

Revision of the Genus *Pandanus* Stickman, Part 13

Pandanus in the Northern Territory, Australia

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IN PREVIOUS LITERATURE there have been but few species of *Pandanus* reported for the Northern Territory, Australia. These were *P. spiralis* R. Br., *P. de-Lestangii* Martelli, *P. Basedowii* C. H. Wright, *P. Whitei* Martelli, and *P. Solms-Laubachii* F. Muell.

The first, *P. spiralis* R. Br., was described from the type collection made on the Wellesley

Group, Island Bay, Gulf of Carpentaria, in Queensland. Later collections to match it have not been seen, and all those so labeled from the Northern Territory seem to be misdetermined.

The second, *P. de-Lestangii* Martelli, is well known from its type locality on the Gregory River, which flows into the Gulf of Carpentaria in northwest Queensland. A recent collection of a similar plant from Arnhem Land is here described as new. Records of *P. de-Lestangii* (under the name *P. aquaticus* F. Muell.) pub-

¹ B. P. Bishop Museum, Honolulu 17, Hawaii, U. S. A. Manuscript received June 28, 1961.

KEY TO SPECIES

- Carpels 1-2, (section *Microstigma*),
 Drupes 3.9-4.4 cm long, 8-12 mm wide, narrowly oblanceoid; (stigmas when 2 approximate); leaves 3.9-4.5 cm wide.....1. *P. Spechtii*
 Drupes 4.3-6.4 cm long, 3.1-5.5 cm wide, suborbicular-pyriform; (stigmas when 2 remote); leaves 1-3.9 cm wide.....5. *P. Basedowii*
- Carpels 7-20; phalange apex convex,
 Intercarpellary apical sinuses 0-0.5 mm deep, mostly merely a tessellate marking, (section *Eydouxia*),
 Phalange sides rounded and smooth; stigmas 3-4 mm long.....4. *P. integer*
 Phalange sides with numerous longitudinal valleys and rounded ridges; stigmas 1-2.5 mm long.....2. *P. arnhemensis*
- Intercarpellary apical sinuses 1.5-12 mm deep, conspicuous,
 Phalanges 5-6.3 cm long, the apex mostly low convex; central apical sinuses 1.5-7 mm deep,
 Phalanges 5.9-6.3 cm long, the apex rounded convex; stigmas 4-5 mm long, (section *Eydouxia*)3. *P. convexus*
 Phalanges 5-5.7 cm long; stigmas 1-2 mm long, (section *Pandanus*),
 Phalange apex low convex; carpels 7-8; central apical sinuses 4-7 mm deep.....10. *P. yirrkalensis*
 Phalange apex semiorbicular; carpels 12-20; central apical sinuses 3-4 mm deep.....7. *P. latifructus*
- Phalanges 6.5-7.7 cm long, (section *Pandanus*),
 Phalanges 6.5-6.8 cm long, the apex truncate or subtruncate; carpel sides smooth and gently convex; central apical sinuses 1-3 mm deep; leaf apex unarmed.....8. *P. semiarmatus*
 Phalanges 7.1-7.7 cm long, the apex semiorbicular; carpel sides with longitudinal ridges and valleys; leaf apex serrulate,
 Central apical sinuses 2-4.5 mm deep; phalanges 7.1-7.5 cm long; near the base the leaf margins with prickles 4-6 mm long.....9. *P. thermalis*
 Central apical sinuses 7-12 mm deep; phalanges 7.5-7.7 cm long; near the base the leaf margins with prickles 0.3-1.3 mm long.....6. *P. darwinensis*

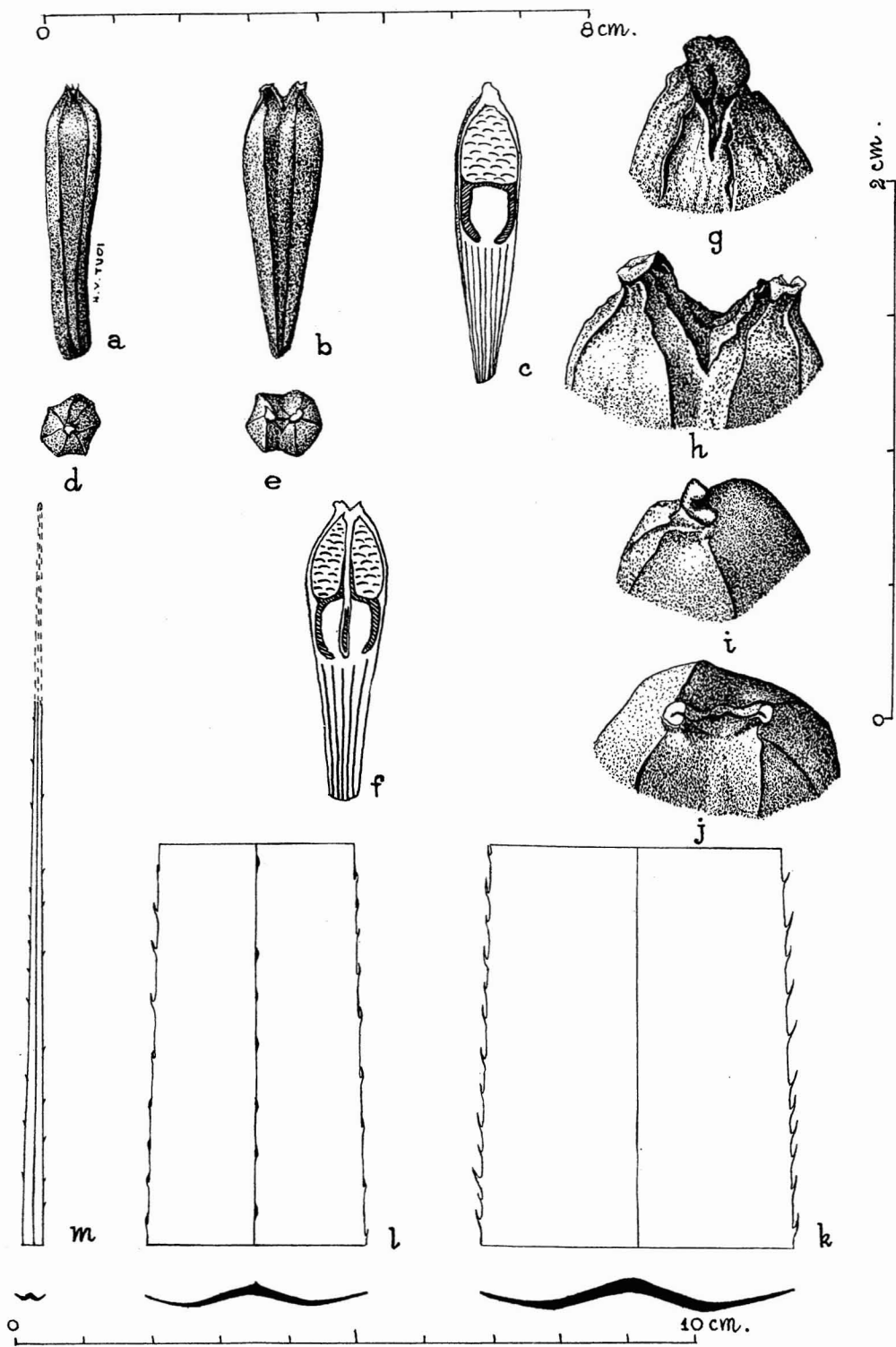


FIG. 139B. *Pandanus Spechtii* St. John, from holotype. *a, b*, Drupes, lateral view, $\times 1$; *c*, drupe, longitudinal median section, $\times 1$; *d, e*, drupes, apical view, $\times 1$; *f*, 2-celled drupe, longitudinal median section, $\times 1$; *g, h, i, j*, carpel apices and stigmas, oblique view, $\times 4$; *k*, leaf base, lower side, $\times 1$; *l*, leaf middle, lower side, $\times 1$; *m*, leaf apex, lower side, $\times 1$.

lished by Blake (1954: 130) indicate its occurrence from the Gregory River, Queensland, to the Daly River, Northern Territory. The specimens so determined from the Katherine River and from the Daly River are now placed in *P. Spechtii* St. John.

The report by Martelli (1933: 24) of the Queensland species *P. Whitei* Martelli from Darwin, is now to be discounted, as this collection by Allen is here described as the new *P. darwinensis* St. John.

P. Solms-Laubachii F. Muell. was based on type material from the Endeavour River, north Queensland, collected by Persich. With this, Warburg (1900: 46) identified the collection, Fr. Shultz 613, from Nord-Australien. This locality may have been in the Northern Territory or in Queensland. No material identical with this species has been seen by the writer from the Northern Territory. The Schultz specimen was doubtless in the Berlin herbarium, but its classification has not been verified. For the present, the record of *P. Solms-Laubachii* for the Northern Territory is to be considered doubtful.

With the benefit of more collections and study, there can now be recorded for the Northern Territory 10 species. They occur at localities all the way from the eastern to the western borders, but mostly near the northern edge of the continent, especially in Arnhem Land. Only in the southwestern part, in the Kimberley district, does the genus approach the southern boundary of the territory. Here occurs *P. convexus* St. John, and it crosses the boundary and is also found in Western Australia.

Of special interest is *P. Basedowii* C. H. Wright. This occurs along valley bluffs in the interior of Arnhem Land in very arid habitats. The phalanges are from 4.3 to 6.4 cm long, suborbicular pyriform. The great part of their contents is of dry, medullary pith, and in consequence, these large phalanges weigh $\frac{1}{2}$ ounce or less apiece. It is thought that wind is the principal agent for their seed dispersal.

1. *Pandanus Spechtii* sp. nov. (sect. *Microstigma*)

Figs. 139B, 140

DIAGNOSIS HOLOTYPI: Arbor 4 m alta 15 cm diametro, cortice griseo-brunneo exlaevibus et in

parte 60 cm infera cum spinulis [radicillis adventiviis], cum radicibus fulturosis, foliis 1.04–1.27 m longis 3.9–4.5 cm latis coriaceis supra midnervum late 1-sulcatis 2-plicatis in sectione mediali cum 43 nervis parallelis secundariis in quoque medio in tertia infera nervis tertialis conspicuis et oblongis longis formantibus, lamina gladiformati et ex basi sensim in apice trigono subulato diminuenti eo in puncto 10 cm ex apice 3.5 mm lato, basi amplexicauli et inermi sed ex 6–7 cm marginibus cum aculeis 1–2.5 mm longis 2–8 mm separatis subulatis subrectis adscendentibus apicibus rubris, midnervo infra ex 20 cm cum aculeis 2 mm longis 12–15 mm separatis acicularibus valde adpressi-adscendentibus rubris, in sectione mediali marginibus cum aculeis 1.5–3 mm longis 6–12 mm separatis subulatis valde adpresse adscendentibus, midnervo infra angusto salienti cum aculeis simulantibus 2.5–3 mm longis 8–16 mm separatis, proxima apicem marginibus et midnervo infra cum serulis 0.2–0.3 mm longis 5–15 mm separatis brunneis, syncarpio in pedunculo folioso, syncarpio 18 cm diametro subgloboso, drupis multis 39–44 mm longis eis 1-carpellatis numerosis 8–11 mm latis 6–9 mm crassis lineari-oblanco-loideis parte $\frac{1}{4}$ supera libera 5–6-angulosa lateribus laevibus subcurvatis sublucidis apice pyramidalis sed obliquo, drupis 2-carpellatis paucis simulantibus sed 10–12 mm latis apice bilobato sinu 2 mm profundo sed in parte grandi cum stigmatate occupato, stigmatate 1.5–2 mm longo late ellipsoideo vel obovato sulcato papilloso obscure brunneo terminali vel obliquo quando 2 centripetali, endocarpio minime supramediis 9 mm longo osseoso mahogani-colorato apice subtruncato lateribus lateralibus 1 mm crassis intra lucidis, semine 6 mm diametro doliformato, mesocarpio apicali ellipsoideo infra truncato cum membranibus transversis fortibus pallidis multis, mesocarpio basali fibroso et carnoso.

