THE FOLLOWING NEW SPECIES of *Pandanus* from India and Thailand are, all except one, based upon collections made by botanists other than the writer.

**SPECIES FROM INDIA**

*Section Rykia*

**Pandanus assamensis** sp. nov. (sect. *Rykia*).

Fig. 225

**Diagnosis Holotypi:** Caule 6–7 mm diametro brunneo lucido laevi, internodos 10–11 mm longis, folis 28–30 cm longis 22–27 mm latis chartaceis supra viridibus infra par-ridienibus 1-sulcatis 2-plicatis in sectione mediali cum 15–16 nervis parallelis secundaris ubique conspicuis in quaque media, nervis tertii nullis, laminis infra cuneatis proxima basem 15–16 mm latis ligulatis ad apicem subiter in apice subulato 3 cm longo 0.5–0.7 mm lato contractis basi amplissimae inerme sed ex 2.5–3 cm marginibus cum aculeis 1–2 mm longis 1.5–3 mm separatis rectis subulatis adscendentibus apicibus subrubris, midnervo infra ex 5–5.5 cm cum aculeis 2–2.5 mm longis 14–26 mm separatis subulatis reflexis basibus incrasatis, in sectione mediiali marginibus cum aculeis 0.3–0.5 mm longis 1–8 mm separatis acicularibus adpressae adscendentibus, midnervo cum aculeis paucis 0.7–0.8 mm longis 20–25 mm separatis crassissimae inaequilateribus reflexis basibus latis, in apice caudato marginibus et midnervo infra cum aculeis 0.3–0.5 mm longis 0.2–1 mm separatis validis arcuatis subulatis adscendentibus; inflorescentia foeminea cum sincarpo terminali erecto solitario, pedunculo 8 cm longo 3 mm diametro 3-laterato supra crassiori et in apice 4 mm diametro cum bracteis paucis, sincarpo 3.5 cm longo 2.5 cm diametro oblongo-ellipsoideo cum circa 720 drupis eis 11–12 mm longis 2 mm latis et crassis 5–6-angulatis corpore 7–8 mm longo oblongo-oblanceolato, pileo cum basi 1.5–2 mm alto semiellipsoideo laevi vel minime papilloso, stylo 5–6 mm longo graciliter subulato in apice valde reflexo, drupis superis cum stylis terminalibus illis lateribus cum stylis lateribus 0.07 mm crassis cartilagineis stramineis, mesocarpio apicali parvo medulloso, mesocarpio basali in lateribus fibroso intra carnosio.

**Diagnosis of Holotype:** Stem 6–7 mm in diameter, brown, shining, smooth, the internodes 10–11 mm long; leaves 28–30 cm long, 22–27 mm wide, chartaceous, green above, pale green below, 1-ribbed, but 2-pleated, at midsection with 15–16 parallel secondary veins in each half, these conspicuous on both sides throughout, no tertiary cross veins, cuneate below and just above the base only 15–16 mm wide, ligulate, near the apex abruptly contracted to a subulate tip 3 cm long, this 0.5–0.7 mm wide, the base amplessicaul and unarmed, but starting 2.5–3 cm up the margins with prickles 1–2 mm long 1.5–3 mm apart, straight subulate, ascending, reddish tipped; the midrib below beginning at 5–5.5 cm with prickles 2–2.5 mm long, 14–26 mm apart, subulate, reflexed, heavy based; at midsection the margins with prickles 0.3–0.5 mm long, 1–8 mm apart, acicular, appressed ascending; the midrib below with a few prickles 0.7–0.8 mm long, 20–25 mm apart, stout subulate, broad based, reflexed; on the caudate apex the margins and midrib below with prickles 0.3–0.5 mm long, 0.2–1 mm apart, stout, arcuate subulate, ascending; pistillate inflorescence with one terminal, erect, solitary syncarp; peduncle 8 cm long, 3 mm in diameter, 3-sided, few bracted.
thickening upwards and near the apex 4 mm in diameter; syncarp 5.5 cm long, 2.5 cm in diameter, oblong-ellipsoid, bearing about 720 drupes, these 11–12 mm long, 2 mm wide and thick, 5–6–angled, the body 7–8 mm long, oblong-oblanceoloid; pileus with its base 1.5–2 mm high, semiellipsoidal, the surface smooth or slightly papillose; style 5–6 mm long, slender subulate, bent at base and sharply reflexed, the upper drupes with nearly terminal styles, the lower ones with styles lateral in attachment; stigma 4–5 mm long, linear, proximal, brown, papillose, running almost to the stigma tip; endocarp in lower ⅔, the walls 0.07 mm thick, cartilagineous, stramineous; seed 2.5 mm long, ellipsoid; apical mesocarp sparse, pithy; basal mesocarp fibrous up the margins, fleshy within.


