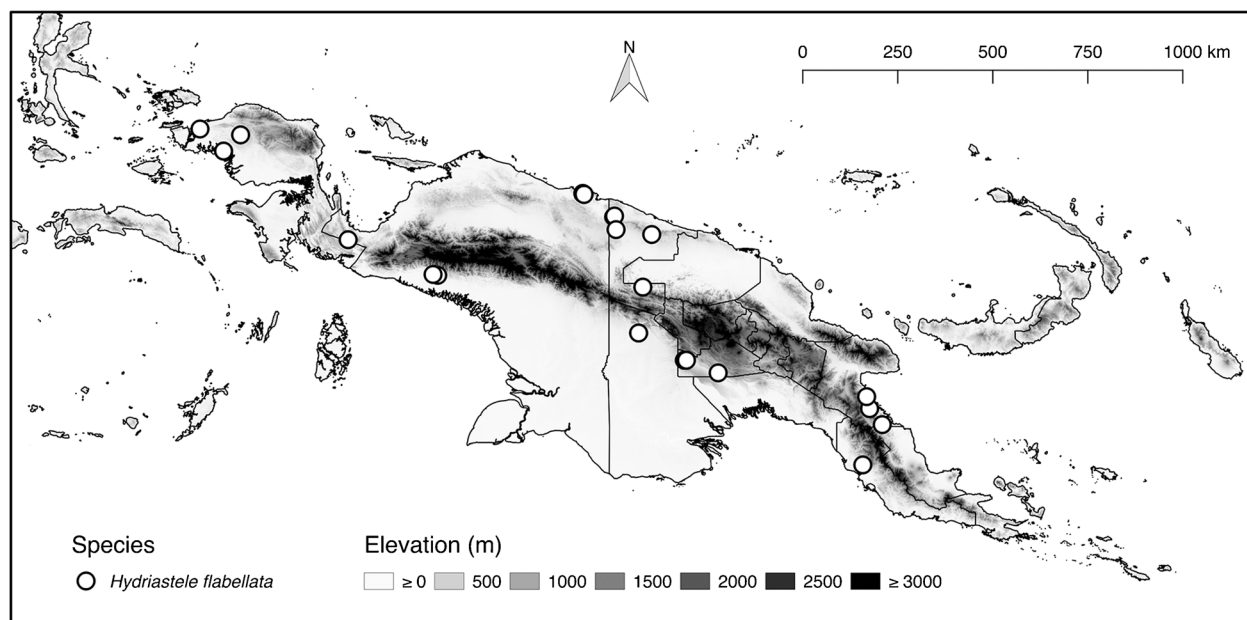


Fig. 3. *Hydiastele flabellata*. A habit; B attached leaf; C–F leaf diagrams; G prophyll; H inflorescence; J portion of rachilla with triads; K staminate flower in longitudinal section; L pistillate flower in longitudinal section; M fruit whole, in longitudinal section, and in transverse section. Scale bar: A = 20 cm; B = 6 cm; C–F = 18 cm; G–H = 2 cm; J = 5 mm; K = 4 mm; L = 3 mm; M = 7 mm. A–C, G–L from Baker *et al.* 879; D from Schlechter 17466; E–F from Baker 643; M from Heatubun 406. DRAWN BY LUCY T. SMITH.



Map 3. Distribution map of *Hydriastele flabellata*.

(AAU!, K!, LAE); Lumi Sub-distr., Karataiem, off road between Lumi Govt. Station and Karataiem Catholic Mission, [3°27'S 142°1'E], Jan. 1974, *Frodin* s.n. (K!, UPNG); Telefomin Sub-distr., Prospect Creek near Frieda R., [4°42'S 141°48'E], 500 m, 23 June 1969, *Henty* NGF 42555 (BH, LAE!); Amanab Sub-distr., Imonda, along road to Bapi R., [3°20'S 141°10'E], 300 m, 25 Nov. 1971, *Essig* LAE 55094 (BH, CANB!, LAE!); **Southern Highlands Province:** Kutubu patrol area, Waro, 500 – 600 m, 3 Aug. 1991, *Takeuchi* 7284 (A!, LAE); same locality as preceding, 500 – 600 m, 3 Aug. 1991, *Takeuchi* 7312 (A!, LAE); Kantobo, [6°44'S 143°35'E] 470 m, 9 Feb. 1996, *Baker et al.* 643 (K!, LAE!); Mt Bosavi, Wasaso, Bona village, [6°26'S 142°47'E], 700 m, 2 Feb. 1996, *Baker et al.* 611 (BH, FTG, K!, LAE); Mt Bosavi, northern side, [6°26'S 142°50'E], 900 m, 26 Oct. 1973, *Jacobs* 9470 (L!, LAE); **Western Province:** Palmer R., 2 min. below junction Black R., [5°47'S 141°42'E], 100 m, June 1936, *Brass* 7083 (A!); Same locality as preceding, [5°47'S 141°42'E], 100 m, June 1936, *Brass* 7368 (A!). **CULTIVATED. UNITED STATES. HAWAIIAN ISLANDS:** Hawai'i, Cultivated Floribunda Palms and Exotics, 14 Nov. 2017, *Baker* 1448 (K!).

HABITAT. The understorey of primary rainforest on slopes, ridges and riverbanks, on a diversity of soils (e.g. waterlogged alluvium, limestone karst and volcanic soil). This species should mainly be considered a lowland rainforest species as its habitat barely stretches into the premontane vegetation zone; 0 – 700 m elevation.

VERNACULAR NAMES AND USES. Two local names are recorded for this species; *mplemponik* (Sayal), *filiawoi yamu* (Bewani).

The leaves are used as food wrapping in the Sayal area of Sorong Selatan in Indonesia (Heatubun 2005)

and in the Bewani Mts of Sandaun Province in Papua New Guinea (Dowe & Ferrero 2000a). The stems are used for making arrow shafts and fish spear handles in Southern Highlands Province (Papua New Guinea).

CONSERVATION STATUS. Least Concern (LC). The EOO (c. 404,000 km²) of this species indicates non-threatened status and the low AOO (44 km²) is thought to be an underestimate resulting from under-collecting. Even the relatively large EOO is likely to be a conservative figure.

NOTES. This widespread and variable species is distinguished by its variation in leaf lamina morphology ranging from entire bifid to pinnately compound with up to 6 cuneate leaflets per side. The inflorescence is spicate or occasionally with 2 rachillae (up to three rachillae has been confirmed from one cultivated specimen; *Baker* 1448), and it has spirally arranged triads with more or less well-defined verticils of 3, that are often subtended by conspicuously cucullate rachilla bracts. *Hydriastele flabellata* can be confounded with *H. pinangoides* because the foliage can appear similar, however the leaves of *H. pinangoides* are never entire bifid and usually include more leaflets, and its somewhat longer inflorescences bear 2 – 5 rachillae with spirally arranged triads in distinct alternating verticils of 3, subtended by inconspicuous rachilla bracts. In addition, the endosperm of *H. flabellata* is homogeneous, whereas *H. pinangoides* is ruminant. The only species within the Nengella group with a similar inflorescence structure to *H. flabellata* is *H. montana* but this species differs in having 9 – 11 narrowly linear leaflets per side and by forming gregarious associations.

There is a considerable span of variation in leaf morphology across specimens of *Hydriastele flabellata*

with some individuals displaying an entire bifid leaf lamina (e.g. *Barfod* 413) and others a distinctly pinnate blade with up to 6 leaflets per side (e.g. *Schlechter* 17466; Fig. 3D). Between these outer extremes we observed intermediate forms and substantial within-specimen variation in the form of both near-entire and bijugate leaves (*Baker et al.* 643; Fig. 3E, F) and leaves with 3–5 leaflets per side (*Baker et al.* 879; Fig. 3C) present within single individuals. When we combined the continuum in leaf lamina morphology with the general uniformity and presence of continua observed across other characters studied, e.g. habit, leaf texture, inflorescence morphology, and seed endosperm condition, it became evident that *H. rhopalocarpa*, *H. cariosa*, *H. pleurocarpa* and *H. gracilis* can no longer be maintained and we therefore consequently place these names in synonymy under *H. flabellata*.

We make note here of a deviating specimen, *Heatubun* 285 from the Cyclops Mountains (*Heatubun* 2000). It resembles *Hydriastele flabellata* except that it has metallic leaves, inflorescences with up to 3 rachillae (known from one cultivated specimen; *Baker* 1448), and somewhat curved fruits when dry. However, there is insufficient material available currently to determine whether it should be recognised as a new species or not.