DESCRIPTION OF ALL SPECIMENS EXAMINED: Tree 4–6 m tall, with or without stilt roots; trunk 15 cm in diameter; bark gray-brown and rough with leaf scars, and on the lower 60 cm with short needle growths [adventitious rootlets] from the scars; leaves 1.04–1.3 m long, 3.9–5 cm wide, coriaceous, broadly channeled above the midrib, with 2 lateral pleats, at midsection with 43 secondary veins on each side, in the

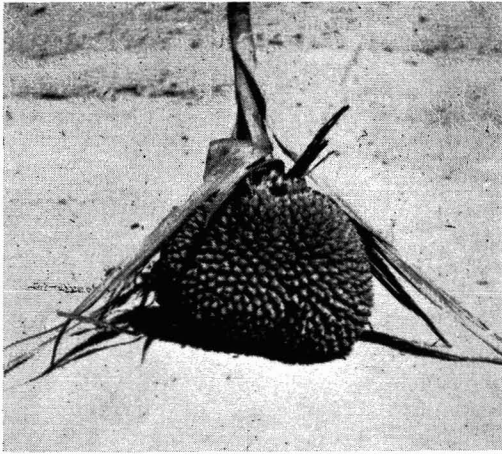


FIG. 140. *Pandanus Spechtii* St. John, from holotype. Syncarp, lateral view. Photo by R. L. Specht.

lower third on both sides the tertiary cross veins conspicuous, forming elongate, oblong meshes, blade swordlike and from the base gradually tapering to the subulate, trigonous apex, this at the point 10 cm down 3.5 mm wide, the base amplexicaul and unarmed, but beginning 6–7 cm up the margins with prickles 1–2.5 mm long, 2–8 mm apart, subulate, nearly straight, ascending, red-tipped; the midrib below unarmed for 20 cm, then with prickles 2 mm long, 12–15 mm apart, acicular, closely appressed ascending, red; at midsection the margins with prickles 1.5–3 mm long, 6–12 mm apart, subulate, closely appressed ascending; the midrib below narrow, salient, with similar prickles 2.5–3 mm long, 8–16 mm apart; near the apex the margins and midrib below with serrulations 0.2–0.3 mm long, 5–15 mm apart, brownish; syncarp borne on a leafy peduncle; syncarp about 15–18 cm in diameter, subglobose; drupes numerous, 39–44 mm long, the abundant 1-celled ones 8–14 mm wide, 6–12 mm thick, linear-oblongoid, upper $\frac{1}{4}$ free, 5–6-angled, the sides smooth, gently curving, somewhat shiny, the apex pyramidal but the actual summit oblique; the infrequent 2-celled drupes similar, but 10–18 mm wide, the apex bilobed, the cleft 2 mm deep, but most of it occupied by the stigmas; stigma 1.5–2 mm long, broadly ellipsoid to obovate, creased, papillose, dark brown, terminal or oblique from the summit, when 2 centripetal; endocarp slightly supramedian, 9 mm long, bony, mahogany-

colored, the apex subtruncate, the lateral walls 1 mm thick, the inner surface shining; seed 6 mm in diameter, barrel-shaped; apical mesocarp ellipsoid, truncate below, with numerous strong, transverse, pale membranes; basal mesocarp fibrous and fleshy.

HOLOTYPE: Australia, Northern Territory, Arnhem Land, Oenpelli ($12^{\circ} 18' S. lat., 133^{\circ} 4' E. long.$), along stream at foot of sandstone scarp, 2 Oct. 1948, R. L. Specht 1,120 (BRI). Isotypes: (AD, Lae, SYD).

SPECIMENS EXAMINED: Northern Territory: Katherine, sandy bank of Katherine River, 100 m alt., 23 June 1946, S. T. Blake 16,085 (BRI); Daly River, $14^{\circ} 5' S., 131^{\circ} 15' E.$, close to edge of water (dry season), 1 July 1946, S. T. Blake 16,256 (BRI).

DISCUSSION: *P. Spechtii* is a member of the section *Microstigma*, as is its closest relative, the Australian species *P. de-Lestangii* Martelli, which species has the drupes 31–35 mm long; endocarp supramedian, leaves 1.8–2.7 m long, near the base 7.5–8 cm wide, at midsection with 62 secondary parallel veins in each half, near the base the margins with prickles 2.5–3.5 mm long, 5–12 mm apart, arcuate subulate. *P. Spechtii* has the drupes 39–44 mm long; endocarp median; leaves 1.04–1.27 m long, near the base 3.9–4.5 cm wide, at midsection with 43 secondary parallel veins in each half, near the base the margins with prickles 1–2.5 mm long, 2–8 mm apart, subulate, nearly straight.

This new species is named in honor of Prof. Raymond Louis Specht of the University of Melbourne, who made noteworthy collections of *Pandanus* while on the Arnhem Land Expedition in 1948.

2. *Pandanus arnhemensis* sp. nov. (sect. *Pandanus*)

Fig. 141

DIAGNOSIS HOLOTYPI: Trunco foliisque incognitis; phalangibus 5–5.4 cm longis 5.3–5.4 cm latis 4.8–4.9 cm crassis quadrato-cuneatis plerumque 5-angulosis suturis lateralibus angustis sed distinctis in parte supera $\frac{1}{2}$ libera, superficie brunneo-stramineo lucido, apice subconvexo, sinibus apicalibus centralibus 0–0.5 mm profundis paene evidentibus, carpello quoque cum

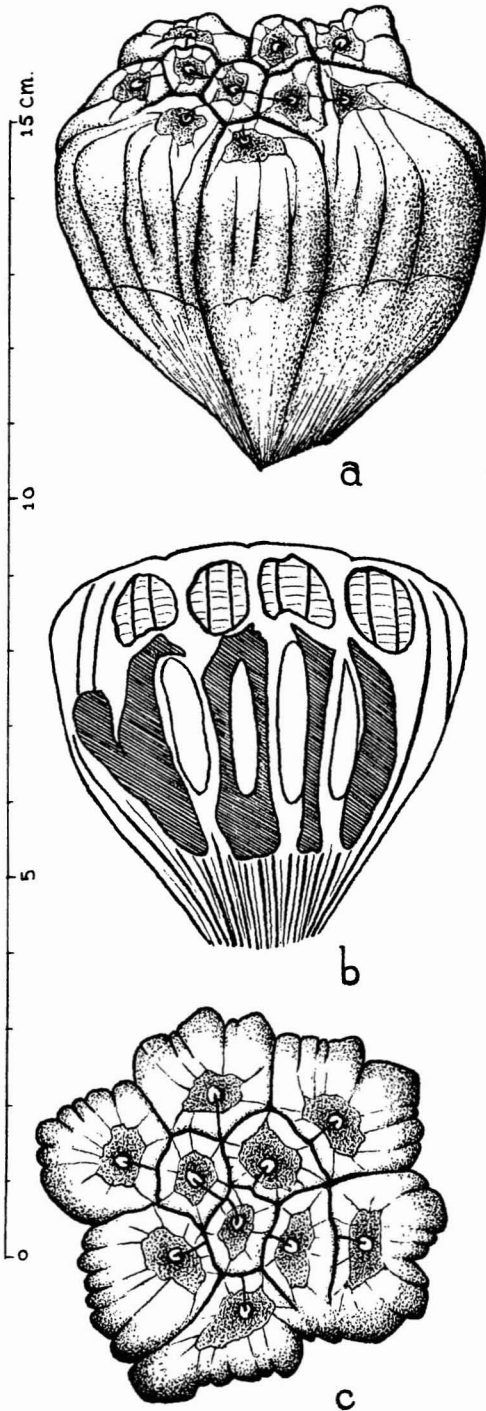


FIG. 141. *Pandanus arnhemensis* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$.

2–6 sulcis angustis deinde phalangibus interobseratis, carpellis 9–10, apicibus carpellarum centralium subconcauis et in eo brunneo-maculatis et frequenter cum fissuris vel dorsis, stigmatibus 1–1.5 mm longis suborbicularibus sulcatis centripetalibus, endocarpio centrali 3.1 cm longo solido osseoso marginibus lateralibus 5–7 mm crassis, seminibus 21 mm longis 4 mm diametro ellipsoideo, mesocarpio apicali in carpello quoque caverna rotundata 8–12 mm longa fibrosa et cum membranis medullosis formanti, mesocarpio basali fibroso et carnoso.

DESCRIPTION OF ALL SPECIMENS EXAMINED:

Trunk and leaves unknown; syncarps "about 20×12.5 cm., probably ovoid," phalanges 5.1–5.4 cm long, 5.1–5.4 cm wide, 4.6–5 cm thick, quadrate cuneate, mostly 5-angled, the lateral sutures narrow but distinct on upper free half, the surface brownish stramineous, shining, apex low convex, central apical sinuses 0–0.5 mm deep, scarcely evident, each carpel with 2–6 additional narrow furrows so that the adjacent phalanges are mortised; carpels 9–10; apices of central carpels with a central shallow concavity containing a dark brown maculation, often with cracks and swellings; stigmas 1–2.5 mm long, suborbicular, creased, centripetal; endocarp central, 3.1 cm long, massive, bony, brown, the lateral walls 5–7 mm thick; seeds 21 mm long, 4 mm in diameter, ellipsoid; apical mesocarp forming in each carpel a rounded cavern 8–12 mm long, traversed by a few fibers and with medullary membranes; basal mesocarp fibrous and fleshy.

HOLOTYPE: Australia, Northern Territory, Arnhem Land, Yirrkala, $12^{\circ} 12' S.$ lat., $136^{\circ} 47' E.$ long., common along fresh-water stream, Aug. 19, 1948, *R. L. Specht* 929C (AD). This was mixed with 929A and B which are here described as *P. yirrkalaensis* St. John. There is an isotype in Melbourne.

SPECIMENS EXAMINED: Australia, Northern Territory, Darwin, cult., April 3, 1957, *M. S. Doty* no. A (BISH), mixed with no. B which is *P. darwinensis* St. John.

DISCUSSION: *P. arnhemensis* is a member of the section *Pandanus*. It finds there its closest relative, *P. truncatus* St. John, also of Australia, but from northern Queensland. It has the phalanges 4.5–5 cm long, 3.1–4.4 cm wide, 2.9–3.3 cm thick; central apical sinuses 3–4 mm deep;

and the carpel apices pyramidal-suborbicular. On the other hand, *P. arnhemensis* has the phalanges 5–5.4 cm long, 5.1–5.4 cm wide, 4.6–5 cm thick; central apical sinuses 0–0.5 mm deep; and the carpel apices low convex or the interior ones with a shallow central concavity.

