

# THE PODOSTEMACEAE OF THE NEW WORLD III

BY

P. VAN ROYEN

(*Rijksherbarium, Leiden*)

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## I. INTRODUCTION

As has been stated in the introduction of the second part, this third part will include the remainder of the American part of the tribe Eupodostemeae of the subfamily Eupodostemoideae which was not treated in part I, viz. the genera *Oserya*, *Devillea*, *Ceratolacis*, *Mniopsis*, *Podostemum* and *Castelnavia*. Included are the dubious genera, and it also contains additions and corrections to part I, latin descriptions of new taxa, a list of collectors' numbers in this part, new references to the literature, and a general index to the third part.

The attention of the reader is drawn to a publication of SZAFER (1952) in which a fossil Podostemaceae from Europe has been described. As I have not seen the material it is at present impossible to judge the value of the discovery though it seems highly improbable that Podostemaceae ever lived in Europe.

The abbreviations of the literature are the same as in Part I and II and therefore it is referred to the list of references in part I. Some new ones are given in this part.

At the end of this study of the American Podostemaceae, a century after Tulasne's monograph of the whole family, I like to express my most sincere thanks to Prof. BREMEKAMP of Utrecht and Dr BAKHUIZEN VAN DEN BRINK jr of Leiden, the former for his kind advice and the corrections of the English text, the latter for the Latin descriptions of the new taxa in Part III. Finally I wish to express my deepest appreciation to Dr G. TAYLOR of London for the discussions we had about this curious family, his warm interest for these studies and the final checking up of the text.

## II. TAXONOMIC SECTION

### 1. OSERYA Tul. & Wedd.

Small to very small herbs living in coenobia; the individuals opposite or subopposite along thin, branched roots, either thalloid or provided with a stem, the latter either hollow or solid and branched. Leaves often repeatedly forked, the forking extending over the whole leaf or confined to the top, sometimes with a distinct sheath and an intrapetiolar stipule, and sometimes indistinctly separated from the thalloid base. Flowers solitary; juvenile spathella clavate, fairly solid, mature one infundibuliform, mostly slightly exceeding the base; tepals 2 or 3, confined to one side, one at each side of the filament and usually a third one at its back; stamen 1, anther basifixed, dehiscent extrorsely to laterally, pollen grains ellipsoid to globose, 3-colpate; ovary 2-celled, with 2 unequal carpels and provided with 6–14 ribs, often obliquely inserted on the pedicel, and the sutures oblique and ex-centric; styles 2, very short, free or cohering. Fruit with two unequal valves, 6–14-ribbed, one of the valves sometimes caducous.

Type: *Oserya flabellifera* Tul. & Wedd.

Distr.: 6 species in Brazil, Guyana and Mexico. (See map)

This small genus is characterized by extrorsely dehiscent anthers. It was established by TULASNE and WEDDELL in 1852 with 4 species, one of which was *O. flabellifera*. WENT (1910) believed that he had found this species in Suriname, and his study of the material on which this belief was founded led him to the conclusion that the genus could not be maintained and would have to be sunk in *Apinagia*. The above named species accordingly was named *A. flabellifera*. The Suriname material, however, proved to belong to a new species, viz. *O. minima*, which differs from the other ones in the presence of 3 filiform tepals and in the 8-ribbed ovary. The description of

*O. sphaerocarpha* matches that of this new species in most respects, but the material on which the latter is based, is so poor that the question of the identity of these species can not be answered.

WENT was of opinion that the differential character of *Oserya*, viz. the extrorse dehiscence of the anthers is not sufficient to justify the separation from *Apinagia*. The present author admits that this difference is in itself insufficient, and he himself did not find it necessary to split *Jenmaniella* on account of the sometimes extrorsely and sometimes introrsely dehiscing anthers into two genera, confining himself to the



distinction of two sections. Nevertheless he prefers to separate *Oserya* from *Apinagia* on account of the following additional characters: anthers basifixed in *Oserya*, dorsifixed in *Apinagia*; styles very short and knob-like in *Oserya*, longer and linear to subulate in *Apinagia*. The species of *Oserya* are always provided with a single stamen, and although this applies to some *Apinagia* species, it is in that genus far from general; moreover the *Oserya* species have often a tepal at the back of the only stamen, and this tepal is never met with in *Apinagia*. Taking all these characters together, it seems desirable to maintain *Oserya*. The genus is undoubtedly related to *Apinagia* but the insertion of the third tepal at the back of the single stamen points to an affinity with those genera which possess 2 stamens borne by an andropodium, where in the fork between the two stamens or, more often, slightly below this point, a third petal is always present.

### Geography (See map)

The genus is widely dispersed in Central America and the northern parts of South America. One species, viz. *O. coulteriana*, is found in the southern part of Mexico, and the other ones in Guiana and Northern Brazil, viz. *O. perpusilla* and *O. minima* in Suriname, *O. sphaerocarpa* in Demerara, and two, viz. *O. biceps* and *O. flabellifera* in Central Brazil. The distribution is rather remarkable, but it is possible that these species, which are easily overlooked on account of their small size, are present in the intervening parts too.