4. *Hydriastele montana* (Becc.) W. J. Baker & Loo (2004: 66). *Nengella montana* Becc. (*Beccari* 1877: 33). *Gronophyllum montanum* (Becc.) Essig & B. E. Young (1985: 134). Type: Indonesia, Papua, Arfak Mts, Gunon Morait, *Beccari* s.n. (holotype FI!, isotype K!). *Kentia beccarii* F. Muell. (*Mueller* 1880: 163). Type: Indonesia, Papua, Arfak Mts, *Beccari* s.n. **nom. superfl. & nom. illeg.**

Gregarious palm to 1.5 m high, very slender, bearing 4–5 leaves per crown, forming new stems through vigorous rhizomatous growth. *Stem* 5–8 mm in diam.; internodes 3–8 cm long, smooth, covered with small dark lacerate-peltate scales. *Leaves* c. 25–50 cm long including petiole; sheath 10–15 cm long, indumentum as upper internodes if more dense; petiole 3–8 cm long, indumentum as sheath; rachis 19–38 cm long, indumentum as sheath; leaflets 9–11 each side of rachis, regularly arranged, alternate to subopposite, borne 1–4.5 cm apart, narrow linear, ± concolorous, ramenta not seen, papery; basal leaflets 18–25 × 0.8–1.3 cm, single- or bi-fold, pointed apically; middle leaflets c. 21–27 × 0.8 cm, single-fold, pointed and truncately praemorse apically; terminal leaflets 14–21 × 0.6–1.7 cm, single- or bi-fold, praemorse apically. *Inflorescences* 7–9 cm long including 1–1.5 cm peduncle, spicate, pendent; prophyll c. 10 × 1 cm; spike 6–7.5 × 0.3–0.4 cm, yellowish to green; rachilla bracts ± conspicuous; triads spirally arranged with ± well-defined verticils. *Staminate flowers* 9–10 × 1.5–2.5 mm in bud; calyx 1.5–2.5 × 1.5–2.5 mm consisting of three basally

connate sepals; petals 9–9.5 × 1.5–2 mm, lanceolate, valvate; stamens 6; filaments c. 0.5 × 0.3 mm; anthers c. 3.5–4 × 0.5 mm; pistillodes 2–3, c. 0.5 × 0.3 mm, column shaped. *Pistillate flowers* 4–4.5 × 3–3.5 mm in bud; sepals 1.5–2 × 2.5–3 mm, rounded; petals 3.5–4 × 2.5–3 mm, rounded and imbricate at the base, with long valvate tips; ovary c. 2.5 × 2 mm, subglobose; staminodes c. 3, tooth-like, rudimentary. *Fruits* c. 12–19 × 4 mm (when dry), fusiform, red. *Seeds* c. 12–14 × 3 mm (when dry), elongate-turbinate; endosperm homogenous (Fig. 4).

DISTRIBUTION. Known from two localities in the Tamrau Mountains on the Bird's Head Peninsula (Map 4).

SPECIMENS CITED. INDONESIA. Papua Barat Province: Kabupaten Tambrau, Gunon [Gunung] Morait, [0°45'S 132°30'E], 1300–1500 m, July 1875, *Beccari* s.n. (FI!, K!); Kabupaten Tambrau, Bamusbama distr., road to Fef, [0°46'S 132°16'E], 950 m, 28 Jan. 2013, *Baker et al.* 1380 (AAU!, BO!, K!, L!, MAN!); Locality info lacking, *Iwanggin* 132 (MAN, K!).

HABITAT. The understorey of premontane forest, on ridges and slopes; 950–1300 (–1500) m elevation.

VERNACULAR NAMES AND USES. None known.

CONSERVATION STATUS. Data deficient (DD). More data are needed about the distribution and abundance of this species.

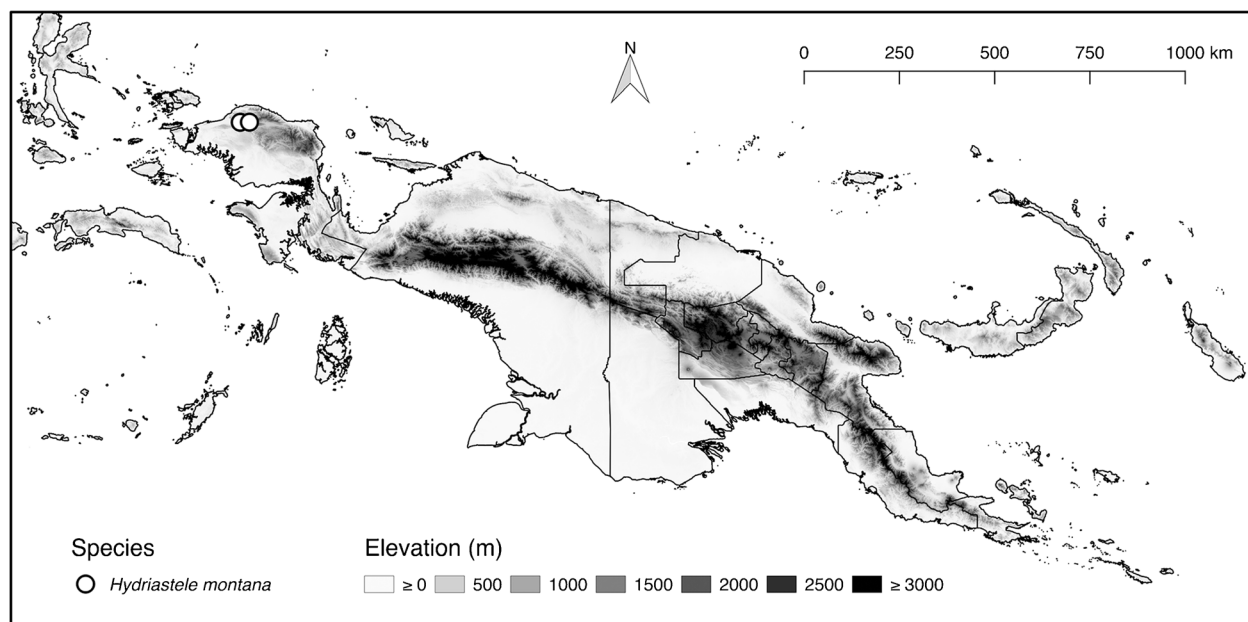
NOTES. *Hydriastele montana* is distinguished by its gregarious habit meaning that it occurs in groups and is locally dominant. This is distinct from the caespitose habit which is not uncommonly observed amongst understorey members of *Hydriastele*. It is arguably the production of multiple running rhizomes (Fig. 4A) that results in the colony formation. Another distinctive feature of this species is the presence of a spicate inflorescence, a character state that is only shared with *H. flabellata* within the *Nengella* group. However, *H. flabellata* has a bifid leaf lamina or the blade is pinnately compound and consisting of up to 6 regularly or irregularly arranged, cuneate leaflets on each side of the rachis, whereas *H. montana* has 9–11 narrowly linear, regularly arranged leaflets per side. Only *H. divaricata* has similar leaflets, but they are divaricate and it also has triads that are spirally arranged with distinct verticils of 3 and seeds with ruminant endosperm. *Hydriastele montana* has spirally arranged triads with more or less well-defined verticils, and homogeneous endosperm.

The name *Kentia beccarii* F. Muell has been highlighted as a superfluous replacement name for *Hydriastele montana* and is therefore illegitimate (*Dowe* 2017).

5. *Hydriastele pinangoides* (Becc.) W. J. Baker & Loo (2004: 66). *Nenga pinangoides* Becc. (*Beccari* 1877: 28).



Fig. 4. *Hydiastele montana*. A stem basal portion with running rhizomes and roots; B leaf diagram; C apical and mid-leaf portion; D portion of stem with attached inflorescences; E portion of rachilla with pistillate flowers; F pistillate flower whole and in longitudinal section. Scale bar: A, C = 4 cm; B = 18 cm; D = 2 cm; E = 7 mm; F = 4 mm. All from Baker et al. 1380. DRAWN BY LUCY T. SMITH.



Map 4. Distribution map of *Hydrastele montana*.

Leptophoenix pinangoides (Becc.) Becc. (Beccari 1885: 82). *Nengella pinangoides* (Becc.) Burret (1936: 315). *Gronophyllum pinangoides* (Becc.) Essig & B. E. Young (1985: 135). Type: Indonesia, Papua Barat, Ramoi, Beccari 430 (holotype FI!, isotype K!).

Nenga affinis Becc. (Beccari 1877: 29). *Leptophoenix affinis* (Becc.) Becc. (Beccari 1885: 82). *Nengella affinis* (Becc.) Burret (1936: 316). *Gronophyllum affine* (Becc.) Essig & B. E. Young (1985: 136). *Hydrastele affinis* (Becc.) W. J. Baker & Loo (2004: 62). Type: Indonesia, Papua, Kapaor, Beccari s.n. (holotype FI!, isotype K!). **synon. nov.**

Nenga calophylla K. Schum. & Lauterb. (Schumann & Lauterbach 1900: 208). *Nengella calophylla* (K. Schum. & Lauterb.) Becc. (Beccari 1914: 27). Type: Papua New Guinea, Morobe, Sattelberg, Lauterbach 564 (holotype B†, type photo FI!).

Leptophoenix minor Becc. (Beccari 1905: 298). *Nengella minor* (Becc.) Burret (1936: 315). Type: Papua New Guinea, San Giuseppe R., Loria s.n. (holotype FI!).

Gronophyllum densiflorum Ridl. (Ridley 1916: 232). *Leptophoenix densiflora* (Ridl.) Burret (1936: 205). *Nengella densiflora* (Ridl.) Burret (1936: 316). Type: Indonesia, Papua, Mt Carstenz, Kloss s.n. (holotype BM, isotype K!).

Leptophoenix incompta Becc. (Beccari 1923: 452). *Nengella incompta* (Becc.) Burret (1936: 316). Type: Papua New Guinea, East Sepik, Ettapenberg, Ledermann 9017 (holotype B†).

