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# The Genus *Freycinetia* (Pandanaceae) in New Caledonia (part 1)

KIM-LANG HUYNH

## ABSTRACT

HUYNH, K.-L. (2003). The Genus *Freycinetia* (Pandanaceae) in New Caledonia (part 1). *Candollea* 58: 297-304. In English, French and English abstracts.

Four new species of *Freycinetia* Gaudich. from New Caledonia are described: *F. modica* Huynh, *F. panica* Huynh, *F. pseudograminifolia* Huynh, *F. separata* Huynh. New data in *F. graminifolia* Solms are also described. Specific characters from both gross morphology and the anatomy of fruits, seeds, and leaf auricles are used for description.

## RÉSUMÉ

HUYNH, K.-L. (2003). Le genre *Freycinetia* (Pandanaceae) en Nouvelle-Calédonie (1ère partie). *Candollea* 58: 297-304. En anglais, résumés français et anglais.

Quatre nouvelles espèces du genre *Freycinetia* Gaudich. sont décrites de la Nouvelle-Calédonie: *F. modica* Huynh, *F. panica* Huynh, *F. pseudograminifolia* Huynh, *F. separata* Huynh. Des données nouvelles chez *F. graminifolia* Solms sont aussi exposées. Des caractères spécifiques de la morphologie macroscopique et de l'anatomie du fruit, de la graine, et des auricules de la feuille sont utilisés pour la description.

**KEY-WORDS:** *PANDANACEAE* – *Freycinetia* – New Caledonia – Taxonomy.

## Introduction

New Caledonia harbours a large number of species of *Freycinetia* Gaudich. Not less than sixteen species are mentioned in the key given by GUILLAUMIN (1948). *Freycinetia hydra* B. C. Stone (STONE, 1979) was the seventeenth and last species described from this island. The present paper describes some unknown species recently observed in New Caledonia. It also describes new data obtained in *F. graminifolia* Solms.

In the present study of the taxonomy of the genus *Freycinetia* in New Caledonia, features from the anatomy of berries, seeds and leaf auricles that were observed in New Guinea (see HUYNH, 2000: 282-283; 2002a: 513-514) are used, besides gross morphological characters. They have proved useful especially for distinguishing between closely related species (HUYNH, 1999, 2000, 2002a, 2002b), besides they increase the substance of diagnoses.

### Observations

1. *Freycinetia modica* Huynh, **spec. nova** (sect. *Pleio stigma*) (Fig. 1)

*Internodia ramulorum 1 cm crassa, laevia, teretia. Folia 25-32 cm longa, 1-1.4 cm lata e medio ad basim (auriculis non inclusis), ensiformia, 3 mm acuminata, imbricata, in basi amplexicaulia; in sicco, coriacea, viridula/brunneola/brunnea in pagina abaxiali, viridula/brunneola et striata in adaxiali, patentia; venis longitudinalibus perspicuis in pagina abaxiali, obscuris vel invisibilibus in adaxiali; venis transversalibus utrinque invisibilibus; marginibus armatis in brevi spatio in basi et apice, denticulis inferne usque ad 1/2 mm longis, superne minutissimis, punctiformibus; costa media armata ex apice fere ad basim; auriculis omnibus conservatis, 6 cm longis, 5 mm latis, in apice adnatis, triangularibus, inermibus, membranaceis, atrobrunneis, non nitidis, (in microscopio) cellulis epidermicis omnibus non lignosis in una pagina sed omnibus lignosis in altera, mesophyllo multis longis separatis filis fibrarum cum fasciculis vasorum praedito, lamina non compressa. Infructescentia terminalis, 2 spicis praedita, pedunculo communi subnullo; syncarpiis 7.5 cm longis, 1.9 cm latis, immaturis (sine seminibus), cylindraceutis, pedunculis 5 cm longis, 4 mm latis, laevibus. Baccae 8 mm longae, sclerenchymate-centrali angusto in pileo et fasciculis fibrarum fusiformibus/ellipticis praeditae; stigmatibus 4-5, areola stigmatica annulo distincto et nitido cincta.*

**Type:** NEW CALEDONIA, Province du Nord, Mt. Panié, above Haut Coulna, 20°37'22"S 164°44'40"E, alt. 1250-1530 m, 1.XI.1999, McPherson & Van der Werff 17844 (holo-: MO!; iso-: MO!) [on SW forested slopes].