#### Key to the species:

- |   |   |   |
|---|---|---|
| 1a. Plants with distinct, 1-3 cm long stems. Leaves repeatedly forked; ovary with 6 ribs; tepals 1-2 mm. Mexico . . . . . | 1. <i>O. coulteriana</i> Tul.           |   |
| b. Plants thalloid or with a very short, 2-5 mm long, hollow stem. South America . . . . .                                |   | 2 |
| 2a. Plants thalloid . . . . .   |   | 3 |
| b. Plants with a short and hollow, 2-5 mm long stem. . . . .  |   | 5 |
| 3a. Leaves with a narrow, c. 0.5 mm wide petiole . . . . .  | 2. <i>O. minima</i> v. Royen            |   |
| b. Petiole 1-10 mm wide . . . . .   |   | 4 |
| 4a. Petiole c. 1 mm wide; pollen grains with numerous small warts . . . . .   | 3. <i>O. sphaerocarpa</i> Tul.          |   |
| b. Petiole 5-10 mm wide; pollen grains smooth . . . . .   | 4. <i>O. perpusilla</i> (Went) v. Royen |   |
| 5a. Flowers with 2 tepals; ovary with 12 or 14 ribs . . . . .   |   | 6 |
| b. Flowers with 3 tepals; ovary with 8 ribs . . . . .   | 2. <i>O. minima</i> v. Royen            |   |
| 6a. Fruit with 12 ribs . . . . .  | 5. <i>O. biceps</i> Tul. & Wedd.        |   |
| b. Fruit with 14 ribs . . . . .   | 6. <i>O. flabellifera</i> Tul. & Wedd.  |   |

1. *Oserya coulteriana* Tul., (1849) 106; Tul. (1852) 153-156, t. 10 f. 2; Walpers (1852) 440; Weddell (1858) 787; Engler (1930) 64-Plate 1 f. 1-2.

Small coenobia consisting of 1-4 individuals clustered along a thin, strongly compressed root. Stems 1-3 cm × 1-2 mm, branched at the top, terete, at the base with a few rests of leaves, at the top with 1-12 cm long leaves, the latter a few times forked, ultimate divisions acute, 2-6 mm, very narrow; petiole 0.5-2 cm, terete, at the base usually provided with 2 wings; basal leaves without wings, and the uppermost leaves with a single, very short, obtuse, membranous wing. Flowers at the end of short branches, pedicel 2-5 mm; juvenile spathe clavate, obtuse to mucronate, slightly papillate, mature one infundibuliform, 4-12 mm; tepals 2, lanceolate, 1-2 mm, acute, one at either side of the filament and united with the latter; stamen 1.5-3.5 mm, anthers cordate, 0.8-1.5 mm, emarginate, base of thecae obtuse to mucronate, pollen grains  $19.2 \times 16 \mu$ ; ovary ellipsoid, 1.5-2.5 × c. 1 mm, obtuse, slightly attenuate at the base, subobliquely inserted on the pedicel, provided with 6 ribs; styles cylindrical, obtuse or with two short teeth, free, c. 0.5 mm. Fruit with 2 unequal valves, each valve with 3 distinct, prominulous ribs and 2 indistinct marginal ones.

Type: Coulter 1394 in K.

Distr.: Mexico.

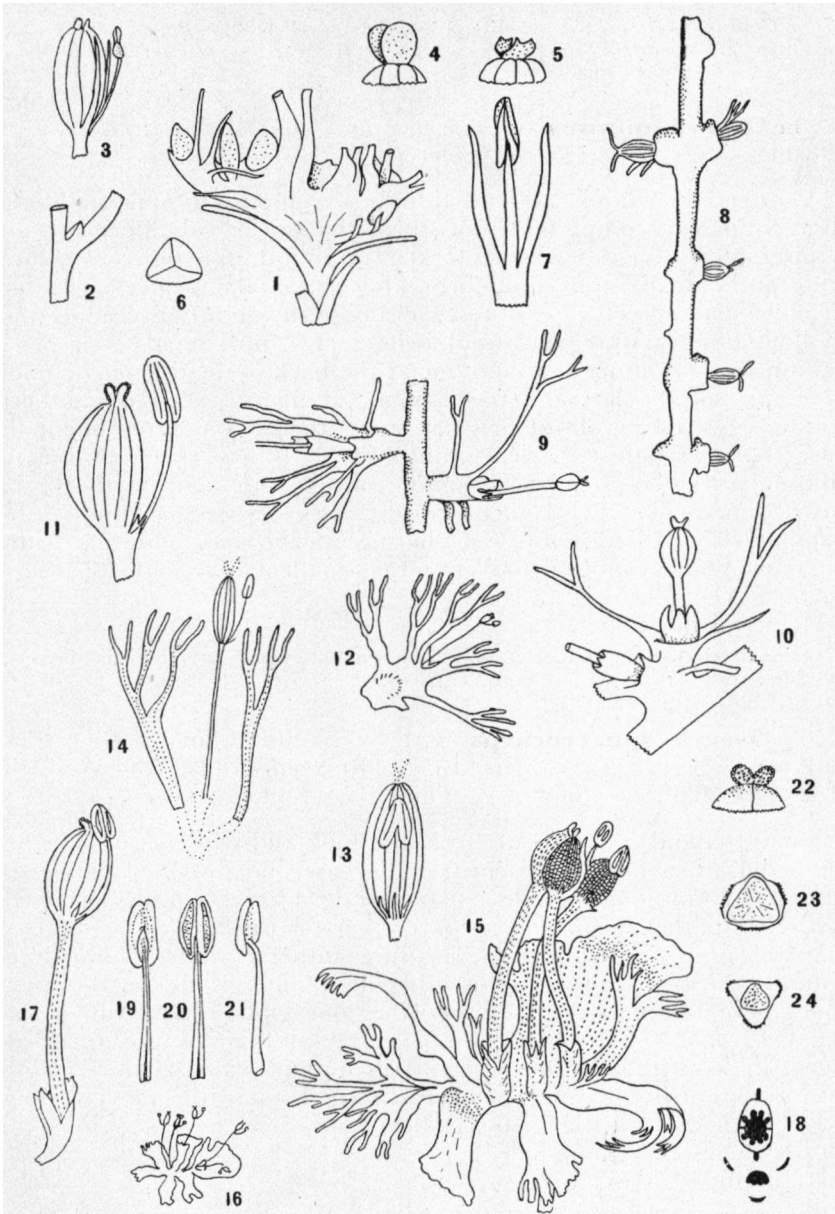


PLATE 1 — 1-7. *Oserya coulteriana* Tul. (*Arsène 5255*), 1. habit (leafless); 2. stipule and leaf-base; 3. flower; 4-5. styles; 6. pollen grains; 7. androecium — 8-11. *Oserya minima* v. Royen (*Went s.n.*), 8. root with secondary shoots; 9. root with two shoots with leaves; 10. one shoot; 11. flower diagram — 12-14. *Oserya sphaerocarpa* Tul. & Wedd. (*Schomburgk 431*), 12. habit; 13. flower; 14. flower and leaves — 15-24. *Oserya perpusilla* (Went) v. Royen (*Lanjouw 723*), 15-16. habit; 17. flower with opened spathe; 18. flower-diagram; 19-21. stamens from the inner, outer and lateral side; 22. styles; 23-24. pollen grains.