DISCUSSION: *P. assamensis* is a member of section *Rykia*, as is the most closely related species, *P. Scortechinii* Martelli, of Perak, Malaya. The new holotype was included among the specimens cited by Martelli when he published the latter species. Later, he typified his species by a collection from Perak, Malaya, and omitted the collection from Assam. One of these is made the basis of the species here described as new. *P. Scortechinii* has the style 4–5 mm long, subulate from a broad, compressed base, terminal and ascending; stigma 2.5–3 mm long; endocarp in lower ⅓; stem near the apex 13 mm in diameter; leaf with the caudate tip 1.3 mm wide, the marginal prickles near the base 3–6 mm apart, the nearby midrib below with prickles 0.5–1 mm long, and at midsection the midrib unarmed. *P. assamensis* has the style 5–6 mm long, slender subulate, the apical drupes with terminal styles, the middle and lower ones with lateral styles; stigma 4–5 mm long; endocarp in lower ⅔; stem near the apex 6–7 mm in diameter; leaf with the caudate tip 0.5–0.7 mm wide, the marginal prickles near the base 14–26 mm apart, the nearby midrib below with prickles 2–2.5 mm long, and at midsection the midrib below with prickles 0.7–0.8 mm long.

SPECIES FROM THAILAND

Section Acrostigma

*Pandanus retroaculeatus* sp. nov. (sect. Acrostigma).

Fig. 226

DIAGNOSIS HOLOTYPI: Planta 2 m alta, foliis circa 64 cm longis 2 cm latis supra viridibus infra pallide viridibus chartaceis excepta in basi subcoriacea supra midnervum sulcatis 2-plicatis ligulatis sed in dm ultimo in apice subulato diminuentibus (apex deest) in sectione mediali cum 28 nervis parallelis secundaris in quoque latere ubique prominentibus ad apicum nervis tertii obliquis remensis evidentibus basi ampexuscali et inerni conspicue nervosa ex 6 cm marginibus cum aculeis 1.5–2 mm longis 2–5 mm separatibus subulatis luteis inferis diversgentibus, midnervo infra ex 9 cm cum aculeis 3.5–5 mm longis 5–12 mm separatis crassiter subulatis valde reflexis basi incrassata, in sectione medio cum aculeis 0.8–1 mm longis 2–5 mm separatibus subulatis adscendentibus, midnervo angusto et elevato cum aculeis 0.5–0.8 mm longis 3–5 mm separatibus subulatis adscendentibus, proksima apicem marginibus cum serrulis 0.2–0.4 mm longis 0.5–1.5 mm separatis, midnervo infra cum serrulis 0.6–0.8 mm longis 2–3 mm separatis, in pagina supera ad meio ad apicem pilcis binis cum aculeis 0.3–0.5 mm longis 1–3 mm separatis subulatis adscendentibus, inflorescentia foemina erecta folioso-bracteata cum syncarpio solitario, pedunculo 13 cm longo 3–4 mm diametro 3-laterato, bracteis florae circa 9 luteis inferiori 7.5 cm longa 1 cm lata lineari-lanceolata marginibus ultimae cum aculeis pallidis congestis 0.1–0.2 mm longis, syncarpio (immaturo) 2 cm longo 18 mm diametro ovoideo cum circa 288 drupis eis cum pileo 6–8 mm longo basi 3 mm alta 5-angulosa lanceoloidæae laevi et cum sulca pro-

Fig. 225. *Pandanus assamensis* St. John, from holotype. *a*, fruiting branch, lateral view, × 1; *b*, drupe, lateral view, × 1; *c*, drupe, longitudinal median section, × 1; *d*, drupe, lateral view, × 4; *e*, drupe, longitudinal median section, × 4; *f*, drupe, style, and stigma, apical view, × 4; *g*, leaf base, lower side, × 1; *h*, leaf middle, lower side, × 1; *i*, leaf apex, lower side, × 1.
fundongento stigmatedescendenti, stylly 3–5 mm longo subulato subarciato vel recto osseoso sub- 
lucuo, stigmatem 3.5–5 mm longo lineari distali obscure brunneo papilloso, corpore 2.5–3 mm 
longo immatura.

**Diagnosis of Holotype:** Plant 2 m tall; leaves about 64 cm long, 2 cm wide, green 
above, pale green below, towards the base sub- 
coriaceous, the rest chartaceous, sulcate above 
the midrib, 2-pleated, ligulate but in the last 
dm tapering to a subulate apex (the tip lacking 
in ours), at midsection with 28 parallel second- 
ary veins, these prominent throughout, towards 
the apex the remote oblique tertiary cross veins 
visible, the base amplexicaul and unarmed, 
proeminently veiny, beginning at 6 cm the mar- 
gins with prickles 1.5–2 mm long, 2–5 mm 

apart, subulate, yellowish, the lowest ones diver- 
gent, the midrib below beginning at 9 cm with 

prickles 3.5–5 mm long, 5–12 mm apart, stout 

subulate, sharply reflexed, the base thickened; at 

midsection the margins with prickles 0.8–1 mm 

long, 2–5 mm apart, subulate, ascending; the 

midrib below narrow and raised, with prickles 

0.5–0.8 mm long, 3–5 mm apart, subulate, 

ascending; near the tip the margins with serrula- 
tions 0.2–0.4 mm long, 0.5–1.5 mm apart; the 