The fact that the leaf auricles of *F. modica* have an epidermis entirely lignified, at least at one side, as described above, suggests that they may probably not disintegrate into separate fibres.

Three infructescences have been collected for *F. modica*, and all three were terminal and had two syncarps. This seems to indicate that the species has a terminal inflorescence with two spikes.

*Freycinetia modica* is named in reference to its leaves of moderate size. Actually, the leaves of the genus *Freycinetia* in New Caledonia extend from 7 cm to 100 cm in length and from 0.3 cm to 7 cm in width, but those of *F. modica* are 25-32 cm by 1-1.4 cm. *Freycinetia modica* appears closest to *F. panica*, described below. These two species differ by inflorescence, and leaf texture and armature (see under *F. panica*).

2. *Freycinetia panica* Huynh, **spec. nova** (sect. *Pleio stigma*) (Fig. 2)

*Internodia ramulorum 1 cm longa, 7-8 mm crassa, laevia, teretia. Folia 30-35 cm longa, 1-1.2 cm lata e medio ad basim (auriculis non inclusis), ensiformia, 1-2 mm acuminata, imbricata, in basi amplexicaulia; in sicco, membranacea, brunnea/brunneola in pagina abaxiali, subviridula et striata in adaxiali, patentia; venis longitudinalibus visibilibus vel obscuris in pagina abaxiali, invisibilibus in adaxiali; venis transversalibus utrinque invisibilibus; marginibus armatis in 1/5 supera circiter, denticulis minutissimis, ut maximum 1/5 mm longis, plerumque punctiformibus; costa media armata in 1/5 supera circiter; auriculis fere omnibus conservatis, 4.5 cm longis, 4-5 mm latis, in apice adnatis, triangularibus, inermibus, membranaceis, brunneis, non nitidis, in fragmentis solutis, (in microscopio) cellulis epidermicis omnibus non lignosis in una pagina sed omnibus lignosis in altera, mesophyllo multis longis angustis separatis filis fibrarum cum fasciculis vasorum praedito, lamina non compressa. Infructescentia lateralis vel terminalis sed probabiliter lateralis praecipue (si lateralis, axe brevi suffulta), (2-) 3 spicis praedita; syncarpiis 4.5 cm longis, 1.9 cm latis, immaturis (sine seminibus), oblongo-ellipticis, pedunculis 4-4.5 cm longis, 2.2-3 mm latis, laevibus. Baccae 6.5 mm longae, sclerenchymate-centrali angusto in pileo et fasciculis fibrarum fusiformibus/ellipticis praeditae; stigmatibus 4-6, areola stigmatica annulo distincto et nitido cincta.*