*Prov. Jalisco*, near San Blas, Coulter 1394, fl. fr. (GH, K, NY, P); *prov. Michoacan*, near Rincón, Arsène 5255, fl. fr. Oct. (GH, MO); near San Miguel, Arsène 5965, fl. fr. Nov. (GH, MO).

2. ***Oserya minima*** v. Royen, nov. sp. — P. 258 and plate 1 f. 8-11.

Very small coenobia, the individuals subopposite to opposite along thin, branched, compressed roots. Base thalloid or tubuliform, up to 4 mm high. Leaves a few times forked, up to 5 mm, petiole c. 0.5 mm wide; ultimate divisions subfiliform. Flowers solitary; pedicel c. 1 mm; juvenile spathella clavate, obtuse, sessile, stout, slightly exceeding the thalloid base, mature one tubuliform, c. 1.5 mm; tepals 2 or 3, c. 0.3 mm, one at either side and one at the back of the filament, sometimes one of the lateral sepals absent; stamen 1–1.3 mm, anthers cordate, c. 0.5 mm, obtuse or emarginate, thecae sometimes unequal, base of thecae obtuse, pollen grains  $14.8 \times 10.7 \mu$ ; ovary obliquely ellipsoid to globose, c.  $1.5 \times 1$  mm, obtuse, attenuate at the base, with 2 unequal carpels and 8-ribbed; styles short, c. 0.3 mm, subpapillate, cylindrical, obtuse, cohering at the base. Mature fruit unknown, but according to WENT the smaller valve caducous.

Type: Went s.n. in U.

Distr.: Suriname.

Suriname-river, near Kabelstation, Went s.n., fl. Sept. (U), cited as *Apinagia flabellifera* (non Tul. & Wedd.) in Went, (1926) 36-37, t. 2 f. 12, t. 6 f. 37-38.

3. ***Oserya sphaerocarpa*** Tul. & Wedd., Tul. (1849) 106; Tul. (1852) 154–155; Walpers (1852) 440; idem (1858) 787; Weddell (1873) 84; Baillon (1888) 272—Plate 1 f. 12-14.

Small thalloid coenobia, up to 5 mm long and wide. Leaves at the top a few times forked, widened at the base and provided with two wings, c. 1 mm long, petiole c. 1 mm wide. Flowers solitary; pedicel 6–8 mm; spathella unknown; tepals 3, very short, filiform, acute, less than 0.5 mm long; stamen c. 1.5 mm, anther cordate, c. 0.5 mm, obtuse, base of thecae obtuse or subacute, pollen grains of two types, one type ellipsoid, 3-lobate, the other one globose with numerous warts,  $15.5 \times 10.6 \mu$ ; ovary ellipsoid, c. 1 mm high, obtuse, rounded at the base, with two unequal carpels and provided with 12 ribs, sutures excentric, oblique; styles unknown. Fruit with one caducous valve, both valves with 7 ribs; pedicel 1 cm.

Type: Schomburgk in K.

Distr.: British Guiana.

Bernice river, Schomburgk 431, fl. fr. (C, K, P, W).

4. ***Oserya perpusilla*** (Went) v. Royen, nov. comb.—*Apinagia perpusilla* Went in Pulle (1909) 267; Went (1910) 43–46, t. 12 f. 106–114; Engler (1930) 39; v. Royen (1948) 382—Plate 1 f. 15-24.

Small coenobia with a narrow base, up to 3 cm large. Leaves cuneate, at the top a few times forked, 1–2 cm, indistinctly nerved,

petiole 5–10 mm wide. Flowers white; pedicel 4–14 mm; tepals 2 or 3, subulate, 0.5 mm long or less, one at either side of the filament and one at the back of the latter, but this one sometimes absent; stamens 1–2 mm, anther cordate, up to 1 mm, obtuse or emarginate, pollen grains  $15.6 \times 12.7 \mu$ ; ovary ellipsoid, 1–2  $\times$  0.5–1 mm, obtuse, terete, rounded at the base or subattenuate, with two unequal carpels and provided with 12 ribs, sutures excentric; styles up to 0.5 mm, free, strongly papillate. Fruit with 2 unequal valves, each valve with 7 or 5 ribs, i.e. the marginal ones sometimes very indistinct or absent, one valve caducous.

Type: Versteeg 810 in U.

Distr.: Suriname and French Guiana.

*Suriname*: Tapanahony river, Kortufutu-falls, Versteeg 810, fl. fr. Aug. (P, U); Marowynne-river, Armina-falls, Went s.n., fl. fr. Oct. (P, U); Coppename-river, Raleigh-falls, Went s.n., fl. fr. Aug. (U); idem, Lanjouw 723, fl. fr. Sept. (U); Saramacca river, Grand Dam, Maguire 24919, fl. fr. Oct. (F, NY, U, US).

*French Guiana*: Rio Oyapock, Salto Caxiry, v. Luetzelburg 21655, fl. March (M); idem, Grande Roche, v. Luetzelburg 21691, fl. July (M).

5. ***Oserya biceps*** Tul. & Wedd., Tul. (1849) 106; Tul. (1852) 152–153; Walpers (1852) 440; Tul. (1863) 260–261; Walpers (1858) 787; Weddell (1873) 83–84; Engler (1930) 64.

