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THE GENUS *PANDANUS* (PANDANACEAE) IN MADAGASCAR (PART 4)

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Key-Words: Africa, Madagascar, *Pandanus* sect. *Acanthostyla*, Pandanaceae, Taxonomy

Résumé

Quatre espèces nouvelles de *Pandanus* de Madagascar appartenant à la sect. *Acanthostyla* sont décrites (*P. alveolatus* Huynh, *P. andringitrensis* Huynh, *P. pluriaculeatus* Huynh, *P. tabellarius* Huynh).

Summary

Four new species of *Pandanus* sect. *Acanthostyla* from Madagascar are described (*P. alveolatus* Huynh, *P. andringitrensis* Huynh, *P. pluriaculeatus* Huynh, *P. tabellarius* Huynh).

Zusammenfassung

Vier neue *Pandanus*-Arten von Sektion *Acanthostyla* aus Madagaskar werden beschrieben (*P. alveolatus* Huynh, *P. andringitrensis* Huynh, *P. pluriaculeatus* Huynh, *P. tabellarius* Huynh).

INTRODUCTION

Pandanus sect. *Acanthostyla* is endemic to Madagascar. It is characterized by drupes with spiniform styles each bearing a long and narrow stigma, and by a columnar coniferoid habit (see for example, MARTELLI & PICH-SERMOLLI, 1951: fig. 22, 26a, and 26b; ST. JOHN, 1968: fig. 249p; STONE, 1970a: plate 1; STONE, 1970b: fig. 10A; GUILLAUMET, 1973: fig. 4/9), besides other characteris-

tics. The stem bears an apical crown of large leaves, and lateral branches with smaller leaves; the branches only, may have inflorescences. Since lateral branches with infructescences were currently collected for specimens, but not apical leaves, the leaves of the branches were used for leaf characters of species in the section. Until recently, this comprised 15 species. In the course of the present study, some unknown species were found, four of which are described below.

OBSERVATIONS

1. *Pandanus alveolatus* Huynh, spec. nova (sect. *Acanthostyla*)

Arbor 3 m alta. Folia infra infructescen-
tiam 100-110 cm longa 1.5-1.7 cm lata in
medio 1.5-1.7 cm supra vaginam, ensi-
formia, apicem versus abrupte attenuata,
circa 1.5 cm caudata, basi amplexicaulia;
lamina in sicco coriacea, dense alveolata e
basi ad apicem in pagina adaxiali, partim
in abaxiali, alveolis usque ad 0.9 mm
longis 0.3 mm latis sed plerumque parvioribus,
stomate unico in centro praeditis;
plicis canaliculatis fere e basi ad apicem,
superne sese appositis in circa 2 cm et 1-2
denticulis armatis; venis longitudinalibus
distinctis in pagina abaxiali minus in
adaxiali; venis transversalibus visibilibus
prope basim; denticulis marginalibus e
circa 20 cm supra basim ad apicem praesentibus,
antrorsis, inferne vix visibilibus
(circa 0.5 mm longis) ad 10 mm inter se
separatis, superne creberrimis et paulo longioribus;
denticulis costalibus praesentibus
in 1/3-1/2 supera, antrorsis, generaliter tam
longis separatis quam marginalibus
proximis; vagina 13-15 cm longa 4 cm lata
in basi 2 cm apice, e basi ad apicem
sensim attenuata, nitida praecipue in basi,
non nervata, in pagina adaxiali dense
alveolata. Infructescencia polysyncarpica;
rhachidi inter syncarpium summum et
infimum circa 8 cm longa, fere recta inter
infimum et tertium, deinde semicirculatim
sursum arcuata; syncarpiis 4, racemosis;
syncarpio summo carenti in specimine;
secundo 6 x 4.8 cm, ellipsoideo, circa 75
drupis praedito, sessili, a praecedenti 2 cm
separato; tertio 4.5 x 4 cm, subgloboso,
sessili, a praecedenti 2 cm separato; infimo
5.7 x 4 cm, ellipsoideo, 1 cm pedunculato,
a praecedenti 3 cm separato; pedunculo
circa 32 cm longo, 7 mm crasso in apice 5
mm medio, trigono, dense longitudinaliter
nervato inter angulos, ascendenti e basi ad
16 cm supra basim, deinde nutanti. Drupae
circa 17 mm longae (stylis exclusis) 10-15