Eydouxia sect. nov.²

Arbores, syncarpiis terminalibus solitariis, phalangibus grandibus apicibus integris convexis latissimis cum stigmatibus sessilibus cordatis vel suborbicularibus centripetalibus aequaliter dispersis, staminibus in columna forti racemosis.

Trees; syncarps terminal, solitary; phalanges large, 7–50-celled, the apex unlobed, very broad convex, with the sessile, flush, cordate or suborbicular stigmas evenly distributed on it, centripetal; stamens racemose on a stout column.

HOLOTYPE: *Pandanus Eydouxia* Balf. f. in Baker, Fl. Mauritius & Seychelles 401, 1877; Engler's Pflanzenreich IV, 9: 55–56, fig. 15B, 1900; Linn. Soc. Bot. Jour. 55: 21–22, fig. 3F, pl. 2F, 3C, 1953; *Eydouxia macrocarpa* Gaud., Bot. Voy. La Bonite, Atlas pl. 18, figs. 1–6, (1843) = [1841], an invalid name. Gaudichaud's genus contained two species, but no generic description. Other species in this new section are the following, all from Australia: *P. arnhemensis* St. John, *P. convexus* St. John, *P. integer* St. John, and *P. spiralis* R. Br.

3. *Pandanus convexus* St. John, Pacif. Sci. 15 (2): 182–184, fig. 10 (repr. pp. 21–23), 1961. (sect. *Eydouxia*)

HOLOTYPE: Western Australia, Dillens Springs, Oct. 1906, *W. F. Fitzgerald 2,394* (SYD).

NORTHERN TERRITORY: Escape Cliffs, *Hulls* [an error for *W. Hulse*], (MEL).

The collector of the specimen from Escape Cliffs was published by Bentham (1878: 149) as *Hulls*. This was an error. The collector's name

was really *W. Hulse*, as indicated by F. von Mueller (1869: 20).

4. *Pandanus integer* sp. nov. (sect. *Eydouxia*)
Fig. 142

DIAGNOSIS HOLOTYPE: Arbor, foliis 1.47 m longis 6 cm latis coriaceis infra subglauca gladiiformatis sensim ex basi in apice longe subulato diminuentibus apice 10 cm ex puncto 4 mm lato, in sectione mediali cum 55–58 nervis secundariis in uno latere sed 62–64 in altero, basi amplexicaule integra et inermi sed ex 10 cm marginibus cum aculeis 2.5–3 mm longis 5–9 mm distantibus subulatis adscendentibus brunneis excepta in basi, midnervo infra toto inermi, in sectione mediali et ad apicem marginibus inermibus, phalangibus 5–5.5 cm longis 5–6.2 cm latis 4.8–6 cm crassis late cuneiformis, apice valde convexo parte 1/2 supra libera, lateribus 4–5-angulosis laevibus lucidis in sicco pallide luteo-brunneis subcurvatis et in aetate cum fissuris longitudinalibus brunneis, suturis lateralibus plerumque nullis, sinibus centralibus apicalibus 0–1 mm profundis plerumque subnullis et suturis solum tessellatis, carpellis 7–10 apicibus subaequalibus sed lateribus inclinatis hinc marginalibus majoribus apparitis, circum stigmatem regione nigro-brunneo lucido folioso, stigmatibus 3–4 mm longis cordatis brunneis intra vel extra subinclinatis sulcatis centripetalibus, suturis proximalibus dimidio distantia ad fondam extentis, endocarpio inframediali solido 34 mm longo osseoso obscure brunneo lateribus 8–9 mm crassis, seminibus 20–23 mm longis 4 mm diametro fusiformibus, mesocarpio apicali in carpello quoque cavernam parvam cum fibris paucis et membranis transversis medullosis formanti, mesocarpio basali minuto sed fibroso et carnoso.

DESCRIPTION OF ALL SPECIMENS EXAMINED: Tree 5–7 m tall, 15 cm in diameter; trunk pale gray; leaves 1.45–1.47 m long, 6 cm wide, cori-

² This new section *Eydouxia* may be inserted in the author's key to the sections (Revision of *Pandanus* Stickman, Part 1, Pacif. Sci. 14 (3)) as follows, on page 226 (reprint, p. 3); replacing the first heading T. by:

- T. Stigmas 1–50, centripetal, not on a ring,
 d. Stigmas approximate in central area of broad, low convex apex; staminate column fasciate, bearing short, terminal, free filaments, or filaments united 1/6–1/2 way into groups.....*Vinsonia*
 d. Stigmas evenly dispersed over the broad convex apex of the phalange; stamens racemose.....*Eydouxia*

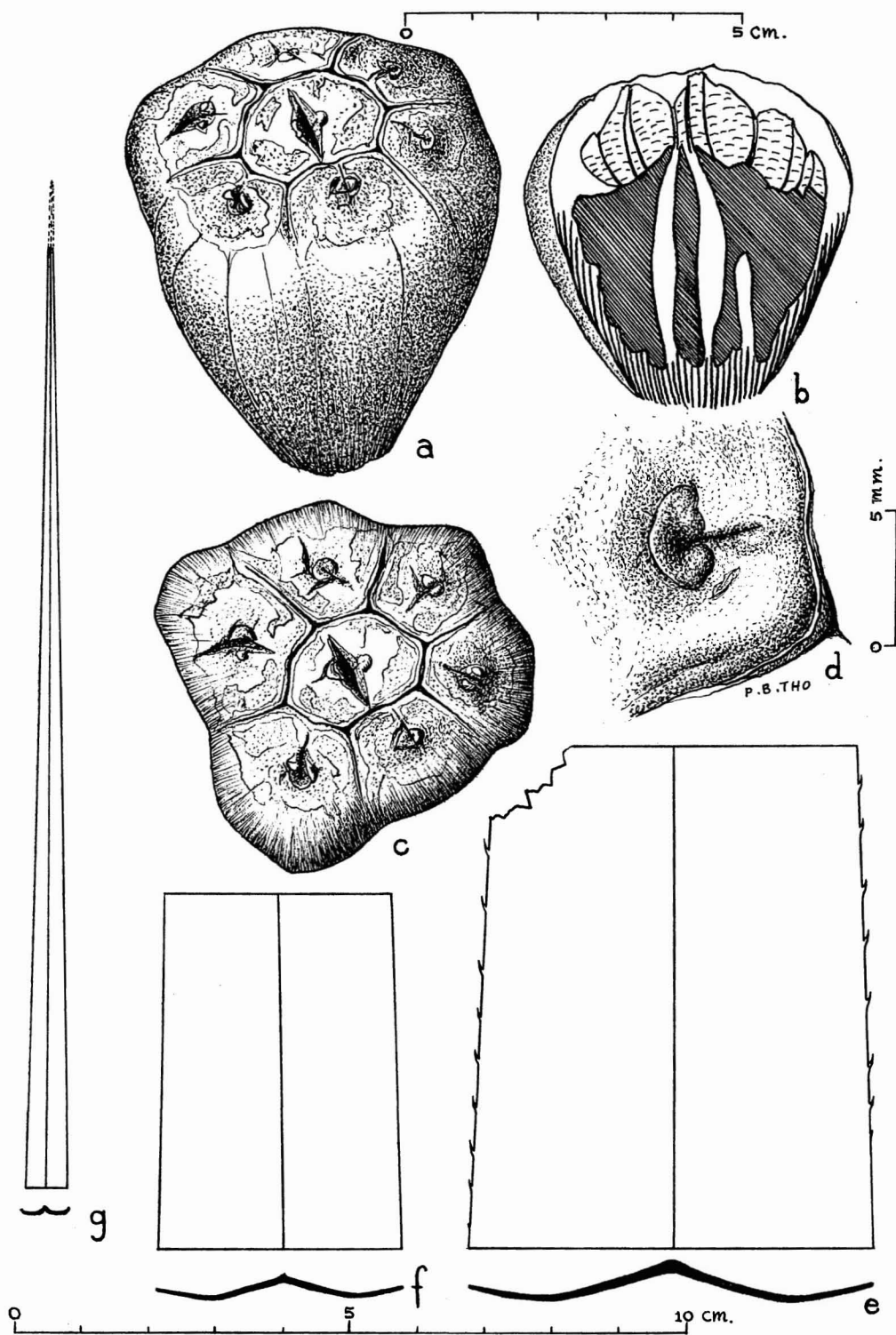


FIG. 142. *Pandanus integer* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$; *d*, carpel apex, stigma, and proximal sinus, apical view, $\times 4$; *e*, leaf base, lower side, $\times 1$; *f*, leaf middle, lower side, $\times 1$; *g*, leaf apex, lower side, $\times 1$.

aceous, somewhat glaucous below, swordlike, gradually tapering from the base to the long subulate tip which 10 cm down is 4 mm wide, at midsection with 55–58 secondary parallel veins in one half and 62–64 in the other, the base amplexicaul and unarmed, but beginning 10 cm up the margins with prickles 2.5–3 mm long, 5–9 mm apart, subulate, ascending, brown except at base; the midrib below unarmed throughout; at the midsection and from there to the apex the margins unarmed; peduncles 30–45 cm long; syncarp 22 cm long, 15 cm in diameter; phalanges 5–6.5 cm long, 5–7 cm wide, 4.3–6 cm thick, broad cuneiform, the apex strongly convex, upper $\frac{1}{2}$ free, the sides 4–5-angled, smooth, shining, when dry pale yellowish brown, gently curved, developing brown longitudinal cracks; lateral sutures mostly none; central apical sinuses 0–1.5 mm deep, usually so shallow as to be scarcely perceptible and the sutures making a dark tessellate pattern; carpels 6–10, the apices subequal, though the sloping sides make the marginal ones somewhat the larger and with a distal concavity forming about half of the apex and being darker brown and more shiny in a leaflike area surrounding the stigma; stigma 3–4 mm long, cordate, brown, slightly inclined inward or outward, sulcate, centripetal; proximal sinus running from halfway to all the way to the valley bottom; endocarp inframedian, massive, 34 mm long, bony, dark brown, the lateral walls 8–9 mm thick; seeds 20–23 mm long, 4 mm in diameter, fusiform; apical mesocarp forming in each carpel apex a small cavern with a few fibers and white, delicate transverse medullary membranes; basal mesocarp minute, but fibrous and fleshy.

HOLOTYPE: Australia, Northern Territory, 20 miles s.w. of Leguna Station, alluvial deep sandy yellow podsol with *Eucalyptus polycarpa* and *Banksia* sp., July 28, 1949, R. A. Perry 2,630 (BRI).

SPECIMENS EXAMINED: Australia, Northern Territory, 20 miles s. of Victoria River Downs Station, near creek, June 12, 1949, R. A. Perry 2,141 (BRI); 12 miles n.e. of Leopold Downs Station, common on levee of creek near semi-permanent spring with *Eucalyptus papuana* and *Dicranthium fecundum*, 10 Sept. 1959, M. Lazarides 6,521 (BRI).

DISCUSSION: *P. integer* is a member of the section *Eydouxia*, and in that section is its closest relative, *P. convexus* St. John, of Western Australia. The latter species has the phalanges 5.9–6.3 cm long, broad cuneate, the upper $\frac{1}{3}$ free; central apical sinuses 1.5–3 mm deep; and the stigmas 4–5 mm long. *P. integer* has the phalanges 5–5.5 cm long, turbinate, the upper half free; central apical sinuses 0–1.5 mm deep, wholly or partly lacking; and the stigmas 3–4 mm long.