Small coenobia with a more or less distinct stem, 3–5 mm. Leaves 2–3 mm, linear, sheathed at the base. Flowers solitary; pedicel 3–5 mm; mature spathella tubuliform; tepals 2, c. 0.3 mm, one at either side of the stamen, linear; anther c. 1 mm, obtuse; ovary ovoid-ellipsoid, 1.5  $\times$  1 mm, obtuse, rounded at the base, provided with 12 ribs, styles unknown. Fruit with two persisting valves (The description is taken from TULASNE, as I have not seen the material).

Type: Weddell s.n. in P (?).

Distr.: Brazil (Province Goyaz)

Rio Araguay, Weddell s.n., fl. fr. (P)? WEDDELL gives the Rio Tocantin as the type locality.

6. ***Oserya flabellifera*** Tul. & Wedd., Tul. (1849) 106; Tul. (1852) 151–152, t. 10 f. 3; Walpers (1852) 440; Walpers (1858) 787; Tul. (1863) 259–260, t. 75 f. 3; Weddell (1873) 83; Warming (EP 1891); Engler (1930) 64, f. 56 A—Plate 2 f. 1-3.

Roots, stem and leaves similar to those of *O. minima*. Flowers with 2 spatulate, c. 0.3 mm long tepals, one at either side of the filament; anther subcordate, c. 0.5 mm, obtuse, base of thecae acute, pollen grains  $20 \times 19 \mu$ ; ovary ellipsoid, subacute, with unequal carpels and provided with 14 lighter coloured streaks, in other respects similar to *O. minima*, styles lanceolate, 3-sided, otherwise similar to *O. minima*. Fruit unknown.

Type: Weddell s.n. in P.

Distr.: Brazil (Province Goyaz)

Rio Tocantin, fl. (C, P).

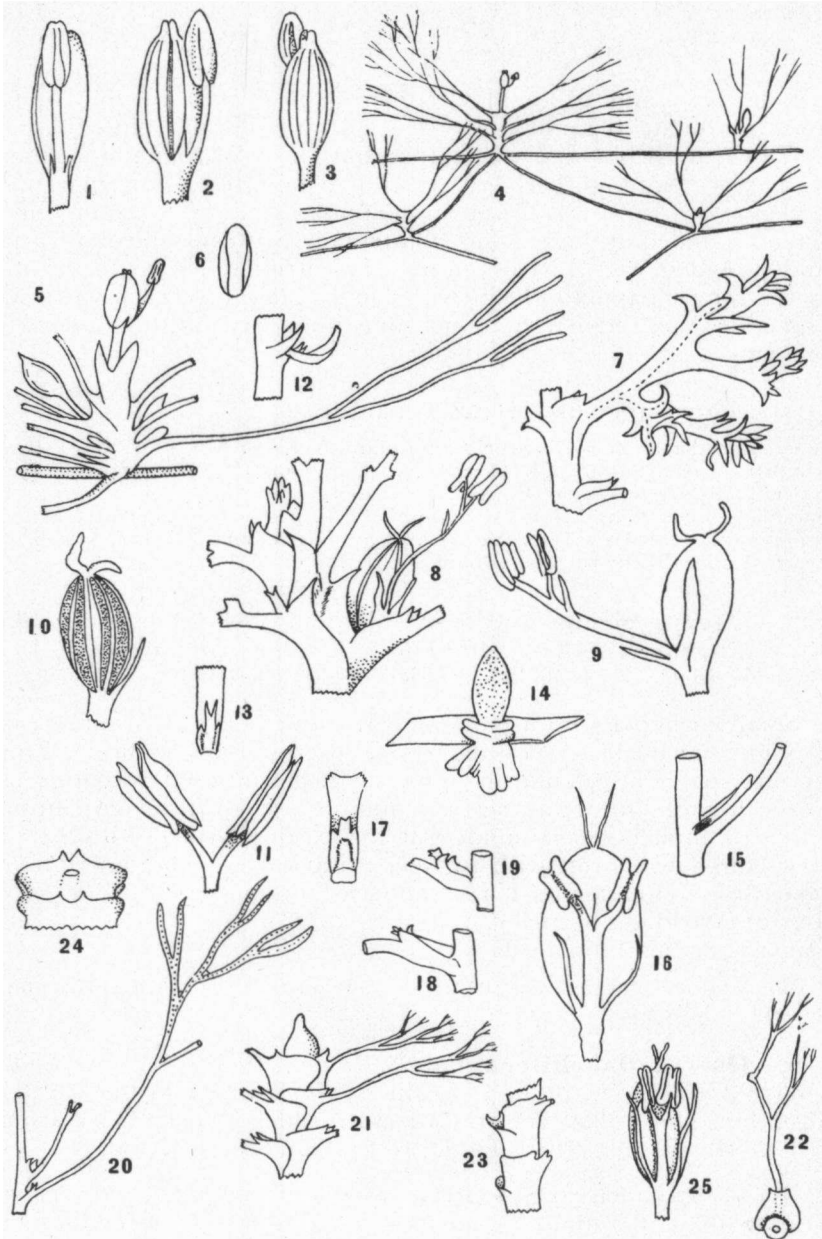


PLATE 2 — 1-3. *Oserya flabellifera* Tul. & Wedd. (*Weddell s.n.*), 1-3. different views of the flower — 4-6. *Devillea flagelliformis* Tul. & Wedd. (*Weddell 2367*), 4. part of coenobium; 5. secondary shoot; 6. pollen grain — 7-13. *Podostemum distichum* (v. Cham.) Wedd. (*Sellow s.n.*), 7. leaf; 8. apical part of a secondary shoot; 9. flower; 10. fruit; 11. stamen; 12-13. stipules — 14-16. *Podostemum dimorphum* v. Royen (*Dusén 16540*), 14. fertile plant showing the haptere; 15. stipule; 16. flower — 17-19. *Podostemum schenckii* Warming (*Schenk 328*), 17-19. different types of stipules — 20. *Podostemum undulatum* v. Royen (*Ule 804*), habit — 21-25. *Podostemum glaziovianum* Warming (*Glaziou 21993*), 21. top of a shoot; 22. leaf with stipule from above; 23. basal part of a shoot; 24. stipule, frontal view; 25. flower.