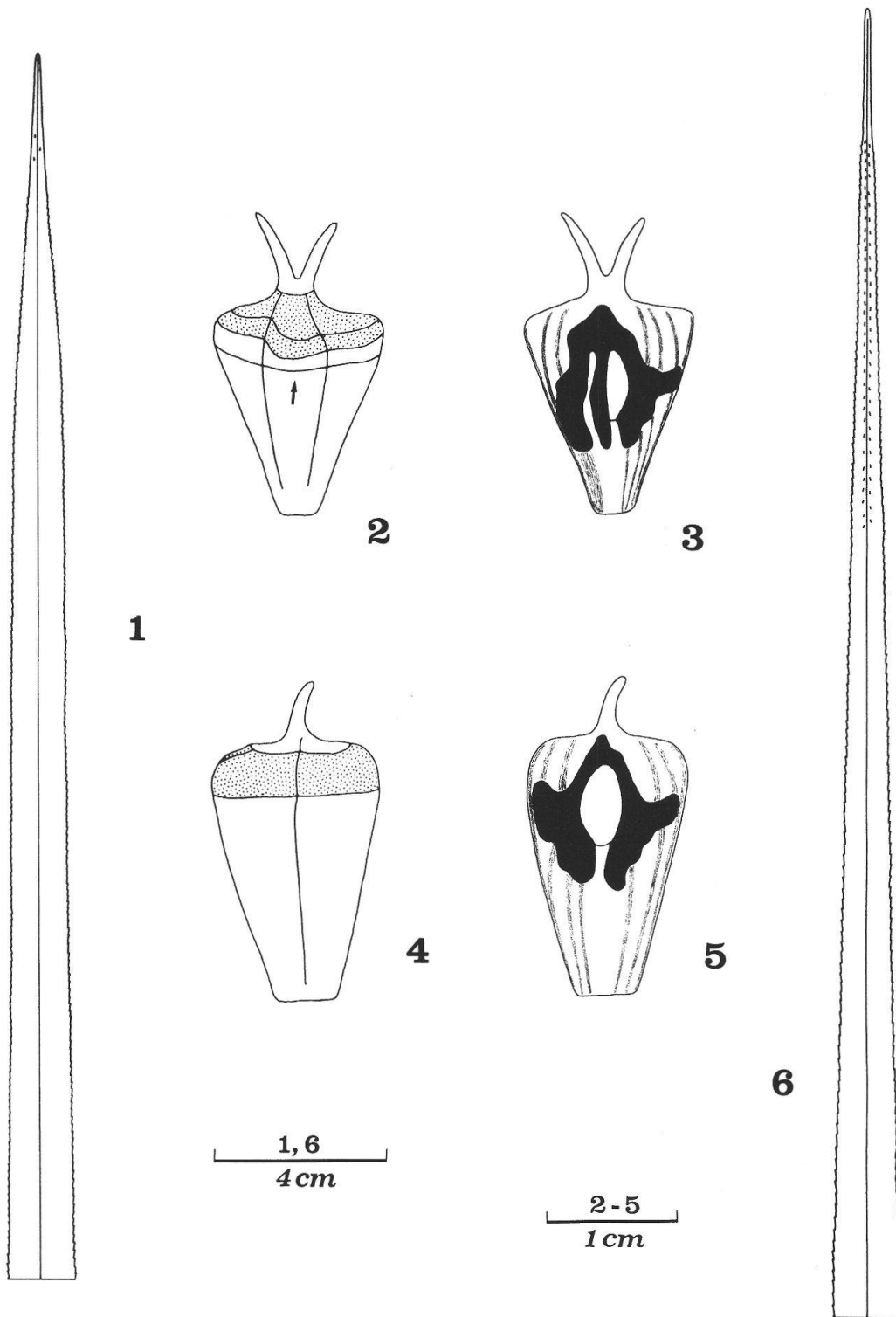
(-18) mm latae 8-12 mm crassae, in 1/3
supera liberae; stylis 1-2, raro 3, spiniformibus,
complanatis, 5-6 mm longis, plerumque
rectis, aggregatis si 2 vel 3; superficibus
stigmaticis linearibus, maximam partem
styli percurrentibus; pileo planoconvexo,
6-7 mm alto, laevi, corneo, leviter nitido,
generaliter prominente angulato, basi paulo
supra partem connatam cuneatam posita;
endocarpio circa 11 mm alto in axe, apice
prope basim stigmatum basi ad 5 mm supra
basim drupae, partibus supra loculos
seminales circa 3 mm altis, conjunctis,
late pyramidalibus; loculis seminalibus
ellipsoideis, circa 5 x 2 mm, apice ad circa
5 mm infra basim stigmatum basi circa 6-7
mm supra basim drupae, centro prope
medium; mesocarpio supero subnullo in
apice sed lato in partibus lateralibus,
fibroso, copiose meduloso; mesocarpio
infero fibroso. Fig. 1-3 and 13.