midrib below with serrulations 0.6–0.8 mm 

long, 2–3 mm apart; on the upper surface from 

the middle to the tip the pleats with prickles 

0.3–0.5 mm long, 1–3 mm apart, subulate, 

ascending; pistillate inflorescence erect, leafy 

bracted, bearing one syncarp; peduncle 13 cm 

long, 3–4 mm in diameter, 3-sided; floral bracts 

about 9, yellow, the lowest 7.5 cm long, 1 cm 

wide, linear-lanceolate, the margins of the outer 

half with pale, crowded prickles 0.1–0.2 mm 

long; syncarp (young) 2 cm long, 18 mm in 

diameter, ovoid, bearing about 288 drupes, these 

with pileus 6–8 mm long, its base 3 mm high, 

5-angled, lanceoloid, smooth, with a deep fur- 

row continuing down from the stigma; style 3–5 

mm long, subulate, slightly arcuate or straight, 

bony, yellowish; stigma 3.5–5 mm long, linear, 

distal, dark brown, papillos; body 2.5–3 mm 

long, too immature to reveal its structure.

**Holotypus:** Thailand, Ronpibun Hill, Na- 
kawn Srithamrat, jungle, 2,000 ft alt; Eryl Smith 

485 (BK).

**Discussion:** *P. retroaculeatus* is a member of 

the section *Acrostigma*, as is its closest relative, 

*P. Toinu* St. John, also of Thailand, a species 

above, pale green below, towards the base sub- 
coriaceous, the rest chartaceous, sulcate above 

the midrib, 2–5 mm apart, lance-deltoid, and 

flat. *P. retroaculeatus* has the pileus 6–8 mm 

long; stigma 3.5–5 mm long; stems 1.5 m tall; 

leaves 20 mm wide, chartaceous except for the 

subcoriaceous base, at midsection with 28 parallel 

secondary veins in each half, the tertiary cross 

veins visible nearly throughout, beginning at 5 

cm from the base the margins with prickles 

1–1.5 mm long, 2–5 mm apart, and stout.

The new epithet is from the Latin *retorsus*, 

backward, and *aculeatus*, with prickles, and it 
is given with allusion to the strong, retrorse 

prickles of the midrib.

**Pandanus Toinu** sp. nov. (sect. *Acrostigma*).

Fig. 227

**Nom. Vern.:** "toi nu."

**Diagnosis Holotypi:** Planta erecta aggre- 
gata, caulibus 15 cm altis 8 mm diametro, foliiis 

72 cm longis 14 mm latis firme characeae su- 

pra viride infra pallide viridibus l-sulcati 2- 

PLICATI in sectione M-formatis ligulatis in apice 

in 8 cm ultimis sensim diminucentibus in apice 

subulato 1 cm longo in sectione mediali cum 

19–20 nervis parallelis secundaris in quaque 

mediae eis ubique evidentibus et reticulis oblongis 

elongatis foraminibus in media ultima plicis su- 

pra cum subulato-serulis 0.5–0.9 mm longis 

2–4 mm separatis basi amplexicauli inerni sed 

nervis longitudinalibus prominenterissimis ex 5

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Fig. 226. *Pandanus retroaculeatus* St. John, from holotype. *a*, fruiting branch, lateral view, EX 1; *b*, drupe, lateral view, EX 1; *d*, drupe, lateral view EX 10; *e*, drupe, longitudinal median section, EX 10; *f*, pileus, style, and stigma, lateral view, EX 10; *b*, leaf base, lower side, EX 1; *i*, leaves middle, lower side, EX 1; *j*, leaf apex, upper side, EX 1; *k*, leaf apex, lower side, EX 1.
cm marginibus cum aculeis 1–1.5 mm longis 2–5 mm separatis lanceo-deltoidesis complanatis luteis adscendentibus, midnervio infra ex 5.5 cm cum aculeis 0.7–1.5 mm longis 2–8 mm separatis subulato-conicis infinis erectis alteris reflexis, in sectione mediali marginibus cum subulato-serrulis 0.7–0.9 mm longis 2–3 mm separatis, midnervio infra cum serrulis 0.5 mm longis 4–8 mm separatis vel nullis, ad apicem marginibus et midnervio infra cum serrulis 0.1 mm longis 1–2 mm separatis, inflorescencia fœminea erecta foliosa cum syncarpio solitario, pedunculo 8 cm longo 4 mm diametro trigono, syncarpio (immaturo) 2 cm longo 18 mm diametro ovoideo-subgloboso cum circa 240 drupis eis immaturis 7–8 mm longis, pileo 5 mm longo obliquiter lanceolideo proxime curvato osseo luteo basi 2 mm alta 1.7–2 mm lata obliquiter pyramidalis prominente 5-angulosa glauca, stylo 3 mm longo crassiter subulato arcuato lucido subereto, stigmatum 2–2.5 mm longo late lineari cinnamomum-brunneo papilloso subterminali, corpore 2.5–3 mm longo oblanceolideo immaturo contracto.