2. **DEVILLEA** Tul. & Wedd.

Small unbranched individuals springing in groups of 1 to 4 from branched, filiform roots. Stem at the base with few rests of leaves, at the top with entire or, sometimes, forked leaves, base of the leaves strongly amplexicaul. Flowers few, within a clavate to globose, acuminate spathella, which is enveloped by two membranes formed by the sheaths of the apical leaves; tepals 3, linear, one on either side of the filament and one at the back of the latter; stamen 1, anther obtuse, dehiscing introrsely, pollen grains ellipsoid, 3-colpate; ovary ellipsoid to globose, with 2 unequal carpels, sometimes with an excentric suture, placenta ellipsoid, strongly compressed; styles very short, cohering at the base, slightly papillate. Fruit with 2 unequal valves, one of the valves caducous.

Type: *Devillea flagelliformis* Tul. & Wedd.

Distr.: One species in Central Brazil. (See map)

This genus was founded by TULASNE and WEDDELL. BAILLON, however, sunk it in *Oserya*, and WARMING (1891) and ENGLER (1930) followed his example. To the present author this seems incorrect, as too many differences exist between the two genera: the anthers dehisce introrsely (against extrorsely in *Oserya*), and the individuals are placed either in groups of 2 to 4 or solitary (in *Oserya* they are opposite or subopposite along the roots, except *Oserya coulteriana* where, however, the ovary is ribbed). These three differentiating characters are of sufficient importance to maintain *Devillea* as a separate genus.

1. **Devillea flagelliformis** Tul. & Wedd., Tul. (1849) 107; Tul. (1852) 157-159, t. 13 f. 1; Walpers (1852) 440; Walpers (1858) 788; Tul. (1863) 262-263, t. 75 f. 4; Weddell (1873) 82; Bentham & Hooker (1880) 114—*Oserya flagelliformis* (Tul. & Wedd.) Baillon, (1888) 272; Warming (EP 1891) 21—*Oserya flagelliformis* (Tul. & Wedd.) Warming, Engler (1930) 64, f. 56 B-H—Plate 2 f. 4-6.

Stems subcompressed, 0.5-1 mm. Leaves 2-2.5 cm, repeatedly forked, intrapetiolar stipule large, linguiform, membranous, c. 0.5 mm; petiole triangular, 5-10 mm, ultimate divisions subfiliform, obtuse. Pedicel 0.5-1 mm; mature spathella widely campanuliform, up to 1 cm; tepals lanceolate, obtuse, up to 0.5 mm; stamen 1-1.5 mm, anther 0.5-0.8 mm, obtuse, pollen grains  $20.1 \times 13.2 \mu$ ; ovary  $1-1.5 \times c. 1$  mm, styles cylindrical, obtuse, up to 0.3 mm.

Type: Weddell 2367 in P.

Distr.: Brazil (Province Goyaz).

Rio Tocantin near Sao João, Weddell 2367, fl. fr. July (C, P).

3. **CERATOLACIS** (Tul.) Wedd.

Very small individuals provided with a small stem or stemless and inserted along vermiform, branched roots. Leaves either entire and

linear or a few times forked with the ultimate divisions linear. Flowers few to one; juvenile spathella clavate, obtuse; tepals 2 or 3, one on either side of the andropodium, the third in the fork between the two filaments; stamens 2, borne by an andropodium; anther dehiscing introrsely; ovary fusiform, with 6 prominent ribs; midribs of the carpels running out into the styles, carpels equal; styles rostriform, when young deflexed towards the anthers. Fruit similar to the ovary, with two persisting valves.

Type: *Ceratolacis erythrolichen* (Tul. & Wedd.) Weddell

Distr.: One species in Central Brazil. (See map)

1. ***Ceratolacis erythrolichen*** (Tul. & Wedd.) Wedd., (1873) 66; Bentham & Hooker (1880) 113; Baillon (1888) 263; Warming (EP 1891) 21; Engler (1930) 52, f. 43 A-E—*Dicraea erythrolichen* Tul. & Wedd., Tul. (1849) 102; Tul. (1852) 126–128, t. 10 f. 1–5; Walpers (1852) 437; Walpers (1858) 783; Tul. (1863) 253–254, t. 74 f. 1.

Roots fleshy, 5–10 × 1–2 mm. Leaves distichous, 2–3 mm, a few times forked or entire. Flowers solitary or few; pedicel up to 3 mm; tepals filiform; stamens 2; anther dorsifixed, elliptic, top retuse; ovary fusiform, with 6 prominent ribs. (The description is partly extracted from TULASNE (1852), as the material was too incomplete to provide sufficient details.)

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Tocantin, Weddell s.n., fl. fr. July (K, M, P).

#### 4. **MNIOPSIS** Mart. & Zucc.

Coenobia consisting of small individuals, opposite or subopposite along branched roots, stems distinct, branched or unbranched, mostly with rests of leaves on the basal part and a tuft of leaves at the top. Leaves either all similar and provided with one or two intrapetiolar stipules, or of two types and then estipulate and in 4 rows. Leaves and stipules obliquely inserted, with the apical end of the insertion area nearest to the substratum. Leaves entire or a few times forked. Flowers few to numerous; pedicel mostly short, slightly exceeding the spathella; juvenile spathella nipple-shaped; tepals 3 or 2, one on either side of the andropodium, the third in the forking between the two stamens and sometimes absent; stamens borne by an andropodium, anthers dehiscing introrsely, pollen grains 2-celled; ovary globose to ellipsoid, with two unequal cells, sutures oblique; styles simple or branched, mostly densely papillate. Fruit similar to the ovary, the smaller valve caducous.