Type: *Miller & Randrianasolo 4433* (holo
MO!); Madagascar, Marojejy natural
reserve, western slopes of Mt Beondroka,
14°27'S 49°47'E, alt. 660-830 m, 23-24
October 1989; cloud forest; shrub 3 m tall,
fruits green; local name "Tsiribe".

P. alveolatus is named in reference to its
leaves whose adaxial face is densely
alveolate from the base to the apex. The
presence of an alveolate pattern at the
adaxial face of leaves has been observed in
various species in sect. *Acanthostyla*, but
in these the pattern was limited to the
vagina (this is the case for example, of the
three species described below). In *P. alveolatus*,
exceptionally, the pattern extends from the
base to the apex at that face. This peculiar
feature contributes to facilitate the
recognition of this species.

2. *Pandanus tabellarius* Huynh, spec. nova (sect. *Acanthostyla*)

Arbor 10 m alta. Folia infra infructescen-
tiam 110-120 cm longa 1.8-2 cm lata in
medio 1.8-2 cm supra vaginam, e circa 1/3
supera ad apicem sensim attenuata, 2-3 cm



Figures 1-6: *Pandanus alveolatus* (1-3: Miller & Randrianasolo 4433, holotype), and *P. tabellarius* (4-6: Miller 3490, holotype). - 1, 6: Upper part of leaves flattened horizontally, viewed by the adaxial face. - 2: Drupe with two stigmas in lateral view (dotted: pileus; arrowed: lower limit of the free part). - 3: Drupe with two stigmas in axial section (black: endocarp). - 4: Drupe with one stigma in lateral view (dotted: pileus and free part). - 5: Drupe with one stigma in axial section (black: endocarp).