DIAGNOSIS OF HOLOTYPE: Plant erect, forming tufts; stems about 15 cm tall, 8 mm in diameter; leaves 72 cm long, 14 mm wide, firm, chartaceous, green above, pale green below, with one central furrow, 2-pleated, in section M-shaped, ligulate, at tip gradually narrowed in the last 8 cm to a 1 cm subulate apex, at midsection with 19–20 parallel secondary veins in each half, these prominent throughout, the tertiary cross veins visible nearly throughout, forming a network with the meshes elongate oblong, on the outer half the pleats on the upper surface with subulate-serrulations 0.5–0.9 mm long, 2–4 mm apart, the base amplexicaul, unarmed, but the longitudinal veins very prominent, beginning at 5 cm the margins with prickles 1–1.5 mm long, 2–5 mm apart, lance-deltoid, flat, yellow, ascending; the midrib below beginning at 5.5 cm with prickles 0.7–1.5 mm long, 2–8 mm apart, subulate conic, the lowest erect, the others becoming reflexed; at midsection the margins with subulate-serrulations 0.7–0.9 mm long, 2–3 mm apart; the midrib below with serrulations 0.5 mm long, 4–8 mm apart, or none; near the tip the margins and midrib below with serrulations 0.1 mm long, 1–2 mm apart; pistillate inflorescence erect, leafy, bearing a single syncarp; peduncle 8 cm long, 4 mm in diameter, trigonous; syncarp (immature) 2 cm long, 18 mm in diameter, ovoid-subglobose, bearing about 240 drupes, these (immature and the body little developed) 7–8 mm long; pileus 5 mm long, obliquely lanceoloid, proximally curved, bony, yellow, the base 2 mm high, 1.7–2 mm wide, obliquely pyramidal, prominently 5-angled, glaucous; style 3 mm long, thick subulate, arcuate, shining, suberete; stigma 2–2.5 mm long, broad linear, cinnamon-brown, papilllose, reaching quite to the tip; body 2.5–3 mm long, oblanceoloid, shrunk, immature.


DISCUSSION: P. Toinu is a member of the section Acrostigma, as is its closest relative, P. similis Craib, of Thailand, a species with the pileus 5 mm wide, the base hemispheric; style flat; leaves 1 m long, 14–19 mm wide, near the base the midrib with prickles 1.5–2 mm long, 15–20 mm apart, reflexed, at midsection the margins with white serrations 0.4–0.5 mm long, and 3–6 mm apart. P. Toinu has the pileus 1.7–2 mm wide, the base obliquely pyramidal; style suberete; leaves 72 cm long, 14 mm wide, near the base the midrib with prickles 0.7–1.5 mm long, 2–8 mm apart; at midsection the margins with yellow subulate-serrulations 0.7–0.9 mm long, and 2–3 mm apart.

The specific epithet is the vernacular name of the species, used as a noun in apposition.

Section Rykia

Pandanus acaulescens sp. nov. (sect. Rykia).