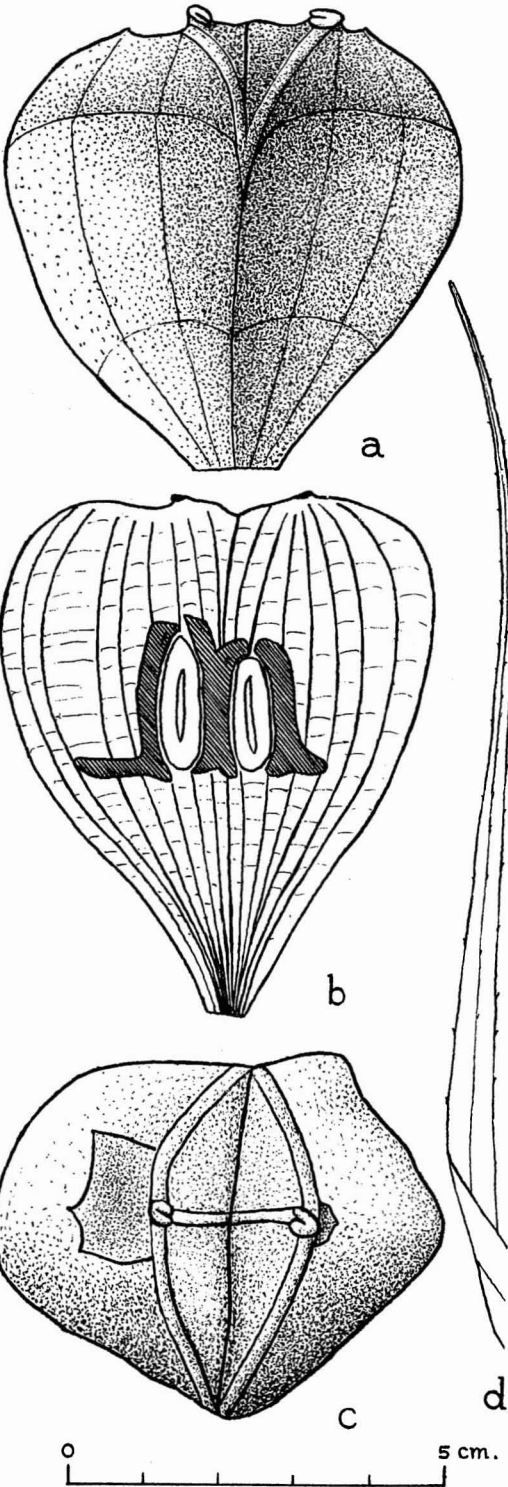
The new epithet is the Latin adjective *integer*, entire, given because so much of the leaf margin is smooth, lacking prickles.

5. *Pandanus Basedowii* C. H. Wright, Kew Bul. 158–159, pl. 6 (habitat), 1930; S. T. Blake, Austral. Jour. Bot. 2(1): 130, pl. 7, fig. 4, 1954, (sect. *Microstigma*)

Fig. 143

HOLOTYPE: Australia, Arnhem Land, high tablelands, ca. 310 m. alt., *Basedow* (not seen). The type locality was probably to the eastward of the East Alligator River and the head of the Liverpool River (*vide* S. T. Blake).

DESCRIPTION OF ALL SPECIMENS EXAMINED: Tree 3–5 m tall; prop roots present; crown broad; branchlets 0.5–3 m long, 2.5 cm in diameter; leaves 30–67.5 cm long, 1–4.6 cm wide, ligulate, at midsection with 42–54 secondary parallel veins in each half, long tapering to a subulate apex, firm, the tip at 10 cm down only 5 mm wide, at 20 cm only 14 mm wide, the base amplexicaul, the midrib below armed sometimes 7 cm from the base with a few slender prickles 2 mm long, 6–8 mm apart, subulate, reflexed, near the middle with slender subulate prickles 2.5 mm long, 8–20 mm apart, reflexed or ascending, and then near the apex with spines 0.2 mm long, 10–15 mm apart, appressed ascending, brown; the margins beginning at 3 cm up with prickles 1–2 mm long, 3–20 mm apart, ascending, dark brown; at the midsection the margins with prickles 1–2 mm long, 8–20 mm apart, closely appressed ascending, brown; near the apex the margins with serrulations 0.1–0.2 mm long, 6–10 mm apart, ascending, brown, or wanting; pistillate heads terminal, solitary; peduncle 10 cm long, 10 mm in diameter, trigonous, few bracted except for the numerous



terminal bracts, these green, 15–30 cm long, 15–28 mm wide, long acuminate, the margins acicular serrulate, the teeth 0.3–1 mm long; syncarps globular, about 20 cm in diameter, bearing 8–13 phalanges; the phalanges 4.3–6.4 cm long, 3.1–5.5 cm wide, 2.6–5.6 cm thick, suborbicular pyriform, a little compressed, obtusely 4–5-angled, pale brown or stramineous when dried, lateral sutures none, sides smooth, convex, apex convex, but when 2-carpellate with a shallow concavity distal of the stigmas, and arcuate ridges running to each lateral suture, proximal sinus running to the valley bottom, a whole phalange weighing $\frac{1}{2}$ ounce or less, well rounded “and could easily be dispersed by the wind” (*vide* Wright, 1930: 159), about one-third of the phalanges 1-celled; central apical sinus superficial, level with the stigmatic base; carpel apices low convex, mostly with a quadrangular concavity distal of the stigma; stigmas 3–3.5 mm long, suborbicular to cordate, creased, oblique; endocarp bony, 2 cm long, with basal horizontal flanges, the lateral walls 2–3 mm thick; seeds 15–18 mm long, 5 mm in diameter, ellipsoid; apical and basal mesocarps extensive, continuous, with longitudinal fibers and light medullary pith, the basal fleshy part only 1 cm long.

SPECIMENS EXAMINED: Australia: Northern Territory, Oenpelli, near dry watercourse on sandstone scarp, Oct. 1, 1948, *R. L. Specht* 1,106 (AD, SYD); Northern Territory, Cannon Hill, about $12^{\circ} 24' S.$, $132^{\circ} 55' E.$, exposed rocky slopes, on cliffs, 2 Oct. 1946, *S. T. Blake* 17,134 (BRI).

6. *Pandanus darwinensis* sp. nov. (sect. *Pandanus*)

Figs. 144–145

DIAGNOSIS HOLOTYPI: Foliis 92–135 cm longis 5.5–6 cm latis subcoriaceis in sectio M-formati ligulatis fere ex basi in apice subulato sensim diminuentibus apice 10 cm ex puncto 10 mm lato, in sectione mediali cum 68 nervis secundariis parallelis in quoque latere, basi amplexicaule et integra sed ex 14–15 cm mar-

FIG. 143. *Pandanus Basedowii* C. H. Wright, from Oenpelli, *R. L. Specht* 1,106. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$; *d*, leaf apex, lower side, $\times 1$.

ginibus cum aculeis 0.3–1.3 mm longis 3–8 mm distantibus adscendentibus arcuato-subulatis punctis brunneis, midnervo omnino inerme, in sectione mediali marginibus cum serris 0.5–1 mm longis 3–7 mm distantibus, circa apicem marginibus cum serris umbonatis 0.1–0.2 mm longis 1.5–3 mm distantibus, phalangibus 7.5–7.7 cm longis 6.2–7.5 cm latis 6–6.7 cm crassis obovoideo-suborbicularibus in sicco pallide brunneis, summo dense minute punctato, lateribus cum 5–6 angulis majoribus et carpello quoque cum 5–8 dorsis acutis et valleculis angustis et igitur phalangibus proximis interobseratis, parte $\frac{1}{2}$ supera libera, apice semiorbiculari, suturis lateralibus angustis sed profundis et ad basem extentis, sinibus centralibus apicalibus 7–12 mm profundis latis cum in fundo V-formato contractis, carpellis 11–13 subaequalibus apicibus centralibus semiorbicularibus vel ellipsoideo-semiorbicularibus pluri-angulosis, sinibus sinuatis, apicibus carpellorum marginalium obliquiter semiorbicularibus 6–8 mm altis valde angulosis sed latere exteriori oblique truncato, stigmatibus 3–3.5 mm longis suborbicularibus vel obdeltoideis sulcatis vel lobatis obliquis centripetalibus, sinu proximo profundo $\frac{1}{4}$ – $\frac{1}{5}$ ad fondam extento, endocarpio maximo 4.5 cm longo osseoso albo sed cavernis seminiferis brunneis lucidis, lateribus exterioribus 8–10 mm crassis, seminibus 3.5–4 cm longis 5 mm diametro ellipsoideis, mesocarpio apicali in carpello quoque cavernam formanti cum fibris multis validis longitudinalibus et membranis albis medullosis, mesocarpio basali minimo carnosum et cum fibris multis.

DIAGNOSIS OF HOLOTYPE: Leaves 92–135 cm long, 5.5–6 cm wide, subcoriaceous, M-shaped in cross section, ligulate, tapering gradually from near the base to the subulate tip which 10 cm down is 10 mm wide, at midsection with 68 secondary parallel veins in each half, at base amplexicaul and entire but 14–15 cm up the margins with ascending prickles 0.3–1.3 mm long, 3–8 mm apart, arcuate subulate, brown-tipped; the midrib unarmed throughout; at midsection the margins with serrations 0.5–1 mm long, 3–7 mm apart; near the tip the margins with umbonate serrations 0.1–0.2 mm long, 1.5–3 mm apart; phalanges 7.5–7.7 cm long, 6.2–7.5 cm wide, 6–6.7 cm thick, obovoid-suborbicular, when dried pale brown, the surface closely

minutely punctate, the sides with 5–6 major angles and each carpel with 5–8 sharp secondary ridges and valleys so that the adjacent phalanges are many times mortised in the syncarp, upper $\frac{1}{2}$ free, the apex semiorbicular; lateral sutures narrow but deep and distinct to the base; central apical sinuses 7–12 mm deep, wide, then narrowing to the V-shaped base; carpels 11–13, subequal, the central apices semiorbicular to ellipsoid-semiorbicular, with several sharp angles which account for the mortising of each with its neighbors and the sinuous or zigzag sutures; apices of the marginal carpels obliquely semiorbicular, 6–8 mm high, also sharply angled but the outer side with one or more truncate or curved surfaces extending almost to the apical stigma; stigmas 3–3.5 mm long, suborbicular to obdeltoid, deeply lobed or creased below, oblique, centripetal; proximal sinus deep but running only $\frac{1}{4}$ – $\frac{1}{5}$ way to valley bottom (except when coinciding with a distal valley); endocarp massive, 4.5 cm long, bony, white except for the brown, shiny lining of the seed cavities, the lateral walls 8–10 mm thick; seeds 3.5–4 cm long, 5 mm in diameter, ellipsoid; apical mesocarp forming a cavity in each carpel apex, crossed by many, strong, longitudinal fibers and with white medullary membranes; basal mesocarp sparse, fleshy and with many fibers.

HOLOTYPE: Australia, Northern Territory, near Darwin, Jan. 1927, C. E. F. Allen (BRI). Isotype in A, BISH, BO.