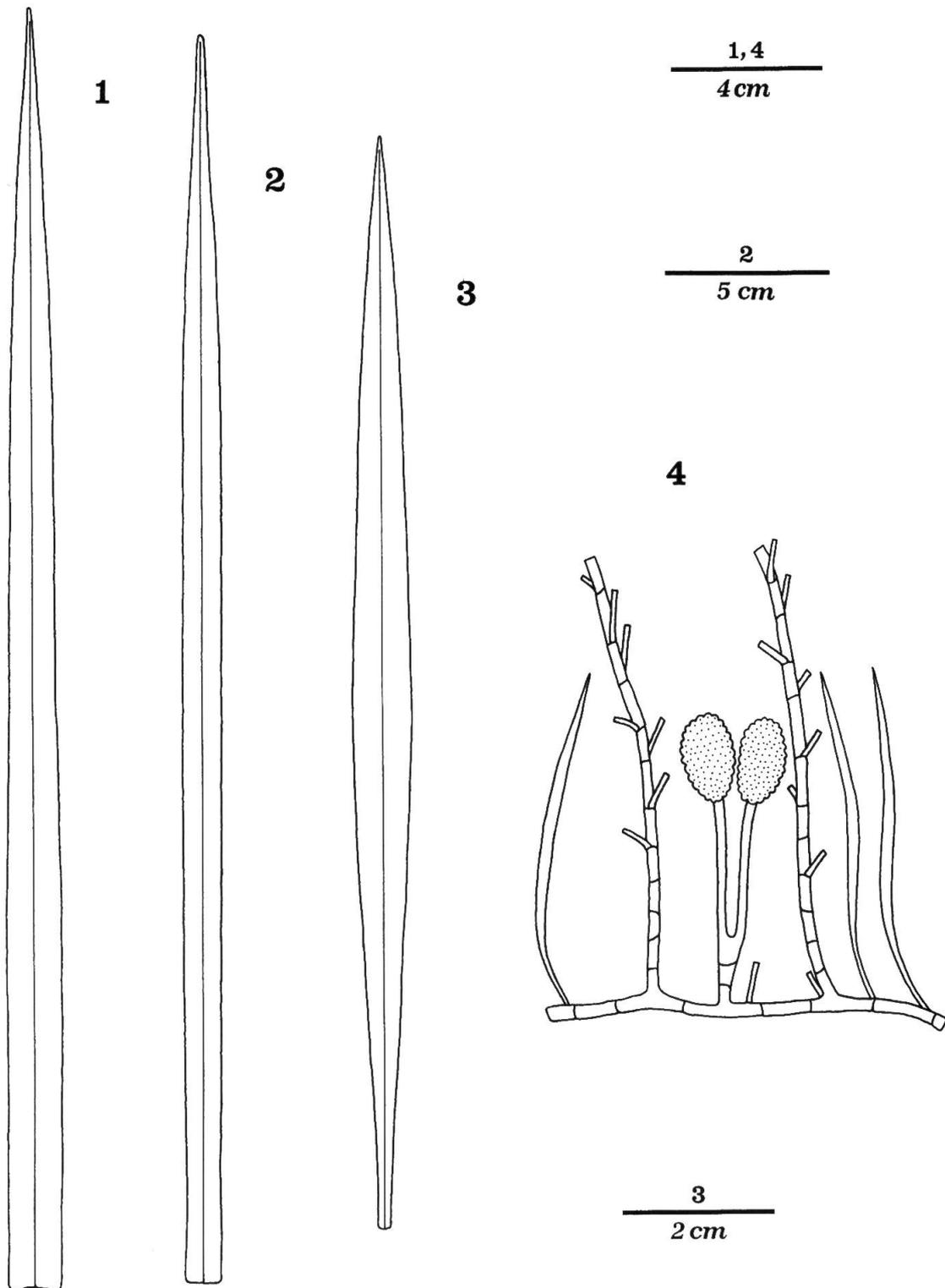


Fig. 1-4. – *Freycinetia modica* Huynh [1: *McPherson & Van der Werff 17844*, holotype], *F. panica* Huynh [2: *Van der Werff & McPherson 15952*, holotype], and *F. pseudograminifolia* Huynh [3, 4: *Pennel s. n.*, holotype]. – 1-3: Leaves, flattened horizontally, viewed at the adaxial face. 4: Fragment of branch with leaves, two sterile branchlets partially represented, and a branchlet bearing a 2-syncarpic infructescence at the apex (syncarps dotted; most of leaves allowed to show only their basal part).

**Type:** NEW CALEDONIA, Province du Nord, Mt. Panié, above Haut Coulna, 20°37'22"S 164°44'40"E, alt. 700-720 m, 26.X.1999, *Van der Werff & McPherson 15952* (holo-: MO!; iso-: MO!) [on SW forested slopes].

*Paratypes.* – NEW CALEDONIA, Thy River valley, ca. 12 air-km NE of Nouméa, alt. ca. 200 m, 23.VIII.1979, *McPherson 1855* (NOU!) [forested slopes]; Forest of Thy River, "Prise d'eau", 18.XI.1983, *Lauri 77* (NOU!).

The inflorescence of *F. panica* appears basically lateral, as observed in the type specimen. This latter comprises two parts. The first part, used here as holotype, is a branch fragment with leaves and a short lateral branchlet, not longer than 1 cm, that shows an infructescence at the apex but no leaves. This infructescence should be termed "lateral" since it closely resembles those which are considered typically lateral in other species (for example *F. cyrtocarpa* Kaneh.: KANEHIRA, 1941: 295, Fig. 13B). The second part, used here as isotype, consists of a branchlet upper part 15 cm long that bears leaves all along and an infructescence at the apex. Thus, the inflorescence of *F. panica* appears closely similar to that of *F. graminifolia* described below, and in consequence should also be considered basically lateral. Actually, in this latter species, the inflorescences as a rule are at the apex of short lateral branchlets, 1-3 cm long (Fig. 7), but some occupy the apex of long branchlets, up to 17 cm, as well. An extensive collection of *F. panica* will probably show that most of its inflorescences are at the apex of short lateral branchlets, as in *F. graminifolia*. In fact, the infructescences observed in *McPherson 1855* and *Lauri 77*, the paratypes of *F. panica*, are at the apex of short lateral branchlets.