caudata, basi amplexicaulia; lamina in sicco rigida coriacea, tessellata in parte basali paginae abaxialis; plicis distinctis in 2/3 superis, superne sese appositis in 20-30 cm et armatis in 10-15 cm; venis longitudinalibus distinctis in pagina abaxiali minus in adaxiali; venis transversalibus visibilibus in partibus tessellatis; denticulis marginalibus e circa 20 cm supra basim ad apicem praesentibus, antrorsis, omnibus brevibus ut maximum 0.5-0.7 mm longis, inferne ad 8 mm inter se separatis, superne creberrimis; denticulis costalibus praesentibus in circa 1/2 supera, antrorsis, \pm tam longis separatis quam marginalibus proximis; vagina circa 13 cm longa 5 cm lata in basi 2.5 cm apice, e basi ad apicem sensim attenuata, atrobrunnea nitida laevi secus axem transversaliter rimulosa in pagina abaxiali, brunneola partim leviter nervata superne minute alveolata in adaxiali. Infructescentia polysyncarpica; rhachidi inter syncarpium summum et infimum circa 8 cm longa, leviter curvata in medio; syncarpiis 3, racemosis, sessilibus, circa 3 cm inter se separatis; syncarpio summo grandissimo, ovato, circa 5.8 cm longo 5.2 cm lato, circa 90 drupis praedito; syncarpiis inferis subovatis vel breviter ellipticis, 4-5 cm longis 4 cm latis; pedunculo circa 40 cm longo, 9 mm crasso in apice 6 mm medio, trigono, dense longitudinaliter nervato inter angulos, superne nutanti. Drupae 19-20 mm longae (stylis exclusis) 12-15 mm latae 6-10 mm crassae, plerumque in 1/5 supera liberae; stylis 1, raro 2 et propinquis in basi, 4-5 mm longis, spiniformibus, complanatis, rectis vel leviter curvatis; superficiebus stigmaticis linearibus, maximam partem styli percurrentibus; pileo 4-5 mm alto, plano tabulari in aspectu laterali, leviter depresso circum stigma in apicali, subcorneo, nitidiusculo, obscure vel acute angulato, 1 interdum 2 rimis verticalibus inter angulos continuos praedito, basi ad apicem partis connatae; endocarpio circa 12 mm alto in axe, apice ad basim stig-

matum basi 8 mm supra basim drupae, parte supra loculum seminale circa 2 mm alta; loculo seminali ellipsoideo, circa 6 x 3 mm, apice ad circa 2 mm infra basim stigmatum basi circa 11 mm supra basim drupae, centro prope 1/4 superam; mesocarpio supero nullo in apice sed lato in partibus lateralibus, fibroso, meduloso; mesocarpio infero fibroso, meduloso. Fig. 4-6 and 14.

Type: *Miller 3490* (with *Rakotozafy, Schatz, Badré & Randrianasolo*) (holo P!, iso MO!); Madagascar, Marojejy natural reserve, along the trail to the summit of Marojejy East, North of Mandena, 14°26'S 49°16'E, alt. 700-1150 m, 8-9 October 1988; cloud forest on steep ridge; dichotomously branched tree 10 m tall; fruits green, pendent.

P. tabellarius is named in reference to the shape of its pileus (fig. 4).

Apparently there are no species very closely related to *P. tabellarius*. This latter may be compared with *P. alveolatus*, found nearby (see above). They seem to be the only species of sect. *Acanthostyla* which were known from the Marojejy massif. This latter species differs from *P. tabellarius* in several characters. In particular, its leaves are abruptly attenuate in the apical part, and the pleats are armed with only 1 or 2 prickles (fig. 1: compare with fig. 6); in addition, the blade of these leaves is densely alveolate from below up to the apex at the adaxial face, a feature to date not observed in any other known species of the section.

3. *Pandanus andringitrensis* Huynh, spec. nova (sect. *Acanthostyla*)

Arbor 5 m alta. Folia infra infructescen-
tiam 85-95 cm longa 1.8-2.1 cm lata in medio 1.8-2.1 cm supra vaginam, ensiformia, apicem versus abrupte attenuata, 4-5 cm caudata, basi amplexicaulia; lamina in sicco coriacea/subcoriacea, partim tessellata praecipue in parte infera paginae