DISCUSSION: *P. darwinensis* is a member of the section *Pandanus*. There, its closest relative is *P. Whitei* Martelli, of Queensland, a species with: leaves 7–8 cm wide, unarmed for the lower third; phalanges 6–6.5 cm wide, the lateral sutures wide; carpels 9–10; central apical sinuses 3–5 mm deep; endocarp 3 cm long; and basal mesocarp 20 cm long. In contrast, *P. darwinensis* has the leaves 5.5–6 cm wide, the margins of the lower third with prickles 0.3–1.3 mm long, 3–8 mm apart; phalanges 7.1–7.5 cm wide, the lateral sutures narrow; carpels 11–13; central apical sinuses 7–12 mm deep; endocarp 4.5 cm long; and the basal mesocarp 12–13 mm long.

These specimens bear a manuscript name that indicates that Martelli at one time considered it a new species. The present writer concurs, but refrains from adopting an unpublished name from an herbarium.

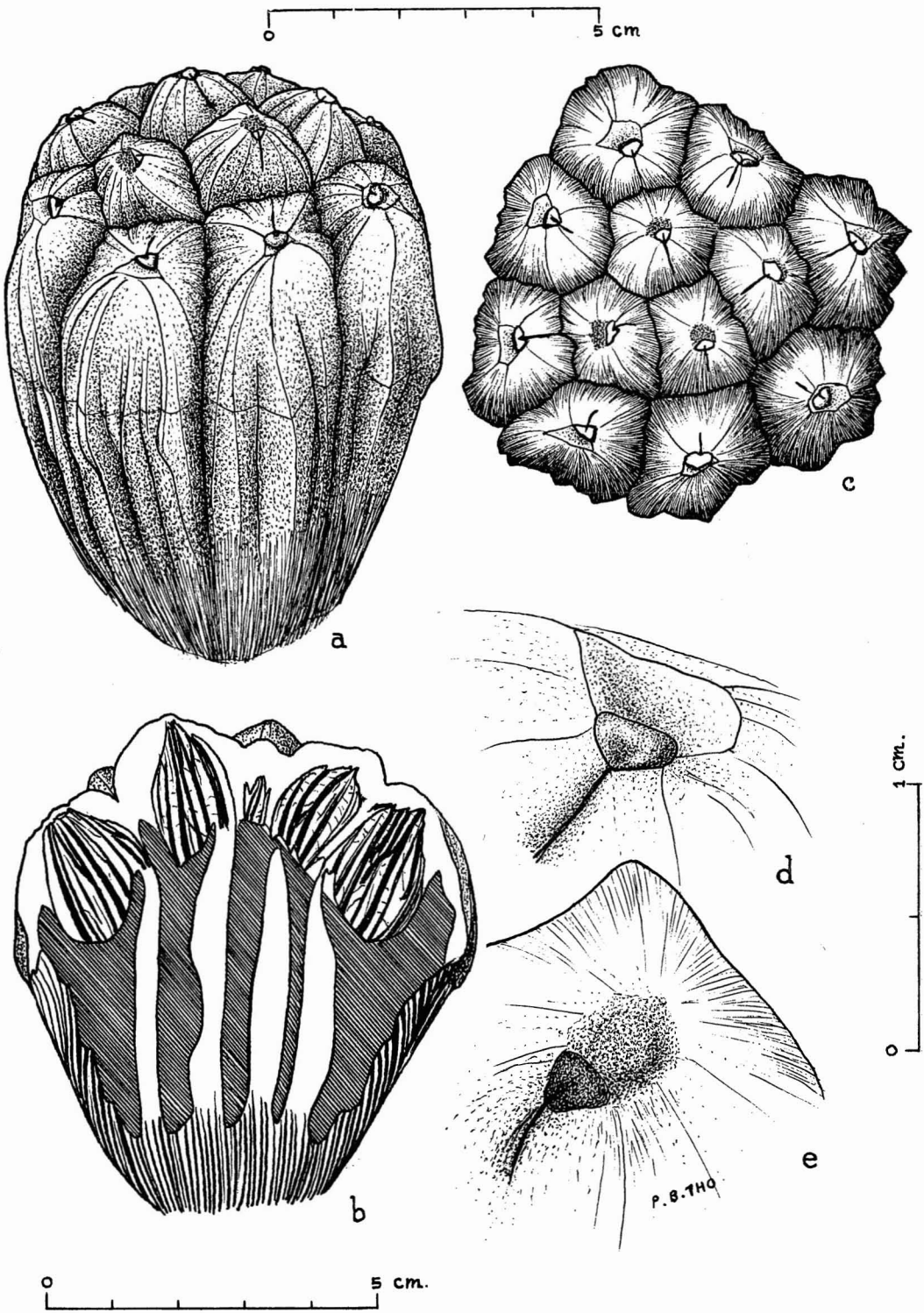


FIG. 144. *Pandanus darwinensis* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$; *d*, apex of marginal carpel, stigma, and proximal sinus, oblique view, $\times 4$; *e*, apex of central carpel, stigma, and proximal sinus, oblique view, $\times 4$.

Mixed with three uniform phalanges, like the one illustrated, is a much smaller one, perhaps from some other source. It is here excluded.

The new specific epithet is formed from the name of the type locality, plus *-ensis*, the Latin adjectival place suffix.

7. *Pandanus latifructus* sp. nov. (sect. *Pandanus*)

Fig. 146

DIAGNOSIS HOLOTYPE: Arbor 6 m alta 1 dm diametro, foliis 120 cm longis 5.5 cm latis subcoriaceis in sectione mediali cum 59 nervis secundariis in quaque latere ligulatis sensim in apice acuto longiter diminuentibus cum sulcum medialem basi inermi, marginibus ex 12-15 cm cum aculeis 1.5-2.5 mm longis 7-10 mm distantibus subulatis rectis adscendentibus, midnervo infra inermi, in regione mediali marginibus cum aculeis simulantibus gracilibus 4-11 mm distantibus sed plerumque eis majoribus cum minoribus 1-1.5 mm longis alternantibus, midnervo infra cum aculeis 2-2.5 mm longis 8-22 mm distantibus simulantibus adscendentibus, apice non preservato, phalangibus 5-5.3 cm longis 6.2-7.5 cm latis 4.6-5.4 cm crassis in imagine obliqua subrotundatis sed in basi truncata compressis superficie laeve sublucida in sicca brunnea parte $\frac{1}{3}$ supra libera sinibus lateralibus V-formatis profundis etiam ad basem apice alte rotundato lateribus cum dorsis et valleculis angustis et interobseratis, sinibus apicalibus centralibus 3-4 mm profundis, carpellis 12-30 apicibus carpellorum rotundatis vel obliquiter rotundatis eis centralibus symmetricalibus rotundatis illis marginalibus obliquioribus et cum cavo centrali et omnibus cum dorsis parvis acutis, stigmatibus 1-2 mm longis obovatis vel obdeltoideis centralibus subobliquis, endocarpio centrali solido obscure brunneo osseoso lateribus 8-13 mm crassis, seminibus 15-17 mm longis 4-7 mm diametro ellipsoideo, mesocarpio in carpello quoque cavernam grandem cum fibris fortibus, mesocarpio basali cum fibris fortibus multis et cartilaginem parvam.

DIAGNOSIS OF HOLOTYPE: Tree 6 m tall, 1 dm in diameter, and to the best of my recollection without prop roots; leaves 120 cm long, 5.5 cm wide, subcoriaceous, ligulate and gradually long tapering to an acute tip, furrowed only

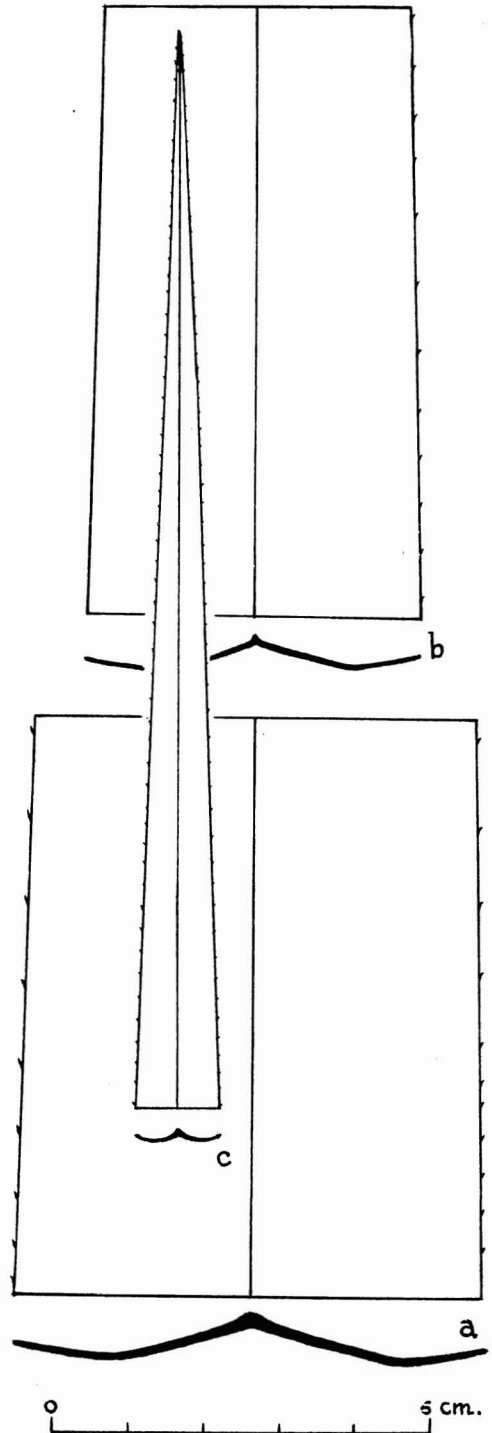


FIG. 145. *Pandanus darwinensis* St. John, from holotype. a, Leaf base, lower side, $\times 1$; b, leaf middle, lower side, $\times 1$; c, leaf apex, lower side, $\times 1$.

along the midrib, at midsection with 59 secondary parallel veins in each half, the base unarmed, beginning 12–15 cm up the margins near the base with prickles 1.5–2.5 mm long, 7–10 mm apart, subulate, nearly straight, ascending; the nearby midrib below unarmed; at midsection the margins with similar slender subulate prickles 4–11 mm apart, but mostly these larger ones alternating with smaller ones 1–1.5 mm long; the midrib below with similar, ascending prickles 2–2.5 mm long, 8–22 mm apart; the tip not preserved; phalanges 5–5.3 cm long, 6.2–7.5 cm wide, 4.6–5.4 cm thick, in profile almost circular except for the truncate or concave base, distinctly compressed, the surface smooth, somewhat shiny, when dry brown, upper $\frac{1}{3}$ free, lateral sinuses V-shaped, deep, distinct to the base, apex high rounded, the carpel sides with numerous narrow V-shaped furrows that are mortised with the ridges of the adjoining phalanges; central apical sinuses 3–4 mm deep; carpels 12–20; carpel apices rounded or obliquely rounded, the central ones rounded, symmetric, the marginal ones very oblique and with a broad central concavity, all with low sharp ridges; stigmas 1–2 mm long, obovate or obdeltoid, central, centripetal, slightly oblique; endocarp central, massive, dark brown, bony, occupying $\frac{3}{4}$ of the body, the outer walls 8–13 mm thick; seed cavities 15–17 mm long, 4–7 mm in diameter, ellipsoid; apical mesocarp in each carpel a large cavern, open but crossed by heavy longitudinal fibers; basal mesocarp small, with a slight amount of pulp but many strong fibers.