*Freycinetia panica* is named after Mt. Panié, where it was observed. It appears closest to *F. modica*, described above, considering in particular their stigma numbers (4-6 stigmas for it, 4-5 stigmas for *F. modica*), length of syncarp peduncles (4.5 cm for it, 5 cm for *F. modica*), and leaf shape and size (Fig. 1 and 2). These two species differ by the following characters. In *F. panica*: the leaves in dry state are membranaceous and flexible; both the leaf margins and midnerve are armed in the apical part only; the inflorescence is basically lateral. In *F. modica*: the leaves in dry state are coriaceous and rigid; the leaf margins are armed in both the apical and basal parts, while the midnerve is armed from the apex almost to the base; the inflorescence is terminal. Another difference: when mature, the syncarps of *F. panica* will probably be shorter than those of *F. modica* since at the present stage prior to the formation of seeds, they are 4.5 × 1.9 cm while those of *F. modica* make 7.5 × 1.9 cm.

### 3. *Freycinetia pseudograminifolia* Huynh, **spec. nova** (sect. *Oligostigma*) (Fig. 3 & 4)

*Ramuli steriles* 20 cm vel plus longi; internodiis 5-15 mm longis, 2.5 mm crassis, laevibus, teretibus. *Folia* 11-15 cm longa, (3-) 5-7 mm lata in medio 2 mm in basi (auriculis non inclusis), lanceolata, dissita, in apice subulata vel anguste acuta, 2 mm acuminata, in basi semiamplexicaulia; in sicco, membranacea, utrinque viridula sed perleviter pallidiora in pagina abaxiali, striata in adaxiali, patentia; venis longitudinalibus vix visibilibus in pagina adaxiali, prominulis in abaxiali; venis transversalibus utrinque invisibilibus; costa media marginibusque generaliter armatis ex apice fere ad basim, denticulis tenuibus, usque ad 1/3 mm longis; auriculis omnibus delapsis. *Ramulus fertilis* brevis, 1.5 cm longus, in apice infructescentiam ferens, lateralem igitur, 2 spicis praeditam; syncarpiis 2 cm longis, 1.3 cm latis, immaturis (sine seminibus), ellipticis, pedunculis 3.5 cm longis, 3 mm latis, laevibus. *Baccae* 3.5 mm longae, 1 mm latae, subcylindricae, sclerenchymate-centrali conspicuo in pileo et numerosissimis fasciculis fibrarum fusiformibus/ellipticis praeditae; stigmatibus 2 (-3-4), arte coalescentibus, nunquam separatis, areola stigmatica annulo tenui sed distincto et nitido cincta.

**Type:** NEW CALEDONIA, ravines of Bourail, alt. 700 m, *Pennel s. n.* (holo-: P!, under P.264666) [schisto-ferruginous soils].

Since the stigmas of *F. pseudograminifolia* are indistinct, being closely coalescent, their numbers on berries were determined by observing the numbers of fertilization canals in the

transverse sections of pilei, each fertilization canal corresponding to one stigma (see HUYNH, 2000: 284).

*Freycinetia pseudograminifolia* appears closest to *F. graminifolia*, considering in particular their lateral inflorescences (Fig. 4 and 7) and leaf shape and size (Fig. 3 and 6). These two species differ by the following characters. In *F. pseudograminifolia*: the stigmas on berries are closely coalescent; the berries have a distinct central sclerenchyma and numerous fusiform/elliptic fibre-bundles; the syncarps are 2 cm long but they are still immature; the syncarp peduncles are 3.5 cm long and 3 mm wide; the berries generally have 2 stigmas, for which reason the species belongs to sect. *Oligostigma*. In *F. graminifolia*: the stigmas on berries are separate from one another; the berries have no central sclerenchyma and no fusiform/elliptic fibre-bundles; the syncarps are mature when they are about 1.9 cm long; the syncarp peduncles are about 2 cm long, at most 2.5 cm, and 1 mm wide, in no case wider; the berries have 3-4 stigmas, for which reason the species belongs to sect. *Pleio stigma*.