abaxialis; plicis fere e basi ad apicem canaliculatis, superne sese appositis in circa 2 cm et armatis in 5-6 cm; venis longitudinalibus distinctis in pagina abaxiali minus in adaxiali; venis transversalibus visibilibus in partibus tessellatis; denticulis marginalibus e circa 10 cm supra basim ad apicem praesentibus, antrorsis, in tertia infera ad 2 mm longis et 1 cm inter se separatis, sursum versus brevioribus creberrimisque; denticulis costalibus e 15-20 cm supra basim ad apicem praesentibus, infimis retrorsis, inferne perspicue brevioribus et magis separatis quam marginalibus proximis, superne generaliter tam longis separatisque; vagina circa 10 cm longa, 2-2.5 cm lata in apice 5 cm basi 6 cm prope basim, e basi ad apicem sensim attenuata, utrinque laevi nitidaeque, in pagina adaxiali leviter alveolata. Infructescencia polysyncarpica; rhachidi inter syncarpium summum et infimum circa 4 cm longa, leviter curvata in medio; syncarpiis 4, racemosis, sessilibus; superis normaliter evolutis, globosis/subglobosis, 4.2 cm longis 4 cm latis, circa 70 drupis praeditis; infimo abortivo, multo parviore, aliquot drupis parvissimis tantum praedito; pedunculo circa 20 cm longo, 7 mm crasso in apice, leviter trigono, dense longitudinaliter nervato inter angulos, fere recto, non nutanti. Drupae 15-17 mm longae (stylis exclusis) 8 (-11) mm latae 6 mm crassae, in fere 1/2 supera liberae; stylis 1, raro 2 vel 3, anguste spiniformibus, complanatis, 5-7 mm longis, leviter curvatis, plerumque obliquis vel subhorizontalibus, aggregatis si 2 vel 3; superficiebus stigmaticis linearibus, maximam partem styli percurrentibus; pileo circa 5 mm alto, pyramidali, laevi, corneo, nitido, prominente acute angulato, basi perspicue supra partem connatam posita; endocarpio circa 11 mm alto in axe, apice ad 1 mm infra basim stigmatum basi 5 mm supra basim drupae, parte supra loculum seminale late pyramidali, circa 2.5 mm alta; loculo seminali oblongo-elliptico, circa 7 x 2.5 mm, apice

ad circa 4 mm infra basim stigmatum basi circa 7 mm supra basim drupae, centro supramediano; mesocarpio supero subnullo in apice, angusto in partibus lateralibus, medullosa, parce fibroso; mesocarpio infero parce medullosa sed copiose fibroso. Fig. 7-9 and 15.