Leptophoenix mayrii Burret (1933: 709). *Nengella mayrii* (Burret) Burret (1936: 314). *Gronophyllum cyclopense* Essig & B. E. Young (1985: 136). *Hydrastele cyclopensis* (Essig & B. E. Young) W. J. Baker & Loo (2004: 64). Type: Indonesia, Papua, Arfak Mts, Mayr

24 (holotype B†, isotype BO — see notes section). **synon. nov.**

Leptophoenix micrantha Burret (1933: 710). *Nengella micrantha* (Burret) Burret (1936: 314). *Gronophyllum micranthum* (Burret) Essig & B. E. Young (1985: 136). *Hydrastele micrantha* (Burret) W. J. Baker & Loo (2004: 65). Type: Indonesia, Papua, Wandammen Mts, Mayr 253 (holotype B†, isotype BO!). **synon. nov.**

Leptophoenix pterophylla Becc. (Beccari 1934: 131). *Nengella pterophylla* (Becc.) Burret (1936: 316). Type: Cultivated in Bogor Botanic Garden ex New Guinea, X D 114 (holotype FI!).

Leptophoenix yulensis Becc. (Beccari 1934: 130). *Nengella yulensis* (Becc.) Burret (1936: 316). Type: Papua New Guinea, Central, von Mueller s.n. (holotype MEL!, isotype FI!).

Leptophoenix brassii Burret (1935: 339). *Nengella brassii* (Burret) Burret (1936: 316). *Gronophyllum leonardii* Essig & B. E. Young (1985: 134). Type: Papua New Guinea, Western, Kubuna, Brass 5631 (holotype A, isotypes BRI!, BO!, NY!).

Leptophoenix macrocarpa Burret (1935: 340). *Nengella macrocarpa* (Burret) Burret (1936: 316). Type: Papua New Guinea, Central, Mafulu, Brass 5299 (holotype B†, isotypes BRI!, NY!).

Leptophoenix microcarpa Burret (1935: 342). *Nengella microcarpa* (Burret) Burret (1936: 316). Type: Papua New Guinea, Central, Dieni, Brass 3998 (holotype B†, isotypes A!, NY, BRI, BO!).

Nengella rhomboidea Burret (1939: 207). Type: Papua New Guinea, Western, Palmer R., Brass 7201 (holotype A!, isotype BRI).

Solitary or clustering, very slender to slender palm to 7 (– 10) m tall, often shorter, bearing 5 – 10 leaves per crown. *Stem* (0.8 –) 1.5 – 7.5 cm in diam.; internodes 4 – 16 cm long, smooth, grey to greenish, ± speckled and lepidote. *Leaves* 50 – 157 cm long including petiole, reddish to bronze when newly emerged; sheath 15 – 52 cm long, green with small brown to purple lacerate-peltate scales covered by larger scurfy scales, crownshaft 23 – 60 (– 112) × 2 – 6 cm; petiole 15 – 54 cm long, indumentum as sheath; rachis 30 – 90 cm long, indumentum as sheath; leaflets 5 – 10 (– 13) each side of rachis, very variable in size and shape, irregularly arranged usually in 2 – 4 widely spaced groups sometimes with portions of the lamina regularly pinnate, very rarely the entire blade regularly pinnate, broadly (rarely narrowly) cuneate, praemorse apically, mid to dark green adaxially and somewhat paler abaxially, ± discoloured, leathery; basal leaflets 16 – 36 × 4 – 11 cm, comprising (1 –) 3 – 6 folds; middle leaflets 12 – 50 × 2 – 20 cm, single- or multi-fold; terminal leaflets 7 – 36 × 3 – 24 cm, multi-fold. *Inflorescences* (13 –) 18 – 30 cm long including 1.5 – 3 cm peduncle, branched to 1 order, arching; prophyll 12 – 31 × 2 – 5 cm, cream-green; rachillae 8 – 25 × 0.2 – 0.5 cm, 2 – 5 (– 6) per inflorescence, with various shades of pink; triads spirally arranged with alternating verticils of 3. *Staminate flowers* 6 – 8 × 1 – 3 mm in bud (when dry), vinaceous; sepals 1 – 2 × 1.1 – 2 mm, basally connate, rounded or sometimes acuminate apically; petals 5 – 7 × 1.5 – 2 mm, lanceolate and valvate; stamens 6; filaments c. 1 – 1.3 × 0.2 – 0.3 mm; anthers 3.5 – 4 × 0.5 mm; pistillodes not seen. *Pistillate flowers* c. 4 × 3.5 mm at fruiting stage, crimson; sepals c. 2 × 3 mm, rounded, imbricate; petals c. 3.5 × 3.5 mm, basally imbricate, with conspicuous valvate tips; staminodes several, small, tooth-like. *Fruits* 10 – 16 × 4 – 8 mm, ellipsoid or cylindrical to fusiform, smooth and shiny, pink, red, purple or blackish. *Seeds* 6 – 10 × 2 – 4 mm broadly to narrowly ellipsoid; endosperm ruminant (Fig. 5).

DISTRIBUTION. Occurs throughout New Guinea including the islands of Misool, Waigeo, and Kobroor in the Aru Archipelago (Map 5).

SPECIMENS CITED. INDONESIA. Maluku Province: Aru Islands, Pulau Kobroor, [6°15'S 134°17'E], 0 m, 6 Nov. 1994, *van Balgooy* 6855 (K!, L!); **Papua Barat Province:** Ramoi, [0°57'S 131°20'E], 1872, *Beccari* PP 430 (FI!, K!); Kabupaten Pegunungan Arfak, Arfak Mts, Minyambou, Mt Nerimbau, [1°8'S 133°51'E], 1600 m, 19 May 1962, *Koster* BW 13879 (L!, LAE!, MAN); Kabupaten Teluk Bintuni, Concession of PT. Manokwari Mandiri Lestari, Blok RKT 2010, Jalur 22 Petak 18Y, 250 m, 18 July 2010, *Heatubun* CH 1040 (K!, MAN); Kabupaten Kaimana, Teluk Arguni, Distrik Arguni Bawah, Kampung Jawera, Hutan Manggai, [3°4'S 133°40'E], 0 m, 3 Oct. 2010, *Heatubun* CH

1074 (K!, MAN); Kabupaten Teluk Wondama, Distrik Wombu (Wasior Barat), Wosimi, Kambi Forest, [3°0'S 134°32'E], 50 m, 18 Aug. 2006, *Heatubun* CH 777 (BO, K!, MAN); Kabupaten Manokwari, Warmare; Valley of R. Prafi, new road to Manyambo, [0°47'S 133°58'E], 350 m, 25 Aug. 1995, *Dransfield* JD 7605 (BO, K!); Manokwari, Kebar, Kebar Valley, forest immediately due N of Andjai in valley, [0°55'S 133°3'E], 550 m, 30 April 1995, *Davis* 685 (K!); Manokwari Distr., Warmare, Prafi R. valley, new road to Manyambo, [0°47'S 133°58'E], 350 m, 25 Aug. 1995, *Zona* 689 (FTG, K!); Manokwari Distr., Nuni, Sungei Asai, between Mt Manggombo and Mt Marwadibau, [0°45'S 133°56'E], 0 m, 15 Aug. 1995, *Zona* 671 (FTG, K!); Vogelkop Peninsula, Segior, NW side of Lake Ajamaru, [1°14'S 132°12'E], 250 m, 10 March 1962, *Vink* BW 15285 (A, K!, L!); Sorong, Tourism Park, Klasaman, KM14, [0°55'S 131°22'E], 50 m, 25 July 1996, *Wally* 490 (K!, MAN); Sorong, Waifo village, Waigeo Island, Raja Ampat Islands, [0°14'S 130°50'E], 200 m, 25 June 1997, *Wally* 702 (K!, MAN); Sorong, Waifo Village, Waigeo Island, Raja Ampat Islands, [0°14'S 130°50'E], 400 m, 25 June 1997, *Maturbongs* RAM 506 (K!, MAN); Sorong, Mamiai, Waigeo Island, [0°20'S 131°9'E], 50 m, 25 June 1997, *Heatubun* 87 (K!, MAN); Manokwari, Cultivated, in the front of a mosque within the university area, [0°51'S 134°4'E], 100 m, 13 Aug. 1995, *Keim* AK 2 (K!); Wandammen Peninsula, Wasior Distr., Manokwari Regency, Kowi, near Wondiwoi village (formerly Kobiari Village), c. 9 km S of Wasior, [2°48'S 134°32'E], 900 m, 24 Feb. 2000, *Baker et al.* 1057 (BO, K!, MAN); Siwi village, Ransiki Sub-distr., Manokwari, [1°30'S 134°2'E], 28 Jan. 1999, *Heatubun* CH 290 (BO, FTG, K!, MAN); Raja Ampat Regency, Misool Island, Motlol, [1°53'S 129°44'E], 0 m, 22 Jan. 2002, *Heatubun* CH 358 (K!, MAN); Sorong Distr., Cape Seget, Seget Camp, [1°20'S 131°0'E], 0 m, 26 Jan. 2002, *Heatubun* CH 367 (K!, MAN); Sorong Distr., around Wavari Logging Camp, 10 km SW of Limalas village, 0 m, 21 Jan. 2002, *Wanggai* 04 (BO, K!, LAE, MAN); Sorong Distr., N Misool Island, about 20 km W of Waigama village, near Motlol Camp, [1°53'S 129°44'E], 0 m, 22 Jan. 2002, *Maturbongs* 699 (BO, K!, LAE, MAN); Sorong Distr., Warsamson, Warsamson R., [0°49'S 131°23'E], 0 m, 28 Jan. 2002, *Heatubun* 373 (K!, MAN); Tambrouw Regency, Fef Distr.; Forest above Fef, [0°48'S 132°27'E], 550 m, 26 Jan. 2013, *Baker* 1377 (BO, K!, L, MAN); **Papua Province:** Wandamen Mts, 1400 m, 8 July 1928, *Mayr* 253 (BO!); Kapaor, April 1872, *Beccari* s.n. (FI!, K!); Fak-Fak, Timika, Road to Kali Kopi from mile 38. Loc 35, [4°25'S 136°56'E], 100 m, 6 Feb. 1998, *Baker et al.* WJB 819 (BH, BO, K!, MAN); Fak-Fak, Timika, between Timika and port, peat lens (plot 22) Loc 20, [4°47'S 136°51'E], 0 m, 16 Feb. 1998, *Witono* JK 17 (BH, BO, K!, L, MAN); Jayawijaya, Snow Mts region, E of the Baliem Valley, Kab. Jayawijaya, Kec. Kurima,