#### 4. *Freycinetia separata* Huynh, **spec. nova** (sect. *Pleio stigma*) (Fig. 5)

*Ramuli steriles* 12 cm vel plus longi; internodiis 5-7 mm longis, 5-6 mm crassis, granularibus, teretibus. *Folia* (6-) 10-13 cm longa, (6-) 8-11 (-13) mm lata in parte media 3-4 mm in basi (auriculis non inclusis), lanceolata, dissita, 3 mm acuminata, in basi semiamplexicaulia; in sicco, coriacea/subcoriacea, brunnea/brunneola, striata in pagina adaxiali, patentia; venis longitudinalibus visibilibus in pagina abaxiali, invisibilibus vel obscuris in adaxiali; venis transversalibus utrinque invisibilibus; marginibus armatis ex apice fere ad basim, interdum partim inermibus, denticulis minutissimis, ut maximum 1/5 mm longis, plerumque punctiformibus; costa media armata ex apice fere ad basim; auriculis omnibus delapsis. *Ramuli fertiles breves*, 1-1.5 cm longi, in apice infructescentiam ferentes, lateralem igitur, 3 vel 4 spicis praeditam; syncarpiis 2.3 cm longis, 8 mm latis, immaturis (sine seminibus), cylindraceutis, pedunculis 3-3.3 cm longis, 2 mm latis, laevibus. *Baccae sclerenchymate-centrali fibrisque destitutae; stigmatibus* 3-4, separatis, 1/3 mm altis et prominentibus, omnibus annulo nitido cinctis.

**Type:** NEW CALEDONIA, Mandjélia, above Pouébo, north end of Mt. Panié, alt. ca. 700 m, 25.XI.1983, McPherson 6042 (holo-: MO!; iso-: NOU!, PTBG!) [forested slopes].

*Paratypes.* – NEW CALEDONIA, East slope of Mt. Aoupinié, alt. 500-700 m, 7.XI.1972, MacKee 25782 (NOU!) [wet forest on graywackes]; Haute Néaoua, 27.II.1978, MacKee 34771 (NOU!).

*Freycinetia separata* is named in reference to its stigmas which are separate from one another on the berry apex. It appears closest to *F. graminifolia*, considering in particular their lateral inflorescences and stigma numbers (3-4 stigmas). This latter species differs from *F. separata* by the following characters: its branchlet internodes are smooth, never granular; its leaves are membranaceous, in any case much less rigid in texture, and longer but narrower (8-18 × 0.3-0.7 cm) (compare Fig. 6 with Fig. 5), in no case exceeding 7 mm in width; its syncarps are mature when they are about 1.9 cm long; its syncarp peduncles are about 2 cm long, at most 2.5 cm, and 1 mm wide, in no case wider.

#### 5. Further notes on *Freycinetia graminifolia* Solms (sect. *Pleio stigma*) (Fig. 6 & 7)

*Freycinetia graminifolia* was described by Solms (see WARBURG, 1900: 36) as having leaves 10-15 mm long and 3-7 mm wide, inflorescences at the apex of short lateral branchlets, and berries with 3-4 separate stigmas. These three characters are sufficient for a safe recognition of *F. graminifolia*. However, other essential characters have not been described for this species, and it would be of interest to know them as well. For this purpose, some 80 specimens collected from 1860 to 1999 have been used, most of them in Paris (P!). As a result, the following