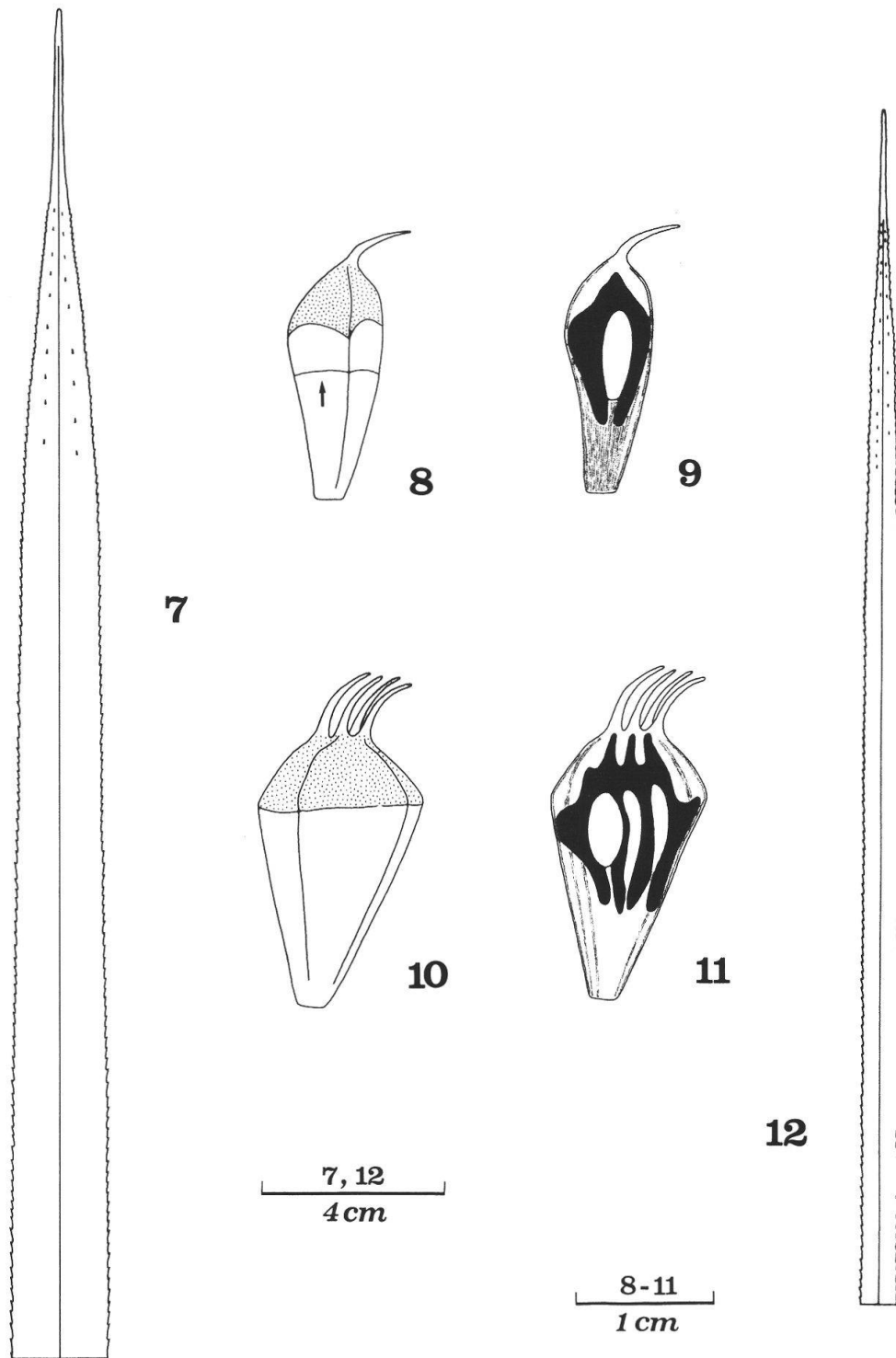
Type: *Beverley Lewis 1032* (with *Raharilala, Rakotomalala, Andrianarisata & McDonagh*) (holo MO!, iso P!); Madagascar, Andringitra reserve on ridge above headwaters of Sahavatoy River, ca 38 km South of Ambalavao, 22°11'39"S 46°58'16"E, alt. 1625 m, 9-16 December 1993; up to 5 m high, leaves up to 70 cm long, fruits green in clusters of 3-4.

Other material: *Rakotavao 297* (with *Randriamasy*) (MO!, NEU!); Madagascar, Andringitra RN, Ivohibe, west of Ambarongy, 22°13'22"S 46°58'18"E, alt. 1210-1625 m, 8-11 December 1994; tree 12 m tall, fruits green, spiny.

P. andringitrensis appears close to *P. sparganioides* Baker. In both of them, the infructescencia is polysyncarpic, the drupes have mostly one stigma, and the pileus is pyramidal. This latter species differs from *P. andringitrensis* especially in that: its infructescencia comprises 6-8 syncarps; its drupes are 13 mm long and 4 mm wide; its leaves are the same length but wider (2-2.5 cm). *P. sparganioides* was found in North-West Madagascar (STONE, 1970b: 585) while *P. andringitrensis* in South-East.

4. *Pandanus pluriaculeatus* Huynh, spec. nova (sect. *Acanthostyla*)

Arbor 8 m alta. Folia infra infructescenciam 60-65 cm longa 7-8 mm lata in medio 7-8 mm supra vaginam, apicem versus sensim attenuata, 2-3 cm caudata, basi amplexicaulia; lamina in sicco subcoriacea; plicis minutissime canaliculatis in parte supera, superne sese appositis in 3-5 cm et armatis in 3-5 cm; venis longitudinalibus utrinque distinctis, transversalibus utrinque invisibilibus; denticulis margina-