HOLOTYPE: Australia, Northern Territory, 22 miles south of Darwin and 4 miles east of North-South Road, trees of open savannah, 24 Nov. 1950, *H. St. John* 24,225 (BISH).

DISCUSSION: *P. latifructus* is a member of the section *Pandanus*. Its closest relative is the Queensland species *P. medialinermis* St. John, ined., which is now in press. The latter has the phalange with the upper $\frac{2}{3}$ part free; carpels with the apical concavity 3–4 mm in diameter, suborbicular and well bounded; the apical central sinuses 1–2 mm deep, gently curved or straight. *P. latifructus* has the phalanges with the upper $\frac{1}{2}$ free; carpels with the apical concavity 5–10 mm in diameter, irregular, and with radial

ridges; apical central sinuses 3–4 mm deep, zigzag.

The new epithet is from the Latin *latus*, broad; *fructus*, fruit, in description of the unusually broad phalanges.

8. *Pandanus semiarmatus* sp. nov. (sect. *Pandanus*)

Fig. 147

DIAGNOSIS HOLOTYPE: Arbor gracilis 6 m alta pauce ramosa, foliis circa 1.5 m longis et proxima basem 5.5 cm latis in media 4 cm latis coriaceis supra viridibus infra pallidioribus et glaucis supra sulcatis et biplicatis in sectione mediali cum 46 nervis secundariis parallelis prominentibus in quoque latere, nervis tertialis infra ad basem evidentis in reticulo lineari-oblongo, laminis gladiformatis ex basi in apice subulato diminuentibus, basi amplexicauli et inermi pallida, marginibus ex 10–11 cm cum aculeis 2–3 mm longis 5–11 mm separatis arcuato-subulatis adscendentibus apicibus rubro-brunneis, midnervo toto inermi, in sectione mediali uno latere inermi sed altero cum aculeis 1–2 mm longis 7–21 mm separatis subulatis adscendenti-adpressis, apice subulato licet inermi, pedunculo curvato et pendenti 55 cm longo 18 mm diametro trigono bracteato, syncarpio solitario 20 cm longo 18 cm diametro late ellipsoideo subtrilaterato, phalangibus 6.5–6.8 cm longis 5.6–6.4 cm latis 4.1–4.9 cm crassis rubris late obovoideis lateribus laevibus lucidis partibus clausis subplanis partibus superis rotundatis parte $\frac{1}{3}$ supera libera apice truncato vel subtruncato, suturis lateralibus nullis, sinibus apicalibus centralibus 1–3 mm profundis latis-simis vadosis rectis, carpellis 8–9 apicibus vadose convexis eis centralibus et illis marginalibus subaequalibus, sinibus proximalibus latis $\frac{1}{3}$ – $\frac{1}{2}$ ad fondam extensis, stigmatibus 2–3 mm latis reniformibus vel suborbicularibus sulcatis pallide brunneis papillosis centripetalibus, endocarpio paene inframediali 4 cm longo osseoso solido partibus centralibus obscure mahogani-brunneis lateribus pallidis intra laevibus lucidis lateribus 15–17 mm crassis, seminibus 18–20 mm longis 5 mm diametro ellipsoideis, mesocarpio apicali cavernam unicam cum fibris fortibus et medulla membranacea alba formanti, mesocarpio basali parvo fibroso et carnoso.

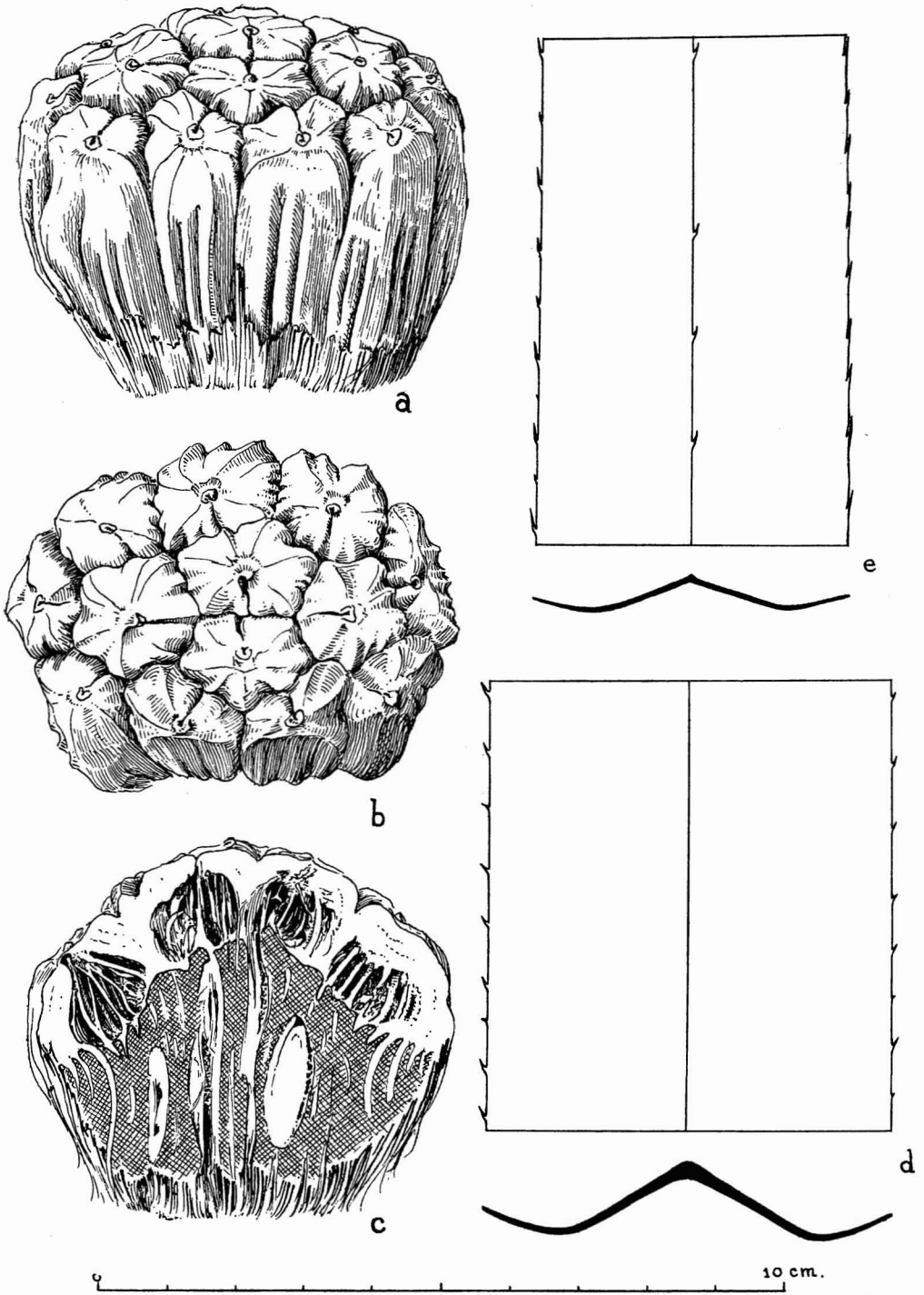


FIG. 146. *Pandanus latifructus* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, apical view, $\times 1$; *c*, phalange, longitudinal median section, $\times 1$; *d*, leaf base, lower side, $\times 1$; *e*, leaf middle, lower side, $\times 1$.

DIAGNOSIS OF HOLOTYPE: Slender tree 6 m tall, few-branched; leaves about 1.5 m long, 5.5 cm wide near the base, 4 cm wide at the middle, coriaceous, green above, below paler green and glaucous, broad furrowed above the midrib and with 2 rounded pleats, at midsection with 46 prominent secondary parallel veins in each half, the tertiary cross veins visible below near the base, making linear oblong meshes, blade sword-shaped, tapering from base to the slender subulate apex which is only partly preserved, this about 10 cm down 2 mm wide, the base amplexicaul and unarmed, pale; the margins beginning at 10–11 cm up with prickles 2–3 mm long, 5–11 mm apart, arcuate subulate, ascending, the outer half reddish brown; the midrib unarmed throughout; at midsection one margin unarmed, the other with prickles 1–2 mm long, 7–21 mm apart, subulate, ascending appressed; the subulate apex apparently unarmed; peduncle curved and pendent, 55 cm long, 18 mm in diameter, 3-sided, leafy bracted; syncarp solitary, 20 cm long, about 18 cm in diameter, broad ellipsoid, somewhat 3-sided; phalanges 6.5–6.8 cm long, 5.6–6.4 cm wide, 4.1–4.9 cm thick, red, broadly obovoid, the sides smooth, shining, the covered parts almost flat, the upper part rounded, upper $\frac{1}{3}$ free, the apex truncate or subtruncate, lateral sutures none, central apical sinuses 1–3 mm deep, very wide and shallow, straight; carpels 8–9, the apices very low convex, the central apices quite or nearly as large as the marginal ones; proximal sinus wide, running $\frac{1}{3}$ – $\frac{1}{2}$ way to valley bottom; stigmas 2–3 mm wide, reniform to suborbicular, creased, pale brown, papillose, centripetal; endocarp slightly inframedian, 4 cm long, bony, massive, all the central part dark mahogany brown, the sides and upper marginal flanges pale, inner surfaces smooth, shining, the lateral walls 15–17 mm thick; seeds 18–20 mm long, 5 mm in diameter, ellipsoid; apical mesocarp one large cavern, traversed by heavy fibers and with a white, membranous pith; basal mesocarp scant, fibrous and fleshy.

HOLOTYPE: Australia, Northern Territory, Koolpinyah, 12° 25' S., 131° 13' E., small or large communities near edge of swampy grassland, 9 m. alt., 10 Sept. 1946, S. T. Blake 16,964 (BRI).

DISCUSSION: *P. semiarmatus* is a member of the section *Pandanus*, as is its closest relative,

P. somersetensis St. John, of the Cape York Peninsula of Queensland, a species with the syncarp 13 cm in diameter; phalanges 5–5.5 cm long, 4–5.1 cm wide, the apex low convex, central apical sinuses 0.5–1 mm deep; leaves 93 cm long, 6.8–7.2 cm wide, and at midsection the margins unarmed. *P. semiarmatus* has the syncarp 18 cm in diameter; phalanges 6.5–6.8 cm long, 5.6–6.4 cm wide, the apex truncate or subtruncate, the central apical sinuses 1–3 mm deep; leaves 150 cm long, 5.5 cm wide, at midsection one margin with prickles 1–2 mm long, 7–21 mm apart, the other unarmed.

The new epithet is formed from the Latin *semi*, half, *armatus*, armed, and is given in allusion to the leaf margins which are only partly armed with prickles.