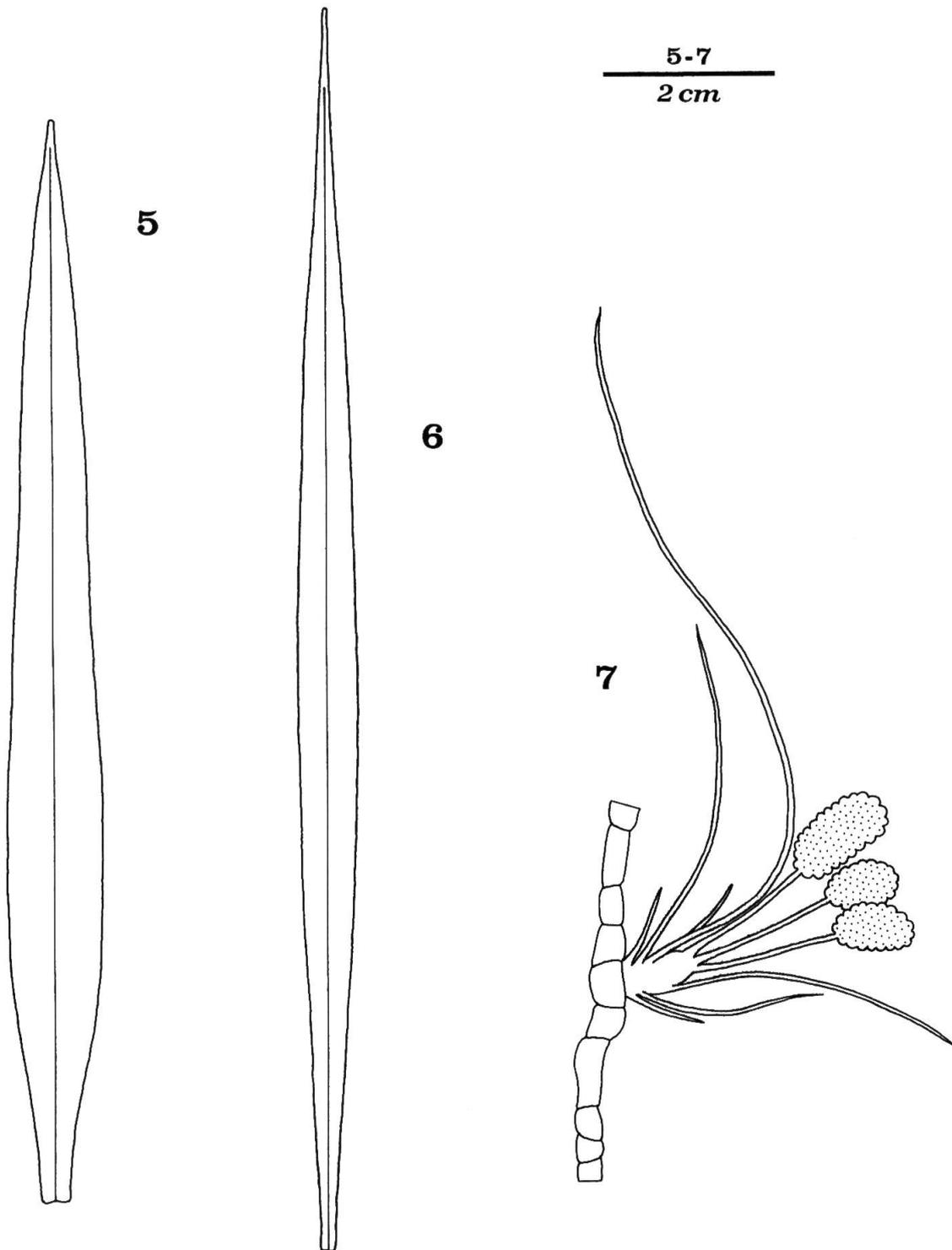


Fig. 5-7. – *Freycinetia separata* Huynh [5: *McPherson 6042*, holotype], and *F. graminifolia* Solms [6: *MacKee 18044*; 7: *Brousse 62*]. – 5, 6: Leaves, flattened horizontally, viewed at the adaxial face. 7: Fragment of branch with a branchlet comprising prophylls, leaves, and a 3-syncarpic infructescence at the apex (syncarps dotted).

characters are now known for *F. graminifolia*: size of syncarps at maturity, anatomy of berries, morphology of seeds, internodes of branchlets, and various features of leaves and bracts.