Fig. 228
Page 374: Revision of *Pandanus*, 20. India, Thailand—St. John

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DIAGNOSIS HOLOTYPE: Planta acaulescens aggregata, foliis 2.54–3.5 m longis circa median 6.1 cm latissima proxima basem 4 cm latiss imperiti coriaceis supra midnervum late sulcatis 2-plicatis in sectione mediiali cum 49 nervis parallelis secundariis in quaque media nervis tertiis in media ultima conspiciuis et reticulis quadratis formantes lamina ligulata in apice trigono subulato 15 cm longo diminuentibus eo in puncto 10 cm ex apice 1.5 mm lato basi ampliscula inermi crassa lucida rubro-brunnea, marginibus ex 16 cm cum aculeis 1.5–2.5 mm longis 5–10 mm separatis subulatis pallidis ascendentibus, midnervo infra ex 14 cm cum aculeis 2–3 mm longis 11–18 mm separatis arcuatis subulatis recurvatis per 16 cm extensis deinde ad 1/4 ultima inermi, in sectione mediiali marginibus cum serrulis 0.7–1 mm longis 4–11 mm separatis, in apice subulato marginibus et midnervo infra cum serrulis 0.6–1 mm longis 1–4 mm separatis, inflorescentia foeminea erecta cum syncarpio solitario, pedunculo 56 cm longo trigono subclavato in apice 15 mm diametro media ultima folioso-bracteato, bracteis syncarpium includentibus interioribus marcescentibus et in stigmatibus affixis, bracteis superis 17 cm longis 6 cm latissimis marginibus inermi et midnervo infra serrulatis, syncarpio 14.5 cm longis 9.3 cm diametro ellipsoido 3-laterato cum circa 696 drupes in lineis verticalibus, drupis 32–33 mm longis 7–10 mm latiss 6–10 mm crassiss viridibus crassiter cuneatis 6-angulosis parte 1/2 supera libera corpore 25–26 mm longo lateribus planis, pilos cum basi 4–5 mm alta subtrundata-pyramidali excuta, stylo 4–6 mm longo longi cornuformi osseo mahogani-brunneo lucido infra tereto supra complanato valde proxime curvato plerumque 1/5–1/3 bifido ramis plerumque divergentibus (stylo druparum terminalium subulatum integro), stigmatic 3–3.5 mm longo lanceolato proximo brunneo papilloso, endocarpio mediiali elliptico-oblancoideos osseo brunneo lateribus lateralibus 1 mm crassi intra laevi et lucido apice in projectione lanceo-subulato extenso, semine 13 mm longo oblancao-ellipsoideo, mesocarpio apicali cavernoso cum membranis medullosis transversis albibus, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Acaulescent, tufted plant; leaves 2.54–3.5 m long, 6.1 cm wide a little beyond the middle, near the base 4 cm wide, thin coriaceous, broadly furrowed above the midrib, 2-pleated, at midsection with 49 parallel secondary veins in each half, the tertiary cross veins conspicuous in the outer half, making a reticulum of squarish meshes, blade ligulate, tapering to a 15 cm trigonous, subulate tip, this 10 cm down 1.5 mm wide, the base ampliicaul, unarmed, thick, shining, reddish brown, the margins beginning at 16 cm with prickles 1.5–2.5 mm long, 5–10 mm apart, subulate, pale, ascending; the nearby midrib below beginning at 14 cm with prickles 2–3 mm long, 11–18 mm apart, arcuate, subulate, recurved, these extending for only 16 cm, then the midrib unarmed till the last quarter; at midsection the margins with serrulations 0.7–1 mm long, 4–11 mm apart, on the subulate apex the margins and midrib below with serrulations 0.6–1 mm long, 1–4 mm apart; pistillate inflorescence erect, with 1 syncarp; peduncle 56 cm long, trigonous, subclavate, at apex 15 mm in diameter, the upper half leafy bracted, the bracts enclosing the syncarp and the inner ones becoming marcescent and impled on the sharp stigmas; upper bracts 17 cm long, 6 cm wide, their upper margins and midrib serrulate; syncarp 14.5 cm long, 9.3 cm in diameter, ellipsoid, 3-sided, bearing in vertical rows about 696 drupes, these dark green, 32–33 mm long, 7–10 mm wide, 6–10 mm thick, cuneate, 6-angled, upper 1/2 free, the body 25–26 mm long, its sides flat; pilleus with the base 4–5 mm high, slightly rounded pyramidal, dull; style 4–6 mm long, hornlike, bony, mahogany-brown, shining, terete below, flattened above, sharply proximally curved, mostly

FIG. 228. Pandanus acaulescens St. John, from holotype. a, syncarp, lateral view, × 1/2; b, drupe, lateral view, × 1; c, drupe, longitudinal median section, × 1; d, e, f, g, h, apical drupes, apical view, × 1; i, j, k, l, m, n, o, lateral drupes, apical view, × 1; e, f, g, b, apical drupes, apical view, × 1; p, drupe, lateral view, × 4; q, drupe, longitudinal median section, × 4; r, style and stigma of lateral drupe, lateral view, × 4; s, style and stigma of apical drupe, lateral view, × 4; t, leaf base, lower side, × 1; u, leaf middle, lower side, × 1; v, secondary and tertiary venation of leaf middle, lower side, × 4; w, leaf apex, lower side, × 1.
bifid $\frac{1}{2}$-$\frac{3}{4}$ way, the forks mostly divergent (the apical drupes with the style simple, subulate); stigma 3–3.5 mm long, lanceolate, on the proximal face of the lobes, united below, brown, papillose; endocarp median, elliptic-oblanceoloid, bony, brown, the lateral walls 1 mm thick, the inner surface smooth, shining, the apex prolonged upwards into a lance-subulate projection; seed 13 mm long, oblance-ellipsoid; apical mesocarp cavernous, with 'transverse, medullary membranes; basal mesocarp fibrous and fleshy.

**HOLOTYPE:** Thailand, Chiangmai, Tat Noi, common in dry waterway, 900 m alt, tufted plant, no stems, 19 April 1960, Tem Smitinand 6,746 (BK F).