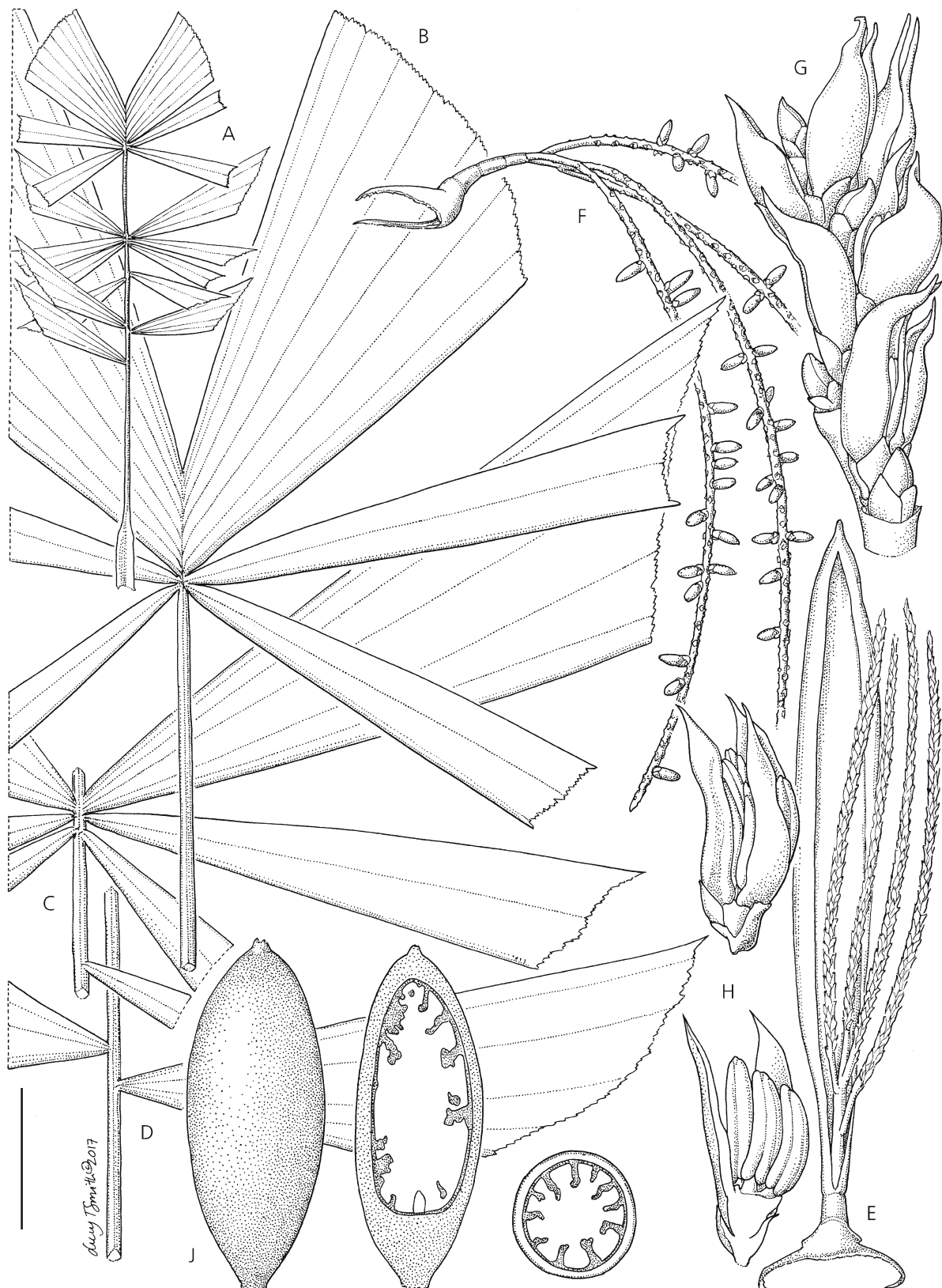
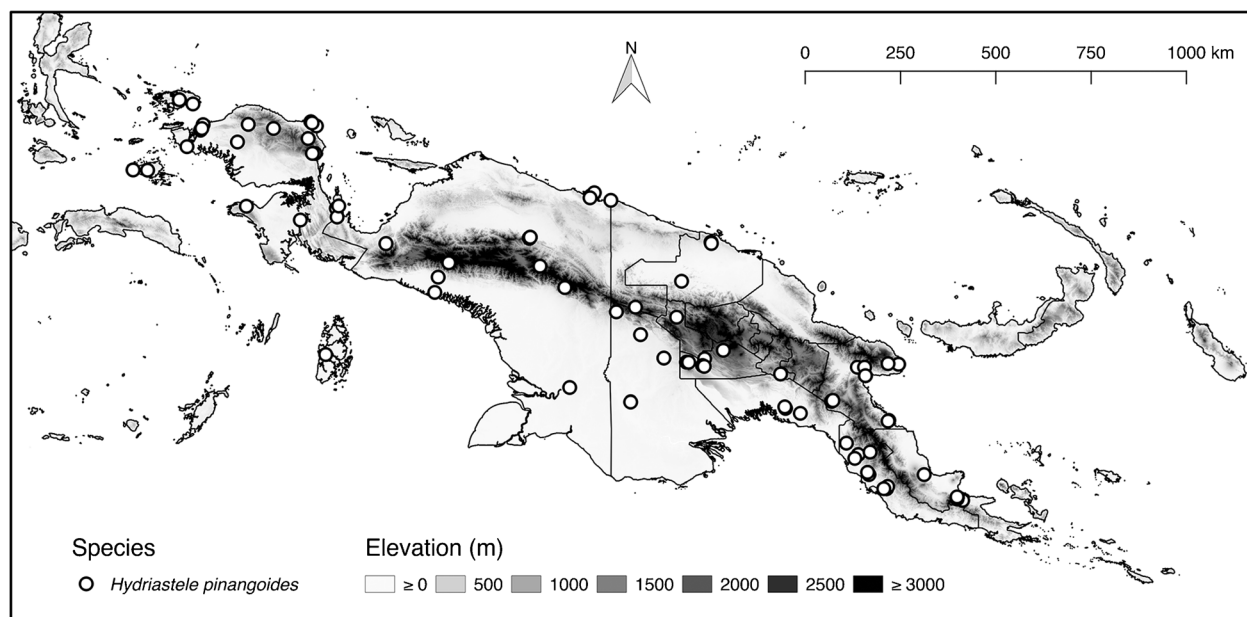


Fig. 5. *Hydiastele pinangoides*. A leaf diagram; B leaf apex; C mid-leaf portion; D leaf base; E inflorescence with attached peduncular bract; F infructescence; G portion of rachilla with triads; H staminate flower whole and in longitudinal section; J fruit whole, in longitudinal section, and in transverse section. Scale bar: A = 24 cm; B – D = 8 cm; E – F = 4 cm; G – H = 5 mm; J = 7 mm. A – H from Pullen 5767; J from Baker et al. 1057. DRAWN BY LUCY T. SMITH.