Field data indicate that the syncarps of *F. graminifolia* are green, then become yellow, then orange or red orange. They are about 19 mm long and 9.5 mm wide when they are mature, having seeds. However, most of the syncarps collected were immature. The syncarp peduncles are about 2 cm long, at most 2.5 cm, and 1 mm wide, in no case wider, the syncarps being mature or not. The berries have no central sclerenchyma and no fusiform/elliptic fibre-bundles, as observed in *Van der Werff & McPherson 15940* (MO!). The seeds are slightly sublunate, almost straight, 1 mm long, 0.35 mm wide at the middle; they do not have a distinct strophiole since the inner cell-layer of the outer integument at the side furthest away from the raphe does not develop in thickness and is not lignified (see the definition of “strophiole” in HUYNH, 1996: 532); the raphe is 0.13 mm wide, and rich in raphide cells from the micropyle to the chalaza, but devoid of crystal cells; the endosperm is 0.20 mm wide.

The branchlet internodes of *F. graminifolia* are 3-10 mm long, 2-3 mm thick, smooth, terete. The bracts are ensiform, up to 5.5 cm long and 1 cm wide at the base, armed in the apical part with minute prickles on the midnerve and hardly visible prickles on the margins. They soon wither and fall. Field data indicate that they are purple or dark purple, with a white base.

The leaves of *F. graminifolia* (Fig. 6) are 8-18 cm long and (2-) 3-7 mm wide. They are narrowly lanceolate, remote, semiamplexicaul, up to 1 cm acuminate, gradually attenuate from the upper third to the apex and from the lower third to the base, at which level they are up to 2 mm wide (auricles not included). They vary widely, especially in width: the most frequently observed are 15-18 cm long and 3-5 mm wide, while those which are 15-18 × 0.6-0.7 cm are generally located in the lower parts of branches or of branchlets. Their position on branches or branchlets may also vary as sometimes a series of leaves 2-3 mm wide is abruptly found between two series 5 mm wide. Field data indicate that in living state, the leaves of *F. graminifolia* are dark shiny green above, light green below. In dry state, they appear greenish or dark greenish, even having been collected some 150 years ago for some of them, with the adaxial face darker than the abaxial face. In dry state, furthermore, they are membranaceous and flexible, and show some tendency to be revolute. The longitudinal veins are visible on the abaxial face, less so or obscure on the adaxial face, while the transverse veins are invisible. The margins are generally armed from near the base to the apex, with prickles up to 1/3 mm long in the basal part, but very minute, punctiform or indistinct above. The midnerve is generally armed in the upper half with sparse and very minute prickles.

The leaf auricles of *F. graminifolia* are cleanly deciduous from the stage when the leaves are very young. In the rare leaves where auricles have been observed (these leaves were not longer than 5-6 cm), the auricles were 10-12 mm long, 1.5-2 mm wide, adnate, unarmed, whitish, scarious, with some vascular bundles and long and separate fibre-bundles within. Their anatomy: the epidermal cells were all unlignified at both sides; long, separate and multi-layered fibre-strands were observed between the vascular bundles; the lamina was strongly compressed between the fibre-strands. This anatomy suggests that the leaf auricles of *F. graminifolia* disintegrate into separate fibres.

As mentioned above, the inflorescences of *F. graminifolia* were described by Solms as being at the apex of short lateral branchlets (“inflorescentiae in ramulis lateralibus abbreviatis ... terminales”). Such inflorescences should be termed “lateral” since they closely resemble those which are considered typically lateral in other species (for example *F. cyrtocarpa*: KANEHIRA, 1941: 295, Fig. 13B). In the present study of *F. graminifolia*, a very large number of lateral branchlets and of inflorescences is used. The branchlets are 1-25 cm long, and may show prophylls at the base. The prophylls are narrowly ensiform, 3-15 mm long, 2 mm wide, whitish, contrasting with the greenish leaves. The inflorescences as a rule are at the apex of short branchlets, not longer than 1-3 cm (Fig. 7). Only in three cases inflorescence was found occupying the apex of long branchlets: two were 17 cm long, the other 7 cm. Thus, the inflorescence of

*F. graminifolia* is basically lateral, and it should be termed "lateral" considering the general case. The fertile branchlets that are 1-3 cm long do not show leaves (probably these latter have been deciduous), like other species with lateral inflorescence (for example *F. pseudograminifolia*, Fig. 4; *F. cyrtocarpa*, see KANEHIRA, 1941: Fig. 13B; *F. louisadensis* Huynh, see HUYNH, 1999: Fig. 34), except for some cases (for example, *Brousmiche 62* and *Le Rat 2900*, both in P!) where leaves are actually observed below the inflorescence (Fig. 7).

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