Type: *Mniopsis scaturiginum* Mart. & Zucc.

Distr.: 5 species in SE Brazil. (See map)

This genus is easily recognizable on account of its smooth ovary and the leaves provided with a distinct stipule which is rarely absent

in some specimens of *M. crulsiana*. The branched styles in some species often give a good indication to which genus a species belongs. It was founded by MARTIUS and ZUCCARINI in 1824 and WARMING between 1881 and 1888 added some more species.

*M. weddelliana* has the largest distribution, for its range covers the Brazilian provinces Rio de Janeiro, Sao Paulo, Minas Geraes, Rio Grande do Sul and Santha Catharina. It proves to be highly variable, and attempts have been made by WARMING to distinguish a number of forms, but on account of the numerous intermediate stages this seems to be impossible.

#### Key to the species:

- 1a. Leaves entire or with 2-lobed top, 2 mm long or less. . . . . 1. *M. scaturiginum* Mart & Zucc.
- b. Leaves a few times forked, up to 2.5 cm long . . . . . 2
- 2a. Styles entire; leaves in 4 distinct orthostichies, estipulate . . . . . 2. *M. glazioviana* Warming
- b. Styles branched; leaves in 2 orthostichies and provided with stipules . . . . . 3
- 3a. Ultimate divisions spatulate to ovate . . . . . 3. *M. weddelliana* Tul.
- b. Ultimate divisions filiform . . . . . 4
- 4a. Stipules acute, distinct; leaves 1-2.5 cm long . . . . . 4. *M. saldanhana* Warming
- b. Stipules obtuse, indistinct or absent; leaves 0.2-10 cm long . . . . . 5. *M. crulsiana* Warming

1. *Mniopsis scaturiginum* Mart. & Zucc., (1824) 3-4, t. 1; Schnitzlein (1843-1846) t. 85 f. 5; Tul. (1849) 105; Tul. (1852) 143-145; Walpers (1852) 439; Walpers (1858) 786; Tul. (1863) 257-258; Weddell (1873) 77; Warming (EP 1891) 21; idem (1899) 135-138, t. 31 & 32; Glaziou (1911) 576; Engler (1930) 60, f. 52 A-E; Tobler (1933) 298-299, f. 15—*Crenias scopulorum* Sprengel, (1827) 247.

Small coenobia, forming dense mats, stem 2-4 cm, branched. Leaves in 4 orthostichies, the largest leaves in the outer orthostichies, the two other orthostichies with smaller leaves. The larger leaves subrotundate, up to 2 × 2.5 mm, top truncate or in the apical ones 2-lobed, base widened, decurrent, the smaller leaves up to 1 × 0.5 mm, top rounded, base widened, decurrent, both types of leaves coriaceous, entire, and nerveless. Flowers terminal; pedicel up to 5 mm; juvenile spathella nipple-shaped, dehiscing laterally, mature spathella campanuliform, up to 3 mm; tepals 3, two of them linear-lanceolate, up to 2 mm, the third one filiform, c. 1 mm, andropodium membranous, up to 1.5 mm, filaments up to 0.5 mm, anthers 4-sided, up to 1.5 mm, the 2 outer loculi larger than the inner ones, top and base of the thecae emarginate, pollen grains unknown; ovary globose, up to 2 mm diam, styles markedly papillate, up to 0.5 mm; each divided in 3 or 4 cylindrical branches. The smaller valve of the fruit caducous.

Type: Martius s.n. in M.

Distr.: Brazil. (Provinces Goyaz, Matto Grosso, Minas Geraes, Santha Catharina)

*Goyaz* — near Contagem de S. Maria, Martius s.n., fl. fr. Oct. (BM, L, M, P, W); Rio Babylon, Glaziou 21985, fl. fr. Aug. (NY); Rio Trindade, Glaziou 21994, fl. fr. Aug. (C, G-Del., P); Rio Carumba, Glaziou 21997, fr. July (BR, C, G-Del., P), idem, Glaziou 21998, fr. July (BR, C, G-Del., P, S); Rio Uruhu, between Jaraguay and Goyaz, Glaziou 22003, fl. fr. July (BR, C, F, G-Boiss., P, S, US); Rio Macaco, Glaziou 22004, July (BR, C, F, G-Boiss., K, P, S); Rio de Almas, near Meia Ponte, Glaziou 22008, fr. Aug. (BM, BR, C, G-Del., P, S, US); idem, Glaziou 22009, fl. fr. Aug. (BM, BR, C, F, G-Del., P, S, US); idem, Glaziou 22010, Aug. (BM, BR, C, P, S); idem, Glaziou 22011, fl. fr. Aug. (BR, C, F, G-Del., P, S, US); Ribeirão de Caldas, Glaziou 22013, fl. fr. July (BM, BR, C, F, G-Boiss., G-Del., P, S, US); Rio Vermelho, Weddell s.n. (P) — *Matto Grosso* — without loc., Moore 711 (BM) — *Minas Geraes* — Caldas, Regnell s.n., Aug. (BR) — *Santha Catharina* — Rio Humboldt, Ehrhardt s.n., fl. Oct. (BM) — *Unknown prov.* — Serra de Carawi, Mosén 359, Aug. (S) — *Without loc.* — Vauthier s.n., (W); Burckell 5665, (W).

2. ***Mniopsis glazioviana*** Warming, (1881) 1-26, t. 6 f. 9-15; idem (1882) 118-120, t. 9 f. 37-53; idem (1888) 481; idem (1899) 138; Glaziou (1911) 575-576; Engler (1930) 60, f. 6, 20 F; Kuhlmann & Kühn (1947) 15, 54, f. 5.