Map 5. Distribution map of *Hydrastele pinangoides*.

vicinity of Panggema village, [4°10'S 139°20'E], 1350 m, Oct. 1992, *Milliken* 1423 (K!); Mt Carstenz, [4°5'S 137°11'E], 12 Jan. 1912, *Kloss* s.n. (K!); Jayapura, North Cyclops Mts, [2°30'S 140°32'E], 150 m, 30 Jan. 2001, *Desianto* BD 03 (AAU!, K!, MAN); Cyclops Mts, on grassy slope above Ifar, [2°33'S 140°31'E], 400 m, 31 Dec. 1954, *Mackee* 1868 (L!); Fak Fak, Kaimana distr., Kroy village, [3°38'S 135°42'E], 100 m, 27 Nov. 2000, *Mehen* SM 08 (AAU, CANB, K!, LAE, MAN); 4 km SW of Bernhard Camp, Idenburg R., [3°29'S 139°6'E], 900 m, March 1939, *Brass* 13095 (A!, L!); Same locality as preceding, [3°29'S 139°6'E], 850 m, March 1939, *Brass* 13434 (A!); 6 km SW of Bernhard Camp, Idenburg R., [3°30'S 139°5'E], 1200 m, Feb. 1939, *Brass* 12872 (A!, L!); Same locality as preceding, [3°30'S 139°5'E], 1100 m, Feb. 1939, *Brass* 12953 (A!, L!); Same locality as preceding, [3°30'S 139°5'E], 1150 m, Feb. 1939, *Brass* 12998 (A!, L!); Same locality as preceding, [3°30'S 139°5'E], 1100 m, Feb. 1939, *Brass* 12952 (A!, L!); Same locality as preceding, [3°29'S 139°6'E], 1100 m, Feb. 1939, *Brass* 12997 (A!). **PAPUA NEW GUINEA. Central Province:** Mafulu, [8°33'S 147°7'E], 1250 m, Sept. 1933, *Brass* 5299 (BRI!, NY!); Dieni, Ononge Road, [8°37'S 146°50'E], 500 m, April 1933, *Brass* 3998 (A!, BO!, BRI, NY); Veimauro logging site, [9°2'S 147°3'E], 5 Sept. 1984, *Naoni* UPNG 6146 (LAE!, US); Kubuna, [8°42'S 146°45'E], 100 m, Nov. 1933, *Brass* 5631 (A!, BO!, BRI, NY); Head of Goldie R. some 4 km from the National walking track entrance, [9°21'S 147°31'E], 400 m, Aug. 1981, *Naoni* UPNG EKN s.n. (LAE!); Kairuku Sub-distr., near Mipa Airstrip, Maipa village, [8°20'S 146°33'E], 50 m, 18 Sept. 1962, *Darbyshire* 973 (CANB!); Sogeru Plateau, [9°25'S 147°26'E], 550 m, 1 Aug. 1962, *Pullen* 3460

(CANB!); Port Moresby Sub-distr., logging road between Kuriva & Veimauro Rs, [9°5'S 147°5'E], 50 m, 27 Feb. 1972, *Essig* LAE 55185 (LAE!); Port Moresby Sub-distr., Owers Corner, Kokoda Trail, [9°25'S 147°30'E], 1 March 1972, *Essig* LAE 55187 (BH, LAE!); Towards Mt Yule, 8 Dec. 1890, *Mueller* s.n. (FI!, MEL!); **Chimbu Province:** Crater Mt, Wildlife Management Area, near Haia village, Wara O., [6°43'S 145°0'E], 650 m, 3 March 1997, *Takeuchi* 11697 (A!, GH); **East Sepik Province:** Maprik Sub-distr., Prince Alexander Range, SE side of Mt Turu, near Yangoru Patrol Post, Wewak-Angoram Area, [3°37'S 143°22'E], 600 m, 19 Aug. 1959, *Pullen* 1504 (CANB!, LAE!); Ambunti Sub-distr., E ridge of Sumset (Mt Hunstein), [4°30'S 142°39'E], 1200 m, 17 Aug. 1966, *Hoogland* 11052 (CANB!, LAE!); **Gulf Province:** Purari Delta, 32.5 km E of Baimuru, [7°29'S 145°6'E], 0 m, 24 March 1974, *Croft* LAE 61091 (BH, L!, LAE!); Baimuru Sub-distr., Purari R., delta area 32.5 km E of Baimuru, [7°31'S 145°7'E], 0 m, 24 March 1974, *Croft* LAE 61085 (LAE!); Baimuru Sub-distr., Vailala R., 70 km at 110 degrees from Baimuru, 50 km at 318 degrees from Kerema, [7°38'S 145°28'E], 50 m, 4 April 1974, *Croft* LAE 61279 (BH, LAE!); **Milne Bay Province:** Raba Raba Sub-distr., Junction Ugat and Mayu Rs, near Mayu, [9°37'S 149°10'E], 350 m, 30 June 1972, *Streimann* NGF 28658 (LAE!); Same locality as preceding, [9°37'S 149°10'E], 350 m, 13 July 1972, *Streimann* NGF 28835 (BH, BRI, L!, LAE!); Maiyu R., E of Mt Suckling, [9°40'S 149°10'E], 450 m, 14 June 1972, *Pullen* 8296 (BH, CANB!, L!, LAE); N slopes of Mt Dayman, Maneau Range, [9°41'S 149°17'E], 700 m, 15 July 1953, *Brass* 23422 (A!); Raba Raba Sub-distr., Mayu camp site I, Mt Suckling, [9°37'S 149°10'E], 400 m, 9 June 1972,

Leach NGF 33288 (BH, LAE!); **Morobe Province:** Sattelberg, *Lauterbach* 564 (B†, FI!); Sattelberg, [6°29'S 147°47'E], 17 Sept. 1935, *Clemens* 135 (L!); same locality as preceding, [6°29'S 147°47'E], 13 Jan. 1936, *Clemens* 1623 (L!); same locality as preceding, [6°29'S 147°47'E], June 1936, *Clemens* 298 (L!); Kwaimengu, Aseki patrol area, [7°21'S 146°12'E], 1150 m, 23 April 1966, *Craven* 1424 (CANB!, L!, LAE!); Kumbok Mt, N of Busu R., [6°33'S 146°59'E], 300 m, 26 Jan. 1993, *Takeuchi* 8691 (A!, L!, F!); Same locality as preceding, [6°33'S 146°49'E], 400 m, 20 Jan. 1993, *Takeuchi* 8680 (A!); Between Gobadik and Gawam, [6°33'S 146°59'E], 350 m, 5 Feb. 1993, *Takeuchi* 8743 (A!); Lae Sub-distr., along Mo R., a few miles SW of Ana village, [7°49'S 147°32'E], 50 m, 29 Jan. 1972, *Essig* LAE 55167 (BH, LAE!); Lae Sub-Distr., along small stream, c. ½ mile NW of Ana Village, [7°48'S 147°33'E], 50 m, 27 Jan. 1972, *Essig* LAE 55155 (BH, LAE!); Menyanya Sub-distr., 2 miles SE of Aseki Patrol Post on Aseki-Koki Rd, [7°20'S 146°14'E], 1200 m, 9 Jan. 1972, *Essig* LAE 55140 (BH, LAE!); Huon Peninsula, Masba Creek area, c. 3 miles S of Pindiu, [6°27'S 147°31'E], 600 m, 22 May 1964, *Hoogland* 9030 (CANB!); Lae Distr., Lae Botanic Garden, [6°45'S 147°0'E], 0 m, 29 April 1974, *Katik* NGF 38000 (LAE!); Lae Subprovince, Lae Botanical Garden, [6°45'S 147°0'E], 0 m, 9 April 1978, *Young* LAE 74011 (BH, LAE!); Mumeng, Gurakor, along Bulolo Road, [6°45'S 147°0'E], 450 m, 15 Sept. 1971, *Essig* LAE 55005 (BH, LAE!); **Oro Province:** Managalase area, Near Pongani Falls SE of Sila, [9°5'S 148°23'E], 600 m, 21 Aug. 1964, *Pullen* 5767 (CANB!); **Sandaun Province:** Wutung Subprovince, Oenake Range, foothills of Mt Bougainville, [2°37'S 141°0'E], 550 m, 7 Sept. 1982, *Kerenga* LAE 56427 (L!, LAE!); Telefomin, Delongkim Creek, Old village site on bank of Delongkim Creek near junction with Hak R., [5°8'S 141°35'E], 750 m, 16 Oct. 1993, *Morren* 3059 (K!); Telefomin Subprovince, Carpentaria Exploration Company, Frieda R. Camp, [4°40'S 139°55'E], 50 m, 26 April 1978, *Essig* LAE 74050 (BH, LAE!); **Southern Highlands Province:** Lake Kutubu, side of Mendi track, [6°9'S 143°39'E], 23 May 1956, *Gray* NGF 8135 (A, BRI!, LAE!); Mount Bosavi, Kolok, near Bona Village, WWF Integrated Conservation and Development Project Area, [6°26'S 142°47'E], 700 m, 2 Feb. 1996, *Baker et al.* WJB 616 (BH, K!, LAE!); near Waro airstrip, 20 km SSW of Kutubu, [6°31'S 143°10'E], 500 m, 15 Oct. 1973, *Jacobs* s.n. (L!); Lake Kutubu, Wanunuku, near to Tugiri, WWF Integrated Conservation and Development Project Area, [6°21'S 143°13'E], 900 m, 12 Feb. 1996, *Baker et al.* 665 (BH, K!, LAE!); Waro and Ubogo Villages, Kutubu distr., [6°32'S 143°12'E], 450 m, 14 Sept. 1993, *Takeuchi* 9242 (A, LAE!); Mt Bosavi, Northern side, [6°26'S 142°50'E], 1000 m, 23 Oct. 1973, *Jacobs* 9405 (L!, LAE!); **Unknown Province:** Mt Belford, 1100 m, *Armit* s.n. (MEL!); San Giuseppe,

10 Nov. 1892, *Loria* s.n. (FI!); **Western Highlands Province:** Kopiago Sub-distr., Batane, off Tari Rd, 9 miles from Kopiago, [5°22'S 142°33'E], 1350 m, 30 Oct. 1968, *Womersley* NGF 37233 (LAE!); **Western Province:** Palmer R., 2 miles below junction with Black R., [5°47'S 141°42'E], July 1936, *Brass* 7201 (A!, BRI!); North Fly Distr., Junction of Harvey Creek and Ok Mani R., 10 km WNW of Tabubil, [5°14'S 141°8'E], 750 m, 14 Dec. 2000, *Baker et al.* 1137 (K!, LAE!); Kiunga, Fly R. (Bulge), [7°2'S 140°2'E], 200 m, 28 March 1968, *Millar* NGF 35430 (A, BH, BO, BRI, CANB, K!, L!, LAE!, NSW); Nomad Subprovince, across R., 2 km from Nomad, [6°20'S 142°15'E], 18 April 1978, *Essig* LAE 74029 (BH, LAE!); Same locality as preceding, [6°20'S 142°15'E], 152 m, 18 April 1978, *Essig* LAE 74028 (BH, LAE!); Kiunga, 50 km NE of Ningerum, [7°22'S 141°28'E], 650 m, HYN 212 (LAE!).