**DISCUSSION:** *P. acaulescens* is a member of the section *Rykia*, as is its closest relative, *P. penetrans* St. John, a species found in the same general locality, and one which has the infructescence pendent; syncarp 12 cm in diameter; drupes 33–35 mm long, 9–11 mm wide, upper $\frac{1}{4}$ free; pileus 12–15 mm high, the base ob lance-pyramidal; style 7–8 mm long; endocarp submedian; leaves 5–5.6 cm wide near the base, at midsection with 43 parallel secondary veins in each half, at midsection the margins with prickles 1.5–2.5 mm long, 13–22 mm apart, subulate, the nearby midrib below with prickles 3.5–5 mm long, 38–70 mm apart, stout subulate, reflexed; tree up to 9 m tall, 8 cm in diameter, the bark with ascending adventitious rootlets. *P. acaulescens* has the infructescence erect; syncarp 9.3 cm in diameter; drupes 32–33 mm long, 7–10 mm wide, upper $\frac{1}{4}$ free; pileus 8–11 mm high, the base slightly rounded pyramidal; style 4–6 mm long; endocarp median; leaves 4 cm wide near the base, at midsection with 49 parallel secondary veins in each half, at midsection the margins with serrations 0.7–1 mm long, 4–11 mm apart, the nearby midrib below unarmed; and the plant acaulescent.

The new epithet is the Latin *acaulescens*, without a stem, and is here given as a descriptive name. **Pandanus ligulatus** sp. nov. (sect. *Rykia*).

**Fig. 229**

**DIAGNOSIS HOLOTYPE:** Trun cus 3 m altus, foliis 3.95 m et plus longis 4 cm latis subcoriaceis apperante pallide viridibus supra midnervum late sulcatis 2-pliicatis ligulatis apice perditio, in sectione medi ali cum 46 nervis parall elis secundariis in quoque dimidio ad apicem praecipue infra nervis terriis conspiciis et oblongos angustos formantibus basi amplexicauli et inermi cupraco ed ex 13–18 cm marginibus cum spinis 4–4.5 mm longis 25–45 mm separatis crasse arcuato-subulatis adscendentibus bruneinis, midnervo infra cum spinis simulanti bis sed crassioribus et reflexis, in sectione medi ali marginibus cum aculeis 2–2.5 mm longis 15–21 mm separatis subulatis adpresse adscendentibus apicibus bruneenis, midnervo infra cum aculeis simulantibus adscendentibus sed 30–33 mm separatis, in apice marginibus cum subulato-serrulis 1–1.5 mm longis 3–5 mm separatis, midnervo infra cum serrulis simulantibus 8–12 mm separatis, infructescentia pendenti cum syncarpio solitario, pedunculo 70 cm longo 1.3 cm diametro trigono folioso-bracteato, bracteis superis 20 cm longis 5 cm latis foliaceis marginibus cum subulato-serrulis 0.5 mm longis 3–5 mm separatis, syncarpio 11 cm longo 7.5 cm diametro late ellipsoideo viridi, drupis 27–32 mm longis 6–8 mm latis 5–7 mm crassiis oblongo-oblanceoloidelis eis lateralibus et subbasalis minime compressis (illis apicalibus parve majoribus et paucis cum stylo subulato integri arcuato), pileo 10–13 mm longo basi 4–7 mm alto anguste pyramidalii-conico 5–6-anguloso minute papilloso, stylo 6–7 mm longo osseo brunneo lucido supra median compresso prox-
ime subarcuato ¼–½ bifido, furcis inaequalibus divergentibus, stigmaticae 4–5 mm longo in basi lanceolato bifido brunneo papilloso ad apices non extento, endocarpio in parte ¾ supera 11 mm longo cylindrico osseoso lateribus 1 mm crassis, semine 7 mm longo sublineari, mesocarpio apicali parvo fibroso et medullosio, mesocarpio basali fibroso et carnoso.

**DIAGNOSIS OF HOLOTYPNE:** Stem 3 m tall; leaves more than 3.95 m long, 4 cm wide, subcoriaceous, apparently pale green, broad channelled above the midrib, 2-pleated, ligulate, the apex lost but apparently acuminate, at midsection with 46 parallel secondary veins in each half, towards the tip especially below the tertiary cross veins conspicuous and forming narrowly oblong meshes, the base amplexicaul, unarmed, copper-colored, but beginning at 13–18 cm the margins with thorns 4–4.5 mm long, 25–45 mm apart, stout arcuate subulate, ascending, brown; the midrib below with thorns similar but stouter and reflexed; at midsection the margins with prickles 2–2.5 mm long, 15–21 mm apart, subulate, appressed ascending, brown-tipped; the midrib below with similar ascending prickles but 30–33 mm apart; near the apex the margins with subulate-tipped serrations 1–1.5 mm long, 3–5 mm apart; the midrib below with similar serrations 8–12 mm apart; infructescence pendulous, bearing a single syncarp; peduncle 70 cm long, 1.3 cm in diameter, trigonous, leafy bracted, the upper bracts 20 cm long, 5 cm wide, foliaceous, the marginal teeth 0.5 mm long, 3–5 mm apart, subulate-serrulate; syncarp 11 cm long, 7.5 cm in diameter, broadly ellipsoid, green; drupes 27–32 mm long, 6–8 mm wide, 5–7 mm thick, oblong-oblanceoloid, the lateral and subbasal ones little or not at all compressed, 5–6-angled (the apical ones slightly the larger and a few of them with an unbranched, arcuate, subulate style); pileus 10–13 mm long, its base 4–7 mm high, narrowly pyramidal-conic, 5–6-angled, minutely papilllose; the style 6–7 mm long, bony, brown, shining, compressed above the middle, gently arcuate proximally, bifid ¼–½ way, the forks subequal, divergent, often unequally so; stigma 4–5 mm long, lanceolate at base, bifid, not reaching the tips, brown papilllose; endocarp in upper ¾, 11 mm long, cylindric, bony, pale, the lateral walls 1 mm thick; seed 7 mm long, almost linear; apical mesocarp sparse, fibrous and pithy; basal mesocarp fibrous and fleshy.