Small herb with a slightly branched stem, which is up to 1 cm long and c. 0.5 mm diam, quadrangular on account of the decurrent margins of the leaves. Leaves up to 2 cm, base ovate, decurrent, provided with a triangular, acute, up to 1 mm long stipule, which is sub-amplexicaul and decurrent, top a few times forked, the lower leaves often without forked top. Flowers few; pedicel up to 1 cm; juvenile spathe nipple-shaped, mature one infundibuliform, up to 3 mm; tepals 3, the two lateral ones linear, up to 1 mm, the third one shorter and narrower, andropodium flattened, up to 1.5 mm, filaments up to 0.5 mm, anthers quadrangular, up to 0.8 mm, top and base emarginate, inner loculi shorter than the outer ones, thecae unequal, emarginate at either end, pollen grains unknown; ovary subglobose to ellipsoid, up to 1.5 mm, styles filiform, entire, more or less cohering at the base, up to 0.5 mm, markedly papillate. Fruit similar to the ovary, the smaller valve caducous.

Type: Glaziou 12191 in C.

Distr.: Brazil. (Provinces Sao Paulo, Rio de Janeiro, Santha Catharina)

*Rio de Janeiro* — Rio Soberbo, Glaziou 12191, fl. fr. Aug. (BR, C, G-Del., P); idem, Glaziou 12193, March (BR, C, G-Del, GH, NY, P); Rio Bengala, Glaziou 12197, fr. Oct. (C, P); Rio Parahyba, near Boa Vista, Glaziou 13144, fr. July (C, P); Rio Soberbo, near Sition de H. Dias, Glaziou s.n., March (P) — *São Paulo* — Rio Camanducara, Cachoeira de Falcão, Kuhlmann & Kühn 970, Aug. (ex litt.) — *Santha Catharina* — Rio Humboldt, Ehrhardt s.n., fl. Oct. (BM); Rio Batatas, Riedel s.n., (C, LE-I) — *Without any details* — Schwacke 3298 (C).

3. ***Mniopsis weddelliana*** Tul. (1849) 105; idem (1852) 145-147, t. 8 f. 4; Walpers (1852) 439; idem (1858) 786; Tul. (1863) 258, t. 74 f. 4; Weddell (1873) 77; Warming (1881) 1-26, t. 4 f. 14-24, t. 5 f. 1-24, t. 6 f. 1-8; idem (1891) t. 8 f. 1-34, t. 9 f. 1-36; idem (1899) 138; idem (EP 1891) 21; Glaziou (1911) 576; Engler (1930) 60.

var. **weddelliana**

Small herb with a branched or unbranched, 0.5–3 cm high stem. Leaves a few times forked, flabelliform, 0.5–2.5 cm, ultimate divisions spatulate to ovate, 2–3 × 0.5–1 mm, obtuse to acute, with a single distinct nerve, petiole 1–3 mm, widened at the base, subamplexicaul, at the lowest margin provided with a triangular, acute, 1–1.5 mm long stipule; basal leaves often squamiform, subamplexicaul, acute, 0.5–1 mm. Flowers solitary; pedicel 0.5–2 mm; juvenile spathella clavate, nipple-shaped; mature one campanuliform, 2–2.5 mm; tepals 3, filiform, one on either side of the andropodium, 1.5–2 mm, the third one inserted in or slightly below the point of fusion of the filaments, 1 mm long or less, filaments 1–1.5 mm, anthers sagittate, 1–1.5 mm, top truncate or emarginate, base deeply incised, pollen grains 2-celled or, sometimes 3- or 4-celled,  $41.6 \times 24.8 \mu$ ; ovary obliquely ellipsoid, 1–1.5 mm, styles provided with 4–6 branches, 0.5–1 mm, strongly papillate. Fruit similar to the ovary, the smaller valve caducous.

Type: Weddell s.n. in P.

Distr.: Brazil. (Provinces Rio de Janeiro, Sao Paulo, Minas Geraes, Rio Grande do Sul, Santha Catharina)

*Rio de Janeiro* — Piabanha-river, Weddell s.n., fl. fr. Nov. (P); Serra des Orgnes, Petropolis near San Antonio, Glaziou 7398, fr. July (G-Del., P); Rio Bengala, between Nova Friburgo and Alto, Glaziou 12197, Oct. (C); Rio Itamaraty, near Petropolis, Glaziou 12198, May (C, P); without loc., Glaziou 8888 (BR); Rio Paqueques, dos Nevès Armond s.n., (C) — *São Paulo* — Cachoeira de Tres Pontes, Harshberger 977, May (US); Tres Pontes, Amparo, Hoehne s.n., fl. fr. May (SP); Salto de Piracicaba, Accorsi s.n., fl. Nov. (PIR); idem, Accorsi s.n., fl. fr. Aug. (PIR). *The two last-named specimens were mentioned by ACCORSI (1944) 93-104, f. 13-17 and ACCORSI (1946) 400-423, f. 19, 24, 25, 27, under the name Mniopsis glazioviana Warming* — *Minas Geraes* — Pogos near Caldas, Regnell s.n., fl. Aug. (BR, C); Caldas, Regnell III 1117, June (C); Caldas, Regnell III 1118, fl. fr. March (C, S, US); Caldas, Regnell 1118 B & C, fl. fr. March (S); Caldas, Mosén 749, fr. (S) — *Rio Grande do Sul* — Rio Burges, without coll., March and April (P) — *Santha Catharina* — Rio Humboldt, Ehrhardt s.n., fl. fr. Oct. (BM) — *Without known province* — Rio Avayandaba, Riedel 395, (C) — *Without loc.* — Riedel 47, fl. fr. (C).

var. **gracilis** Warming, (1899) 138.

This variety differs from the var. *weddelliana* in the longer and narrower leaves, the acute ultimate divisions, and the pedicel up to 2.5 cm. As no flowering specimens were at hand, I have not been able to decide whether the specimens referred to, represent a variety of the species mentioned above or whether they are, as WARMING suggests, to be regarded as a distinct species.

Type: Glaziou 17777 in C.

Distr.: Brazil. (Province Rio de Janeiro)

Rio Grande, near Nova Friburgo, Glaziou 17777, Dec. (C, P); Rio Soberbo, Glaziou 12192, March (BR, C, F, G-Del., P, US); Rio Piabanha, near Petropolis, Glaziou 12194, May (BR, C, F, G-Del., US).