CULTIVATED. INDONESIA: Bogor Botanic Garden ex New Guinea, X D 114 (FI!). **UNITED STATES. HAWAIIAN ISLANDS:** Kauai, 20 Aug. 2002, *Chapin* 80 (K!, PTBG).

HABITAT. The understorey or midstorey of lowland or premontane rainforest on well-drained to water-logged soil, sometimes on hill sides and ridge crests. This species grows in primary or secondary forests on a range of soil types including clay, limestone karst and volcanic soils; 0 – 1350 m elevation.

VERNACULAR NAMES AND USES. A dozen local names are known for this species; *tapolo* (Pawaian), *gilaia* (Waskuk), *kobu* (Wagu), *ugarreh* (Daga), *mara* (Ambakanjah), *kupal* (Gal), *tegradri* (Irarutu), *bim/kabim* (Matbaat), *yali* (Biyal), *seraach* (Maibrat), *séméngbrè* (Hattam). Names of unknown dialects from Papua New Guinea; *manggam* (Maprik), *tooma* (Western Province).

The stems are used for spears and spearheads (Sandaun and Chimbu Provinces, Papua New Guinea), for arrowheads (Papua Province, Indonesia) and for sewing thatch and as bow material (Papua Province, Indonesia). The foliage is utilised as roofing material and the palm as a whole, as an ornamental (Papua Barat Province, Indonesia). This palm is also used for magic (Papua Province, Indonesia).

CONSERVATION STATUS. Least Concern (LC). This species has a large EOO (> 1,000,000 km²) and the relatively small AOO (300 km²) is thought to stem from the fact that *Hydriastele pimangoides* has still not been collected from many localities where it may very well occur.

NOTES. This variable species is distinguished from other members of the *Nengella* group mainly by its ruminant endosperm and spirally arranged triads with distinct alternating verticils of 3 in combination with broadly cuneate leaflets arranged in 2 – 4 distinct groups. Rarely, the leaflets can be ± regularly arranged and ± narrowly cuneate prompting comparison with *Hydriastele divaricata* and *H. simbiakii*, but *H. divaricata* has divaricate leaflets and inflorescences with 1 – 2 rachillae, whereas *H. simbiakii* has more numerous

leaflets and flexible, often leaning, stems. *Hydriastele flabellata* can have similar looking foliage but this species has a spicate and relatively short inflorescence (more rarely with 2 rachillae or up to 3 rachillae known from one cultivated specimen) often with conspicuously cucullate rachilla bracts subtending spirally arranged triads with more or less well-defined verticils, and seeds with homogeneous endosperm.

We concur with the taxonomic changes for this species established by Essig & Young (1985), who formally synonymised multiple species thereby broadly circumscribing *Hydriastele pinangoides*. Here, we expand the delimitations of this variable species further by tentatively placing *H. affinis*, *H. micrantha* and *H. cyclophensis* in synonymy under *H. pinangoides*. We have opted for this solution because the morphology displayed by these species is consistent with *H. pinangoides*, as circumscribed here, although they are notable for their leaves which consist of more or less regularly arranged, narrowly cuneate leaflets. However, we have seen evidence of leaflet arrangement transitioning between forms collected from a single area (e.g. *Brass* 13095 [regularly arranged leaflets]; *Brass* 12952 and *Brass* 12998 [slightly irregularly arranged leaflets]), which supports the suggestion that leaflet arrangement can be plastic within this group. Two other collections (*Essig* LAE 55185; *Koster* BW 13879) further bridge the gap between the \pm regularly arranged, narrowly cuneate leaflet form and the irregularly arranged, broadly cuneate leaflet form. Both specimens display variably cuneate leaflets with one group present in the middle of the rachis, but the grouping is less pronounced than that which is seen in a typical *H. pinangoides* specimen. On a nomenclatural point, we have inferred that the species epithet coined in the combination *Gronophyllum cyclopense* Essig & B. E. Young, a *nomen novum* to replace *Nengella mayrii* (Burret) Burret by Essig & Young (1985), appears to have been chosen in error, because the type of this name was collected in the Arfak Mountains, not the Cyclops Mountains. At the time, the name *Gronophyllum mayrii* (Burret) H. E. Moore already existed (based on a specimen that was collected in the Cyclops Mountains) and the recombination of *Nengella mayrii* in *Gronophyllum* required a *nomen novum*. In choosing the epithet *cyclopense*, Essig & Young appear to have confused the type localities of *Gronophyllum mayrii* and *Nengella mayrii*. Unfortunately, we have not been able to locate the type specimen of *H. cyclophensis*. We believe that it is extant at BO because it is recorded as such in the BO specimen database. However, the specimen could not be located by curators there. Its place-

ment as a synonym of *H. pinangoides* is inferred from the species protologue (Burret 1933).

6. *Hydriastele simbiakii* Heatubun, Petoe & W. J. Baker sp. nov. Type: Indonesia, Papua Barat Province, Tambrauw Regency, Fef Distr., Sungai Sujak (Sungai Eyei), river bank near bridge, 23 Jan. 2013, Baker et al. 1365 (holotype K!, isotypes AAU!, BO!, LI, MAN!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77175855-1>

Clustering, very slender rheophytic palm to 5 – 6 m tall, bearing c. 6 – 7 leaves per crown. *Stem* 1.5 – 2.5 cm in diam., shorter stems erect, longer stems leaning over river, clumps often including numerous stems; internodes 3.5 – 8 cm long, smooth, green turning brown. *Leaves* 64 – 104 cm long including petiole; sheath 26 – 36 cm long, clothed with small purple lacerate-peltate scales, crownshaft 34 – 44 \times 3.5 – 4.5 cm; petiole 12 – 25 cm long, indumentum as sheath and additionally with patches of coarse grey to black scales; rachis c. 40 – 60 cm long, slightly arching, indumentum as petiole; leaflets 14 – 16 each side of rachis, regularly arranged, alternate to opposite, borne 0.5 – 3.5 cm apart, linear, obliquely praemorse apically, mid green adaxially and paler green abaxially, leathery; basal leaflets 15 – 20 \times 0.8 – 1 cm, single-fold; middle leaflets 30 – 35 \times 1 – 1.8 cm, single-fold; terminal leaflets 23 – 25 \times 2 – 3 cm, comprising c. 5 folds. *Inflorescences* 13 – 17 cm long including 1.5 – 3 cm green to yellow peduncle, branched to 1 order; prophyll c. 17 \times 3.5 cm, lepidote near apex; rachillae 7 – 16 \times 0.2 – 0.3 cm, 3 – 4 per inflorescence, scarlet; triads spirally arranged with alternating verticils of 3. *Staminate flowers* 10 – 11 \times 5 – 6 mm at anthesis, pink; calyx 1.5 – 2.6 \times 1.7 – 2 mm, irregularly 3-lobed; petals 7.2 – 8 \times 3.5 – 5 mm, lanceolate; stamens 6; filaments c. 0.8 – 1 \times 1 mm; anthers 3.75 – 5 \times 1.5 – 2 mm; pistillodes not seen. *Pistillate flowers* 4 – 5.5 \times 2 – 3 mm after anthesis, sepals 2.5 – 3 \times 2 – 3 mm, broadly imbricate, scarlet; petals 4 – 5.5 \times 2 – 2.5 mm, broadly imbricate basally, conspicuously acute and valvate apically, white to pink; ovary c. 3 \times 1.8 mm, ovoid; staminodes not seen. *Fruits* 8 – 12 \times 4 – 5 mm, ellipsoid, red. *Seeds* 7 – 8 \times 4 mm, ellipsoid; endosperm ruminant (Fig. 6).

RECOGNITION. Distinguished from all other species in the *Nengella* group by forming clusters of pliable stems, the longer ones of which are leaning, by displaying 14 – 16 regularly arranged, linear leaflets per side, and by being restricted to growing on riverbanks within the flood-zone.

DISTRIBUTION. Known only from the type locality in the Tamrau Mountains in the central northern portion of the Bird's Head Peninsula (Map 6).