Figures 7-12: *Pandanus andringitrensis* (7-9: Beverley Lewis 1032, holotype), and *P. pluriaculeatus* (10-12: Van der Werff & McPherson 13494, holotype). - **7, 12:** Upper part of leaves flattened horizontally, viewed by the adaxial face. - **8:** Drupe with one stigma in lateral view (dotted: pileus; arrowed: lower limit of the free part). - **9:** Drupe with one stigma in axial section (black: endocarp). - **10:** Drupe with four stigmas in lateral view (dotted: pileus and free part). - **11:** Drupe with four stigmas in axial section (black: endocarp).

libus e circa 9 cm supra basim ad apicem praesentibus, antrorsis, in tertia infera ad 0.5-0.7 mm longis et 3-5 mm inter se separatis, sursum versus brevioribus creberrimis; denticulis costalibus generaliter praesentibus in dimidio supero tantum, \pm tam longis separatis quam marginalibus proximis; vagina circa 9 cm longa, 1.4 cm lata in apice 3 cm basi, e basi ad apicem sensim attenuata, utrinque nitida et partim leviterque nervata, basi leviter alveolata in pagina adaxiali. Infructescentia monosyncarpica; syncarpio ovato, 5-5.7 cm longo 4.5-5 cm lato, circa 50 drupis praedito; pedunculo 25-30 cm longo 6 mm crasso in apice deorsum versus attenuato, trigono, dense longitudinaliter nervato, \pm rectangulariter curvato in medio. Drupae 19-20 mm longae (stylis exclusis) 11-16 mm latae 7-13 mm crassae, in circa 1/4 supera liberae; stylis (3-) 4-5 (-6), anguste spiniformibus, complanatis, 5-6 mm longis, leviter curvatis, in vertice pilei aggregatis, fere omnibus persistentibus, plerumque verticem syncarpium orientibus igitur obliquis vel subhorizontalibus; superficiebus stigmaticis linearibus, maximam partem styli percurrentibus; pileo circa 5 mm alto, late pyramidali, laevi, subcorneo, subnitido, acute angulato, basi ad apicem partis connatae; endocarpio circa 13 mm alto in axe, apice ad basim stigmatum basi 6 mm supra basim drupae, partibus supra loculos seminales circa 4 mm altis, superne separatis spiniformibusque; loculis seminalibus oblongo-ellipticis, circa 6 x 3.5 mm, apice ad circa 5 mm infra basim stigmatum basi circa 9 mm supra basim drupae, centro supramediano; mesocarpio supero nullo in apice sed distincto in partibus lateralibus, copiose medullosa sed parce fibroso; mesocarpio infero parce fibroso medullosa. Fig. 10-12 and 16.

Type: *Van der Werff & McPherson 13494* (holo MO!); Madagascar, Manongarivo massif, East of Ankaramy, above village of Ambodisakoana, 14°05'S 48°20'E, alt. ca. 1100 m, 17 October 1994; rather dry, evergreen forest on weathered granite; tree 8 m tall, fruits green.

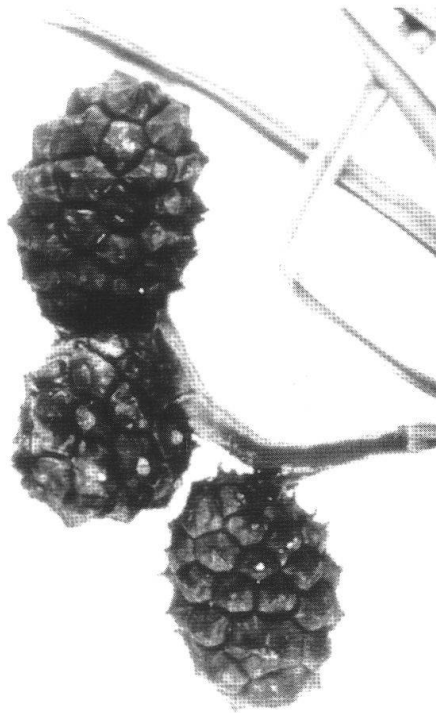
Other material: *Gautier, Messmer & Totozafy Be LG.3116* (G!, NEU!); Madagascar, Bekolosy, upper course of Bekolosy River, East branch, 14°02'S 48°18'E, alt. 1280 m, 22 September 1996; along stream, open vegetation on rose granite; small tree 4.5 m tall, fruits green.