**HOLOTYPUS:** Thailand, northeastern part, Loei, Phu Kradung, common in evergreen forest by stream, 1,300 m alt, 24 Nov. 1958, *Tem Smith* and 4,950 (BKF).

**DISCUSSION:** *P. ligulatus* is a member of the section *Rykia*, as is its closest relative the Thailand species *P. penetrans* St. John, which species has the syncarp 14 cm long, 12 cm in diameter; drupes 35–35 mm long, 9–11 mm wide, 7–10 mm thick; base of the pileus 7–10 mm high; endocarp submedian; seed 13 mm long; leaves 2.7–29 m long, 5–5.6 cm wide, near the base the margins with prickles 3.5–4 mm long, 11–18 mm apart. *P. ligulatus* has the syncarp 11 cm long, 7.5 cm in diameter; drupes 27–32 mm long, 6–8 mm wide, 5–7 mm thick; base of the pileus 4–7 mm high; endocarp in the upper ¾; seed 7 mm long; leaves 3.9 or more m long, 4 cm wide; and near the base the margins of the leaves with thorns 4–4.5 mm long, 25–45 mm apart.

The new epithet is the Latin adjective, *ligulatus*, strap-shaped, in reference to the ligulate leaf blades.

**Pandanus penetrans** sp. nov. (sect. *Rykia*).

Figs. 230, 231

**NOM. VERN.:** "toei."

**DIAGNOSIS HOLOTYPI:** Arbor 9 m alta 8 cm diametro, cortice brunneo cum radicillis 1 cm
longis adventivis paucis spiniformatis adpresse adscendentibus, radicibus fulturosus nullis vel in trunci prostratis 3–5 dm longis 1 cm diametro paucis laevisbus vel parve spinosis, foliis 2.73–2.9 m longis 6–6.3 cm latis in media sed proxima basem 5–5.6 cm latis subcoriaceis supra obscure olivaceo-viridibus infra pallide viridibus in basi clausa cupracea supra midnervo late 1-sulcatis 2-plicatis in sectione mediial cum 43 nervis parallelis secundaris in quoque medio in dimidia ultima nervis tertii conspicuis in lateribus ambis laminis ligulatis sed in basi subcuneatis et in apice subulato trigono gracili breviter diminuentibus eo 10 cm ex apice 1 mm lato basi amplexicauli et inerimi sed marginibus ex 10–11 cm aculeis 3.5–4 mm longis 11–18 mm separatis substratalis validibus subadscedentibus subviridibus vel albis apicibus brunneis, midnervo infra ex 18 cm cum aculeis 4–5 mm longis 15–25 mm separatis crasse subulatibus subreflexis in sectione mediae marginibus aculeis 1.5–2.5 mm longis 13–22 mm separatis subulato adpresse adscendentibus, midnervo infra cum aculeis 3.5–5 mm longis 38–70 mm separatis crasse subulatibus reflexis, in apice subulato marginibus et midnervo infra cum serrulis 0.3–0.5 mm longis 1–6 mm separatis, inflorescentia foeminea terminali pendenti cum syncarpio solitario, pedunculo 65 cm longo subclavato in apice 2 cm diametro trigono folioso-bracteato bracteis superis 80 cm longis 7 cm latis, bractea supera 17 cm longa 5.5 cm lata marginibus superis serrulatis, syncarpio cum bracteis marcescentibus subclausis, syncarpio 14 cm longo 12 cm diametro late ellipsoido valde 3-laterato cum circa 576 drupis eis 33–35 mm longis 9–11 mm latis 7–10 mm crassis oblongo-lanceoloides 5–7-anulus (drupis terminalibus parum majoribus et cum stylo subulato arcuato integro) eis lateralis viridibus subglaucescens lateribus planis laevisbus parte ¼ supera libera, pileo 12–15 mm alto cum basi 7–10 mm alta 5–7-angulosa oblanco-pyramidalis lateribus laevisbus, stylo 7–8 mm longo cornoso obscure bruno lucido compresse adscendentibus tum valde proxime curvato ½–¾ furcato furcis spinosiformibus ple- rumque divergentibus et subequalibus, stigmatem 4–5 mm longo lanceolato bifurcato brunneo papilloso paene ad apices extento, drupis apicalibus cum stylo 5–6 mm longo subulato recto vel subarcuato, endocarpio submediiali corpori 14 mm longo osseoso brunneo in apice cum extensioni subulato 8 mm longo lateribus lateribus 1–1.5 mm crassis intra lucidum, semine 13 mm longo ellipsoido, mesocarpio apicalis cavernoso cum membranis albis medullosis multis, mesocarpio basali parvo fibroso et carnoso.