9. *Pandanus thermalis* sp. nov. (sect. *Pandanus*)

Fig. 148

DIAGNOSIS HOLOTYPI: Arbor 9 m alta plerumque congregata "erecta vel breviter decumbens et ita radificera, radicibus fulturosis nullis, trunco spiraliter sulcato et cum projectionibus paucis brevibus erectis" [radicibus adventivis], foliis 2 m longis in basi 6 cm latis ex 30 cm 6.5 cm latis coriaceis pallide viridibus subglaucis parte tertia ultima pendenti supra costam late sulcatis 2-plicatis in sectione mediali cum 72 nervis secundariis parallelis in quoque dimidio, nervis tertialis non evidentis, laminis gladiformatis longiter in apice gracili subulato trigono diminuentibus eo circa 30 cm longo et circa 10 cm ex apice 2.5 mm lato, basibus non visis, proxima basem marginibus cum aculeis 4–6 mm longis 9–18 mm separatis subulatis paene rectis adscendentibus brunneo-rubris excepta basi, midnervo infra per 55 cm inermi tum cum aculeis simulantibus adscendentibus 3–4.5 mm longis 21–33 mm separatis, in sectione mediali marginibus cum aculeis 1.5–2 mm longis 5–10 mm separatis subulatis adscendentibus, midnervo infra cum aculeis 2 mm longis paucissimis remotis arcuato-adscendentibus, in apice subulato marginibus cum serrulis 0.2–0.4 mm longis 2–6 mm separatis, midnervo infra inermi, syncarpio 30 cm diametro subgloboso aurantiaco pendenti, phalangibus 7.1–7.5 cm longis 6.8–8.5 cm latis 7–7.5 cm crassis subglobosis sed ad basem cuneatis lateribus lucidis sublaevibus sed

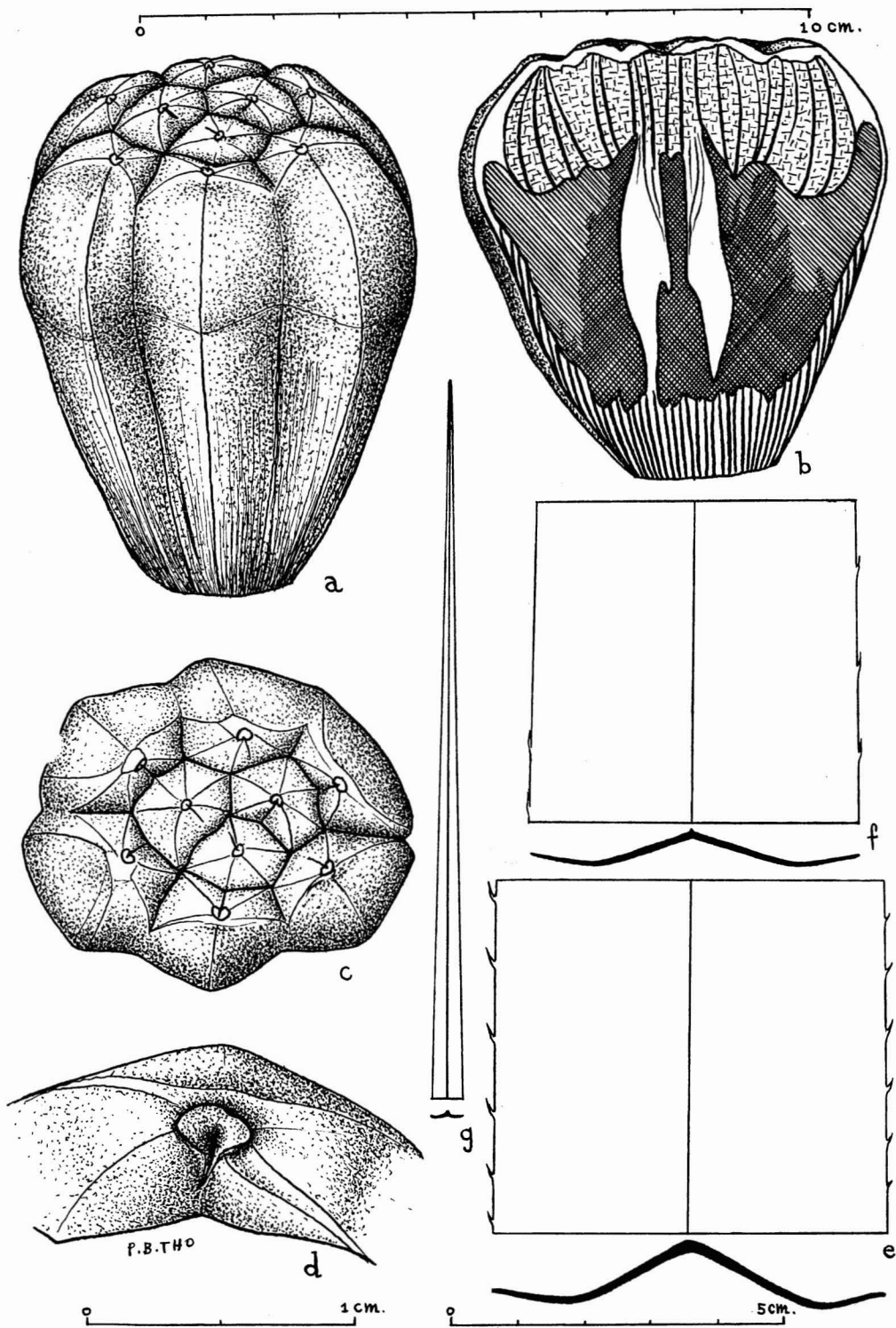


FIG. 147. *Pandanus semiarmatus* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$; *d*, carpel apex and stigma, oblique view, $\times 4$; *e*, leaf base, lower side, $\times 1$; *f*, leaf middle, lower side, $\times 1$; *g*, leaf apex, lower side, $\times 1$.

cum dorsis et valleculis longitudinalibus parte $\frac{2}{5}$ supera libera apice semiorbiculari suturis lateralibus profundis et conspicuis, sinibus centralibus apicalibus 2–4.5 mm profundis anguste V-formatis sinuosis et interobseratis, carpellis 9–11 apicibus centralibus truncatis vel subconvexis eis marginalibus $\frac{1}{5}$ – $\frac{1}{3}$ majoribus et valde obliquis et cum cavitate apicali grande, sinibus proximalibus profundis et $\frac{1}{3}$ – $\frac{1}{2}$ ad basem extensis, stigmatibus 3.5–5 mm latis reniformibus vel late reniformibus sulcatis prostratis brunneis papillois centripetalibus, endocarpio mediali 5 cm longo solido osseoso obscure brunneo lateribus 15 mm crassis intra lucidis, seminibus 25–27 mm longis 5 mm diametro ellipsoideo, mesocarpio supero in apice carpelli quique cavernam cum fibris paucis et membranarum albis delicatis medullosis formanti, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Tree, often gregarious and 9 m tall, "erect or shortly decumbent at base and there rooting, no prop roots; trunk with loosely spiral shallow furrow and a few short erect processes" [adventitious rootlets]; leaves 2 m long, 6.5 cm wide, 30 cm up, 6 cm wide near the base, coriaceous, pale green, slightly glaucous, $\frac{1}{3}$ way out breaking and the rest pendent, broad furrowed above the midrib, with two rounded pleats up the middle, beyond that plicate, at midsection with 72 prominent secondary parallel veins in each half, but no clearly visible tertiary veins, blade sword-shaped, long tapering to the trigonous slender subulate apex, this about 30 cm long, and at about 10 cm down 2.5 mm wide, the base not preserved, near the base the margins with prickles 4–6 mm long, 9–18 mm apart, subulate, nearly straight, ascending, brownish red except at base; the midrib below unarmed for about 55 cm, then with ascending similar prickles 3–4.5 mm long, 21–33 mm apart; at midsection the margins with prickles 1.5–2 mm long, 5–10 mm apart, subulate, ascending; the midrib below with a few very remote prickles 2 mm long, arcuate ascending; on the subulate apex the margins with serrulations 0.2–0.4 mm long, 2–6 mm apart; the midrib below unarmed; syncarp 30 cm in diameter, subglobose, orange, pendulous; phalanges 7.1–7.5 cm long, 6.8–8.5 cm wide, 7–7.5 cm thick, subglobose but cuneate towards

base, the sides shining, almost smooth, but with longitudinal ridges and valleys, upper $\frac{2}{5}$ free, the apex semiorbicular, lateral sutures well marked and deep, central apical sinuses 2–4.5 mm deep, narrow V-shaped, sinuous because of the ridged and mortised sides; carpels 9–11, the apices of the central ones truncate or slightly concave, of the marginal ones $\frac{1}{5}$ – $\frac{1}{3}$ the larger and very oblique and with a large apical concavity, proximal sinus deep, running $\frac{1}{3}$ – $\frac{1}{2}$ way to valley bottom; stigmas 3.5–5 mm wide, reniform or broadly so, flush, creased, brown, papillose, centripetal; endocarp median, 5 cm long, massive, bony, dark brown, the lateral walls 15 mm thick, the inner surfaces shining; seeds 25–27 mm long, 5 mm wide, ellipsoid; upper mesocarp forming in the apex of each carpel a cavern with a few fibers and delicate, white membranous pith; basal mesocarp fibrous and fleshy.

HOLOTYPE: Australia, Northern Territory, near Hot Springs, Douglas River, 13° 46' S., 131° 27' E., common in flat drainage channels, 11 July 1946, S. T. Blake 16,433 (BRI).

DISCUSSION: *P. thermalis* is a member of the section *Pandanus*, as is its closest relative, the Australian species *P. latifructus* St. John, which latter has the phalanges 5–5.3 cm long, 6.2–7.5 cm wide; seed cavities 15–17 mm long; leaves 1.2 m long, 5.5 cm wide, at midsection with 59 secondary parallel veins in each half, the margins near the base with prickles 1.5–2 mm long, 7–10 mm apart. *P. thermalis* has the phalanges 7.1–7.5 cm long, 6.8–8.5 cm wide; seed cavities 30–35 mm long; leaves 2 m long, 6.5 cm wide, at midsection with 72 secondary parallel veins in each half; the margins near the base with prickles 4–6 mm long, 9–18 mm apart.

The new epithet is the Latin adjective *thermalis*, hot, and is given in reference to its habitat by the Hot Springs.