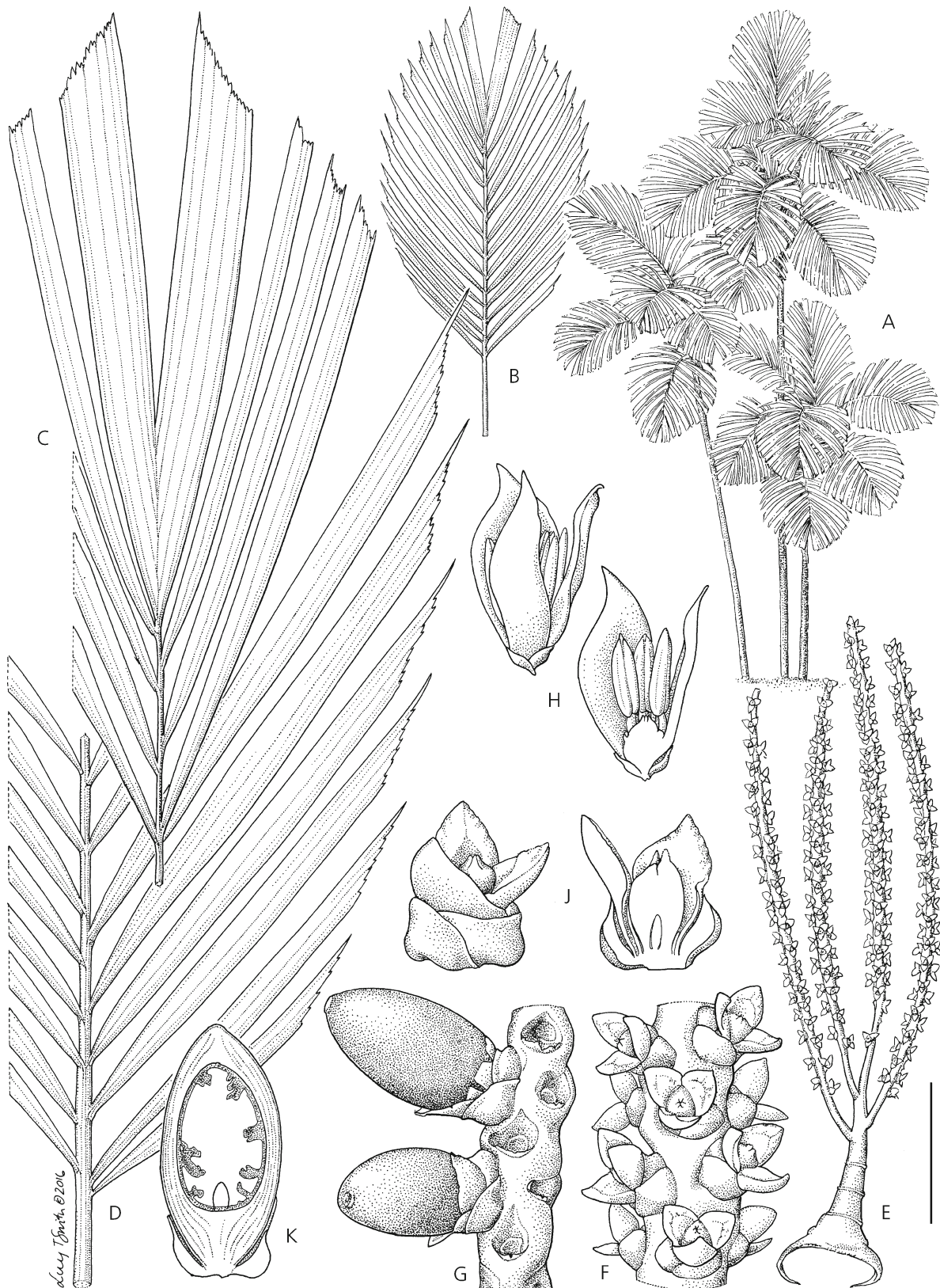
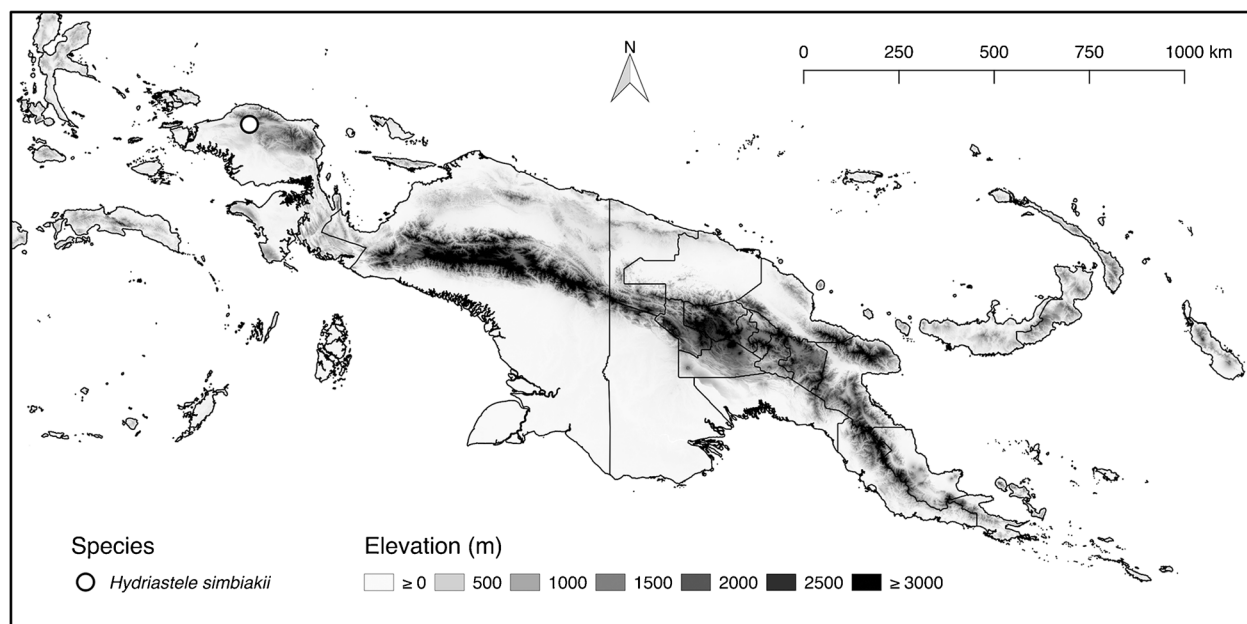


Fig. 6. *Hydiastele simbiakii*. A habit; B leaf diagram; C leaf apex; D leaf base; E inflorescence; F portion of rachilla with pistillate flowers; G portion of rachilla with fruits; H staminate flower whole and in longitudinal section; J pistillate flower whole and in longitudinal section; K fruit in longitudinal section. Scale bar A = 60 cm; B = 24 cm; C – D = 6 cm; E = 4 cm; F – H = 8 mm; J = 4 mm; K = 7 mm. All from Baker *et al.* 1365. DRAWN BY LUCY T. SMITH.



Map 6. Distribution map of *Hydriastele simbiakii*.

SPECIMENS CITED. INDONESIA. Papua Barat Province: Tambrauw Regency, Fef Distr., Sungai Sujak (Sungai Eyei), river bank near bridge, [0°50'S 132°30'E], 400 m, 23 Jan. 2013, *Baker et al.* 1365 (AAU!, BO!, K!, L!, MAN!).

HABITAT. Steep riverbanks in the flood zone c. 1 – 2 m above fast flowing water, on rocky river margin over limestone; 400 m elevation.

VERNACULAR NAMES AND USES. No local names are recorded for this species. The stems are used for making spears.

CONSERVATION STATUS. Data deficient (DD). This species could be threatened as a new road has been constructed through the only known locality where it occurs, and there is a potentially increasing deforestation threat for the area in the future. Even so, more data are still needed about the distribution and abundance of this species before an assessment can be made.

NOTES. *Hydriastele simbiakii* is the only rheophytic species in the *Nengella* group, although a second rheophytic species in the genus, *H. rheophytica*, a member of the *H. wendlandiana* group (Dowe & Ferrero 2000b; Petoe *et al.* 2018), is known. Although closely related to *H. pinangoides* and other species with ruminant endosperm, it is immediately distinguished by its ecological preferences (scattered clumps of this species are restricted to a strictly riverine habitat) and by its leaves which have numerous regularly arranged, linear leaflets. *Hydriastele pinangoides* very rarely displays a regularly pinnate lamina.

The species is named for Victor I. Simbiak, botanist at Universitas Papua, who drew WJB's attention to this palm in the field in the Tamrau Mountains.

7. *Hydriastele splendida* Heatubun, Petoe & W. J. Baker sp. nov. Type: Indonesia, Papua Province, Mimika Regency (Previously Fakfak Regency), Timika, PT. Freeport Indonesia Area of Work, Km 63 road to Tembapapura, 7 Feb. 1998, *Baker et al.* 820 (holotype K!, isotypes AAU!, BH!, BO!, L!, MAN!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77175863-1>

Clustering or solitary, very slender palm to 4 m tall, bearing c. 4 – 5 leaves per crown. *Stem* 1.5 – 2 cm in diam.; internodes 6 – 15 cm long, smooth, green, with patches of small lacerate-peltate purple to black scales. *Leaves* c. 100 cm long including petiole, with conspicuous dense indumentum of scurfy, white, caducous scales (resembling vermiculite) throughout petiole and rachis, and extending on to adaxial and abaxial surface of lamina veins and throughout the sheath, scales blackening and sometimes lost with age; sheath c. 30 cm long, lepidote beneath the scurfy, white scales, crownshaft c. 50 cm long; petiole c. 20 cm long, indumentum as sheath; rachis c. 46 cm long, indumentum as sheath; lamina c. 80 × 40 cm, entire bifid with apical cleavage c. 30 cm deep, obovate, distal half of margin rounded and praemorse, leathery, bronze-pink or red when newly emerged. *Inflorescences* c. 18 cm long including c. 2 cm peduncle with indumentum as upper internodes, branched to 1 order; prophyll not seen; rachillae c. 11 – 16 × 0.2 cm, 3 – 4 per inflorescence, scarlet; rachilla bracts inconspicuous; triads spirally arranged with alternating verticils of 3. *Staminate*