**DIAGNOSIS OF HOLOTYPHE:** Tree, up to 9 m tall, 8 cm in diameter; bark brown, with a few, well spaced, adventive rootlets, up to 1 cm long, appressed ascending, almost spine-like; prop roots none on erect trunks, but on fallen trunks rare and 3–5 dm long, 1 cm in diameter, smooth or with a few remote, small spines; leaves 2.73–2.9 m long, 6–6.3 cm wide at the middle, 5–5.6 cm wide near the base, subcoriaceous, above dark olive green, below pale green, the covered auriculate base copper-colored, broadly furrowed above the midrib, 2-pleated, at midsection with 43 parallel secondary veins in each half, in the outer half the tertiary cross veins conspicuous on both sides, a little sinuous, making a pattern of squares or short oblongs, blade ligulate, though slightly tapering to the base and short tapering to the 10–15 cm, trigonus, slender subulate-apex, this 10 cm down 1 mm wide, the base amplexicaul and unarmed, but the margins beginning at 10–11 cm with prickles 3.5–4 mm long, 11–18 mm apart, stout subulate, slightly ascending, greenish to whitish and brown-tipped; the midrib below beginning at 18 cm with prickles 4–5 mm long, 15–25 mm apart, stout subulate, slightly reflexed; at midsection the margins with prickles 1.5–2.5 mm long, 13–22 mm apart, subulate, appressed ascending; the midrib below with prickles 3.5–5 mm long, 38–70 mm apart, stout subulate, reflexed; on the subulate apex the margins and midrib below with serrations 0.3–0.5 mm long, 1–6 mm apart; pistillate inflorescence terminal, pendent, bearing one syncarp; peduncle 65 cm long, slightly clavate, at apex 2 cm in diameter, trigo- nous, leafy bracted; upper bracts 80 cm long, 7 cm wide, the innermost 17 cm long, 5.3 cm

**FIG. 231. Pandanus penetrans St. John, from holotype, syncarp, lateral view, × 1.**
wide, the upper margins serrulate; syncarp en-wrapped and nearly concealed by the marcescent bracts; syncarp 14 cm long, 12 cm in diameter, broad ellipsoid, markedly 3-sided, bearing about 576 drupes, these 33–35 mm long, 9–11 mm wide, 7–10 mm thick, oblong-lanceoloid, 5–7-angled (the apical ones averaging slightly the larger and with a simple, arcuate, subulate style), the normal lateral ones still green, but full sized, a little glaucous, the sides plane and smooth, upper ¼ free; pileus 12–15 mm high, the base oblong-pyramidal, 7–10 mm high, 5–7-angled, the sides smooth; style of lateral and basal drupes 7–8 mm long, horn-like, dark brown, shining, flattened, ascending, then sharply proximally curved almost at right angle, bifurcate ½–2½ way, the forks spine-like, mostly divergent and subequal; stigma 4–5 mm long, lanceolate, bifurcate, brown, papilllose, extending almost to the tips; apical drupes with simple, subulate style 5–6 mm long, erect, straight or slightly arcuate; endocarp submedian, the body 14 mm long, bony, brown, the apex bearing a subulate prolongation 8 mm long, the lateral walls 1–1.5 mm thick, the inner surface shining; seed 13 mm long, ellipsoid; apical mesocarp a cavern with many white medullary membranes; basal mesocarp scant, fibrous and fleshy.

HOLOTYPE: Thailand, Doi Suthet, Chiang Mai, moist forest of Manglieta Garrattiana and Podocarpus nereifolia, moist stream bank on granite, 1,200 m alt, June 7, 1960, H. St. John 26,352 (BISH).

DISCUSSION: P. penetrans is a member of the section Rykia, as is its closest relative, the Malayan species P. longicaudatus Holttum & St. John, a species which has the syncarp 16–17 cm long; drupes 41–44 mm long, 8–14 mm wide, cuneate oblong; pileus base 4–6 mm high, pyramidal-hemispheric; stigma 3–3.5 mm long; leaves 4.7–6 cm wide, at midsection with 48 parallel secondary veins in each half, the covered base olive-ochre, and at midsection the midrib unarmed. P. penetrans has the syncarp 14 cm long; drupes 33–35 mm long, 9–11 mm wide, oblong-lanceoloid; pileus base 7–10 mm high, oblong-pyramidal; stigma 4–5 mm long; leaves 6–6.3 cm wide, at midsection with 43 parallel secondary veins in each half, the covered base copper-colored, at midsection the midrib below with prickles 3.5–5 mm long, 38–70 mm apart.

The new epithet is the Latin word penetrans, penetrating, and is given in reference to the sharp, rigid style forks that easily penetrate one's flesh.