P. pluriaculeatus is named in reference to its drupes, which have several styles.

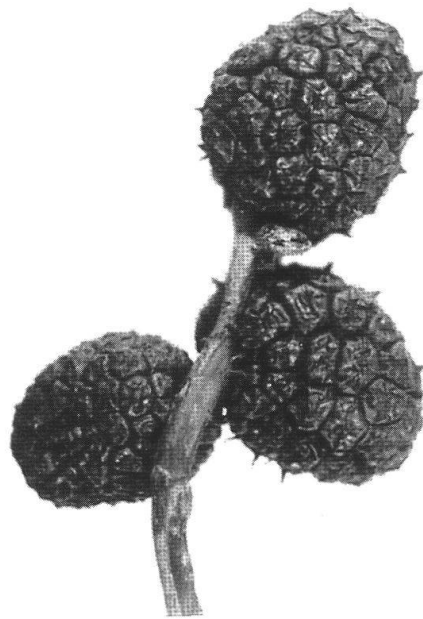
P. pluriaculeatus seems to be the only species of sect. *Acanthostyla* which was known from the Manongarivo massif. It appears closest to *P. laxespicus* Martelli, from Analamazaotra (about 18°56'S 48°25'E). Both have monosyncarpic infructescences, drupes with low pyramidal pileus, and 4-5 stigmas. This latter species differs from *P. pluriaculeatus* especially in that: its syncarp is oblong cylindrical (MARTELLI & PICHI-SERMOLLI, 1951: fig. 20c); its leaves are about 1 m long and 8-12 mm wide; in particular on these, the abaxial face is tessellate in the lower third and the pleats are armed along 19-20 cm.

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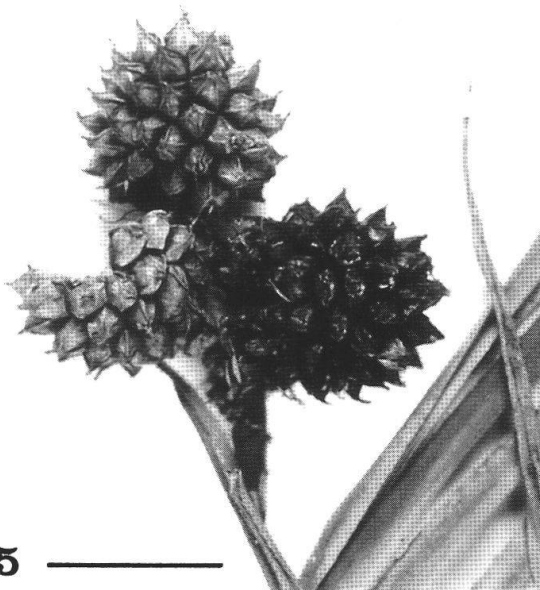
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13 —————



14 —————



15 —————



16 —————

Figures 13-16: Infructescences of *Pandanus* sect. *Acanthostyla*. - **13:** *P. alveolatus* (Miller & Randrianasolo 4433, holotype): 4-syncarpic infructescence (the uppermost syncarp visible is the second syncarp, the apical syncarp being removed). - **14:** *P. tabellarius* (Miller 3490, holotype): 3-syncarpic infructescence. - **15:** *P. andringitrensis* (Beverley Lewis 1032, holotype): 4-syncarpic infructescence (the uppermost syncarp visible is the apical syncarp; that on left and preserved in part is the second syncarp; that on right is the third syncarp; the basal syncarp, very small, is partially visible below the two latter syncarps). - **16:** *P. pluriaculeatus* (Van der Werff & McPherson 13494, holotype): syncarp of 1-syncarpic infructescence (apex of the syncarp, on top; apex of the peduncle, still adherent to the syncarp, below). - **Note:** all scale bars = 3 cm.

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