10. *Pandanus yirrkalaensis* sp. nov. (sect. *Pandanus*)

Fig. 149

DIAGNOSIS HOLOTYPI: Arbor 4.5 m alta, corona 2 m diametro, trunco 3 m alto 10 cm diametro, foliis 111.5 cm longis 4 cm latis coriaceis ligulatis gradatim in apice subulato acuto

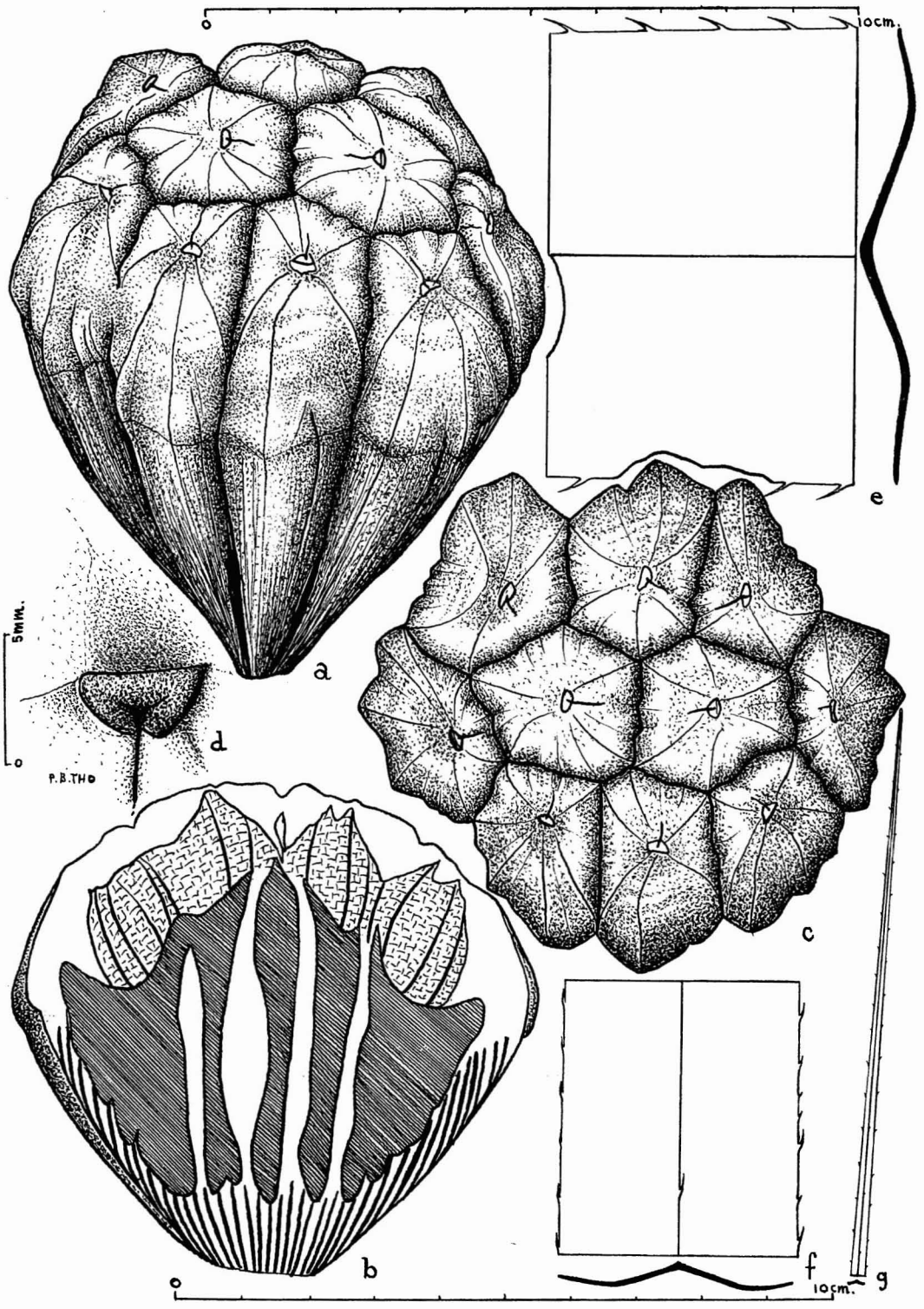


FIG. 148. *Pandanus thermalis* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, longitudinal median section, $\times 1$; *c*, phalange, apical view, $\times 1$; *d*, carpel apex, stigma, and proximal sinus, oblique view, $\times 4$; *e*, leaf base, lower side, $\times 1$; *f*, leaf middle, lower side, $\times 1$; *g*, leaf apex, lower side, $\times 1$.

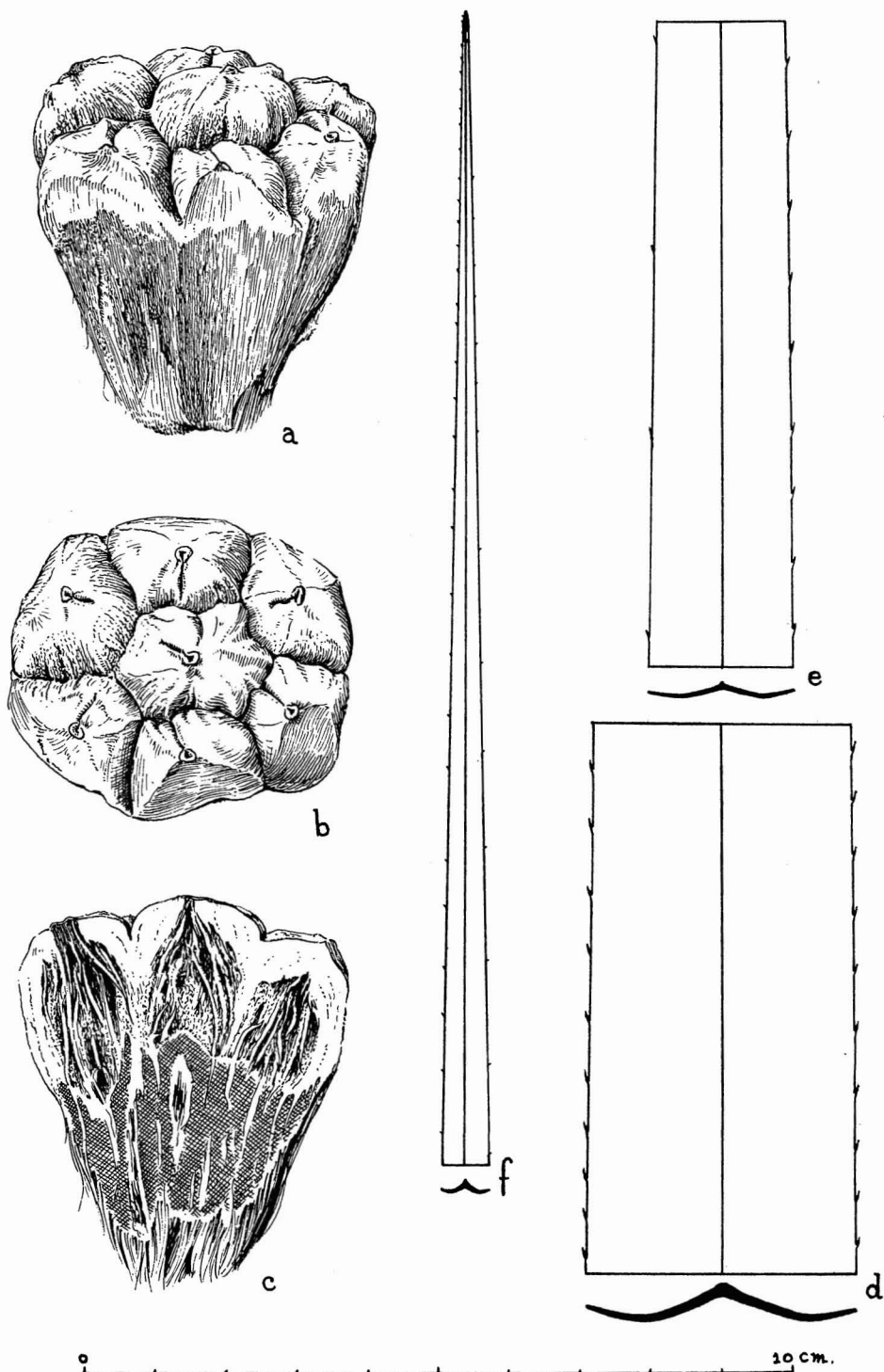


FIG. 149. *Pandanus yirrkalaensis* St. John, from holotype. *a*, Phalange, lateral view, $\times 1$; *b*, phalange, apical view, $\times 1$; *c*, phalange, longitudinal median section, $\times 1$; *d*, leaf base, lower side, $\times 1$; *e*, leaf middle, lower side, $\times 1$; *f*, leaf apex, lower side, $\times 1$.

diminuentibus eo ex 10 cm 4 mm lato, laminis plicatis solum in midnervo inermi sed ex 10 cm marginibus cum aculeis 1.5–2.3 mm longis 5–10 mm distantibus subulatis ascenduntibus brunneis excepta basi, in medio marginibus cum aculeis simulantibus 0.5–1 mm longis 5–12 mm distantibus, proxima apice marginibus cum aculeis simulantibus 0.2–0.3 mm longis 1.5 mm distantibus, syncarpio unico terminali, phalangibus 5.5–5.7 cm longis 4.5–5.3 cm latis 3.2–4 cm crassis late cuneatis in apice latissimo paene compressis aurantiacis sed in sicco pallide brunneis pauciter brunneo rimosis, apice convexo, suturis lateralibus plerumque non evidentis, parte $\frac{1}{4}$ supera libera, apicibus carpellorum oblatohemisphaericis prominentibus cum dorsis radiatis parvis pluribus, sinibus proximalibus angustis plerumque ad fundam extentis, sinibus centralibus apicalibus 4–7 mm profundis, stigmatibus apicalibus 1.3–2 cm longis deltoideo-ovalibus sulcatis vel cordatis centripetalibus obliquis, endocarpio in parte $\frac{2}{5}$ infera osseoso brunneo solido marginibus lateralibus 2–3 mm latis, seminibus 17 mm longis 3 mm diametro ellipsoideo, mesocarpio apicali in carpello quoque caverna unica cum fibris fortibus paucis longitudinalibus et membranibus medullois paucis, mesocarpio basali fibroso et carnosio parvo.

DIAGNOSIS OF HOLOTYPE: Tree 4.5 m tall; crown 2 m in diameter; trunk 3 m tall, 10 cm in diameter; leaves 111.5 cm long, 4 cm wide, coriaceous, ligulate, long tapering to subulate acute tip which 10 cm down is 4 mm wide, the blade plicate only along the unarmed midrib, beginning 10 cm up from the base the margins with prickles, 1.5–2.3 mm long, 5–10 mm apart, subulate, ascending, brown except at base; at the midsection the margins with similar teeth 0.5–1 mm long, 5–12 mm apart; near the tip the margins with similar teeth 0.2–0.3 mm long, 1–5 mm apart; syncarp single and terminal; phalanges 5.5–5.7 cm long, 4.5–5.3 cm wide, 3.2–4 cm thick, broad cuneate, widest at the apex, a little compressed, orange but drying light brown, with a few dark brown cracks, the surface smooth, somewhat shining, the apex convex, lateral sutures mostly not evident, upper $\frac{1}{4}$ free; carpel apices oblate hemispheric, prominent, with several low, radiating ridges, proximal sinus

narrow, usually running to the valley bottom; central apical sinuses 4–7 mm deep; stigmas apical 1.3–2 mm long, deltoid-oval, creased or cordate, centripetal, oblique; endocarp in lower $\frac{2}{5}$, bony, brown, massive, the lateral margins 2–3 mm wide; seeds 17 mm long, 3 mm in diameter, ellipsoid; apical mesocarp forming in each carpel a cavern crossed by a few heavy longitudinal fibers and a few medullary membranes; basal mesocarp fibrous and fleshy, sparse.

HOLOTYPE: Australia, Northern Territory, Arnhem Land, Yirrkala, 12° 12' S. lat., 136° 47' E. long., common along fresh water stream, Aug. 19, 1948, R. L. Specht 929A (AD). Originally mixed with 929C here described as *P. arnhemensis* St. John, and 929B, a smaller narrower leaf, gathered from a sucker at the base of the same tree.

DISCUSSION: *P. yirrkalaensis* is in the section *Pandanus*. It is related to *P. Whitei* Martelli of Australia, which species has its phalanges 7–7.3 cm long, with lateral sutures deep and distinct at least $\frac{2}{3}$ way down; and the carpel sides mortised by the many longitudinal furrows. *P. yirrkalaensis* differs by having the phalanges 5–5.7 cm long, the sides smooth and the lateral sinuses mostly not evident; and the carpel sides smooth, not mortised.

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