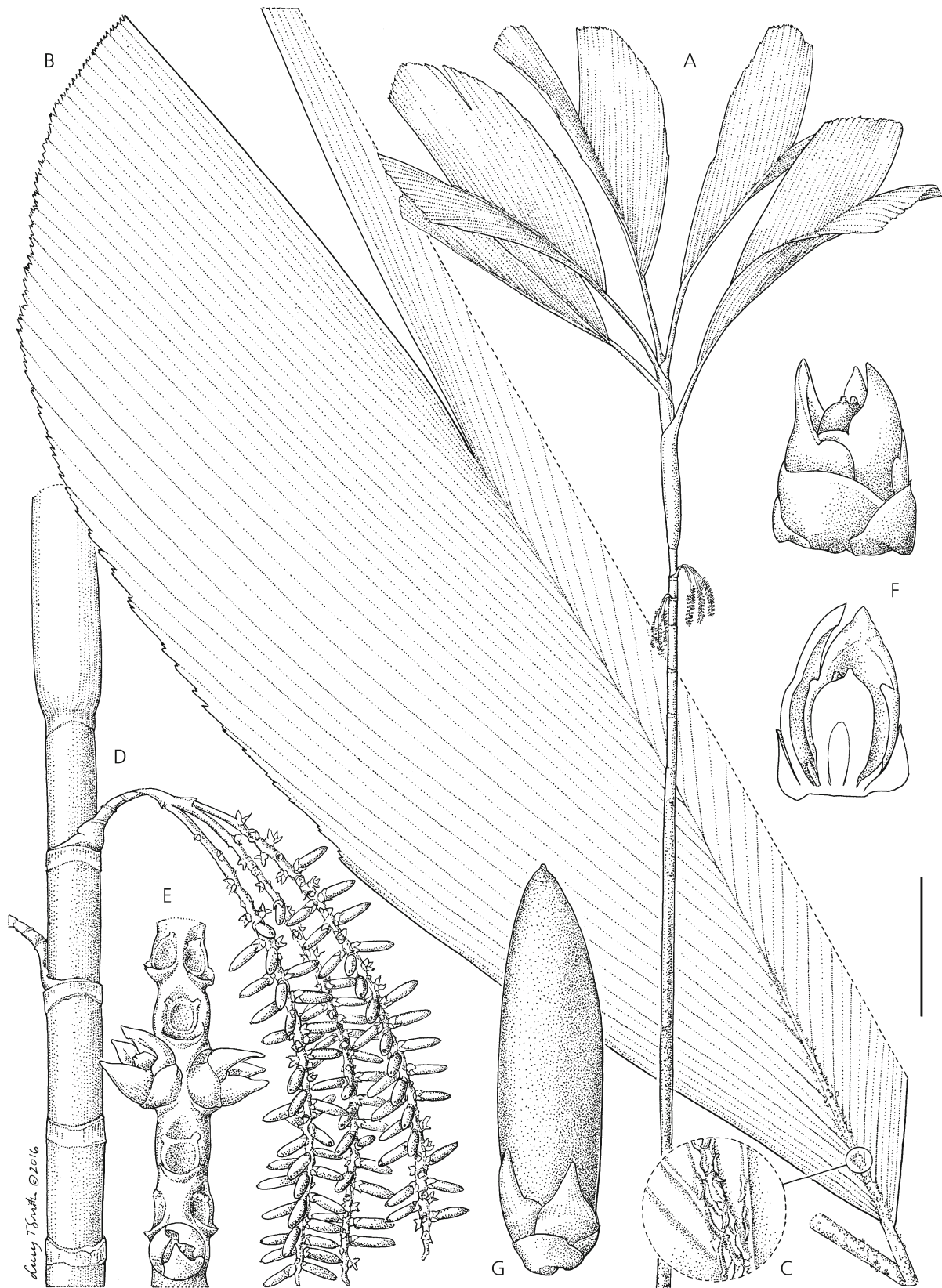
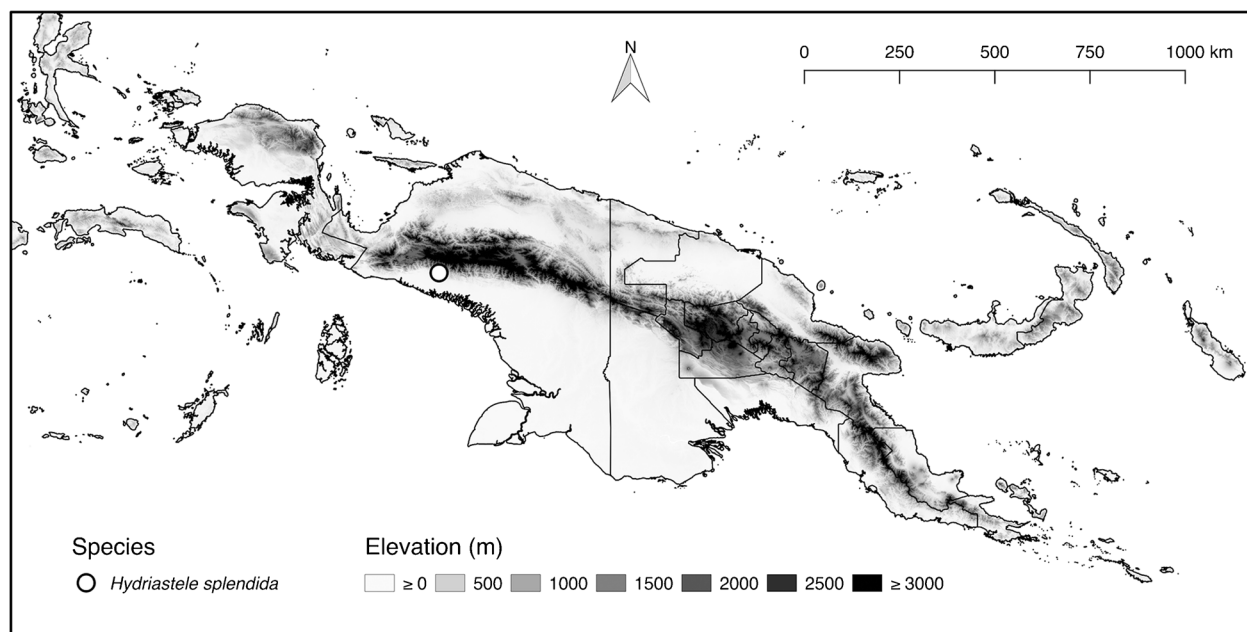


Fig. 7. *Hydiastele splendida*. A habit; B leaf; C detail of leaf indumentum; D portion of stem and sheath with attached infructescence; E portion of rachilla with pistillate flowers; F pistillate flower whole and in longitudinal section; G fruit. Scale bar A = 40 cm; B = 8 cm; C = 1.5 cm; D = 4 cm; E = 7 mm; F = 3.3 mm; G = 5 mm. All from Baker et al. 820. DRAWN BY LUCY T. SMITH.



Map 7. Distribution map of *Hydriastele splendida*.

flowers not seen. *Pistillate flowers* c. 4–5 × 3 mm after anthesis (when dry), crimson; sepals c. 2 × 3 mm, rounded, imbricate; petals c. 4 × 2 mm, consisting of a basal rounded portion c. 2 mm long, imbricate, and an upper triangular portion c. 2 mm long, valvate; ovary c. 3.5 × 2 mm, ellipsoid; staminodes 3, c. 0.5 mm long triangular and very thin. *Fruits* c. 1 cm long, cylindrical, pink. *Seeds* c. 7 × 1.5 mm (when dry), turbinate, endosperm ruminant (Fig. 7).

RECOGNITION. This species is distinguished by its entire bifid leaves in combination with inflorescences with 3–4 rachillae bearing triads in alternating verticils of 3, and seeds with ruminant endosperm.

DISTRIBUTION. Known only from the type locality in Papua Province (Indonesia) on the lower slopes of the Mt Jaya region (Dransfield *et al.* 2000; Map 7).

SPECIMENS CITED. INDONESIA. Papua Province: Mimika Regency (Previously Fakfak Regency), Timika, PT. Freeport Indonesia Area of Work, Km 63 road to Tembagapura, [4°21'S 136°58'E], 435 m, 7 Feb. 1998, Baker *et al.* 820 (AAU!, BH!, BO!, K!, L!, MAN!).

HABITAT. The understorey of heath forest on outwashed sands and gravels on steep and mossy slopes with many fallen trees, in areas of high rainfall (Dransfield *et al.* 2000); 435 m elevation.

VERNACULAR NAMES AND USES. None known.

CONSERVATION STATUS. Data deficient (DD). More data are needed about the distribution and abundance of this species.

NOTES. *Hydriastele splendida* is a distinctive and exceptionally beautiful species (hence the species epithet). In habit and reproductive morphology, it is

similar to *H. pinangoides*, to which it is undoubtedly closely related. However, *H. splendida* bears entire leaves, which are few in number and display a deep cleft in the broadly rounded, praemorse distal margin. The species can be confused with entire-leaved forms of *H. flabellata*, but *H. flabellata* differs significantly in its spicate inflorescences (occasionally with 2 rachillae or up to 3 rachillae known from cultivation) with spirally arranged triads with ± well-defined verticils and seeds with homogeneous endosperm.

Hydriastele splendida appears to be already well established in cultivation, often erroneously named as *H. flabellata*.

Acknowledgements

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