4. **Mniopsis saldanhana** Warming, (1888) 458–460, 481, t. 20 f. 10–29; Glaziou (1911) 575; Engler (1930) 60, f. 2 & 20 A–E.

Small herb with a stem up to 5 mm, strongly branched at the top, branches congested. Leaves a few times forked, 1–2.5 cm, ultimate divisions subfiliform; base subamplexicaul, 2–5 mm, widened, decurrent, provided with a single lanceolate, 1.5–2 mm, acute, stipule. Flowers relatively numerous, slightly protruding beyond the spathe; pedicel very short; juvenile spathe clavate, umbonate, mature one infundibuliform, up to 2.5 mm; tepals 3, one on either side of the andropodium, linear, 1–1.5 mm, the third one linear, up to 0.8 mm, andropodium up to 2.5 mm, filaments 0.5 mm, anthers quadrangular, top and base deeply incised, loculi inserted at different levels, pollen grains 2-celled,  $46.5 \times 27.9 \mu$ ; ovary ellipsoid,  $1.5-2 \times 1-1.5$  mm, sutures distinct, oblique, styles up to 1 mm, strongly papillate, provided with 6–9 branches. Fruit incompletely known.

Type: Glaziou 13146 in C.

Distr.: Brazil (Province Rio de Janeiro)

Rio Bengala near Nova Friburgo, Glaziou 13146, Febr. (BR, C, F, G-Del. P, US); idem, Glaziou 17225, Dec. (BM, BR, C); idem, Glaziou 17229, fl. (P).

5. **Mniopsis crulsiana** Warming, (1899) 138–140, f. 33–34; Engler (1930) 60, f. 52 G.

Coenobia consisting of small individuals arising from 0.2 mm wide, flattened roots, and either stemless or provided with a short, i.e. not more than 12 mm high, stem. Leaves a few times forked, 2–10 mm, ultimate divisions subfiliform, up to 1 mm, base widened, subamplexicaul, provided with a single stipule, appearing in the form of a narrow, obtuse crest, or without stipule; petiole relatively long. Flowers few; juvenile spathe clavate, mature one narrowly infundibuliform; tepals 3, linear, two of them reaching  $\frac{3}{4}$  of the length of the andropodium, the third one slightly shorter, anthers quadrangular, top emarginate. pollen grains 2-celled, incompletely known; ovary globose, styles provided with 4–6 branches; densely papillate. Fruit unknown. (The description of the flower is extracted from the publication of WARMING)

Type: Glaziou s.n. in C.

Distr.: Brazil.

Rio Alto Macahé, Glaziou s.n., fl. June (C, U).

## DUBIOUS SPECIES

1. **Mniopsis guianensis** Klotsch, Schomburgk (1848) 930.

This species is reported from the Essequibo, Mazaruni and Cuyuni rivers but as no specimens are indicated by KLOTSCH I was unable to trace this species.

5. **PODOSTEMUM** Michaux

Small to medium-sized coenobia arising from the flanks of branched roots; individuals provided with a more or less distinct stem or stemless,

branched or unbranched. Fertile individuals sometimes separate from the sterile individuals along the same root. Leaves distichous, repeatedly forked or entire, sometimes obliquely inserted, provided with a distinct intrapetiolar stipule, in the lower leaves the peripheral parts nearly always suppressed and the stipule reduced or lacking. Flowers axillary, spathe splitting at the top; pedicel as a rule relatively short; tepals 3; one on either side of the andropodium and the third one in the fork between the two filaments; stamens 2, borne by an andropodium, filaments rather short, anthers dehiscent introrsely, pollen grains 2-celled; ovary consisting of two subequal cells and provided with 6 or 8 ribs, styles simple, equal or unequal, free. Fruit similar to the ovary, the smaller valve caducous.

Type: *Podostemum ceratophyllum* Michaux

Distr.: 17 species in southern and southeastern parts of North America, in the West Indian islands, Central America, southern and south-western parts of Brazil, Uruguay, Paraguay, Argentina, tropical parts of Africa, Ceylon, India. (See map)

### Taxonomy

The genus was founded in 1803 with a single species, viz. *P. ceratophyllum*. The correct form of the name of this genus and consequently that of the name of the family and of the order, has for a long time been a subject of dispute. In A. MICHAUX's 'Flora boreale-americana' the plant on which the genus was based is described under the name *Podostemum ceratophyllum*, but in the explanation of the accompanying figure it is named *Podostemon ceratophyllum*. SPRAGUE discussed this question in 1933 and came to the conclusion that the form *Podostemum* must be regarded as the right one. The discovery of the type specimen in the Paris herbarium proved the correctness of this interpretation as that sheet bears the name *Podostemum ceratophyllum* in the handwriting of A. MICHAUX.

As WARMING had accepted the form *Podostemon*, his new species were all published under this generic name. ENGLER (1930) too regards *Podostemon* as the correct form, and he introduced therefore for the order the name *Podostemonales*, a name also erroneously used by the editor of the Bulletin of the Missouri Botanical Garden in a publication of the present author in 1950.

In the course of the present study it became necessary to describe some new taxa, viz. *P. ceratophyllum* var. *circumvallatum*, *P. dentatum*, *P. dimorphum*, *P. undulatum*, with the var. *angustifolium*, while one new combination had to be made, viz. *P. ricciiforme*. *P. warmingii* proved to be conspecific with *P. aguirense*.

*P. ceratophyllum* var. *circumvallatum* differs from the type in the shorter stems, the densely congested bases of the leaves, and the larger number of rests of leaves on the basal parts of the stem. The flower unfortunately is unknown. The varieties *abrotanoides* (Nuttall) Weddell and *chondroides* Fassett can not be maintained as they are merely extreme variants connected with the ordinary form by a series of intermediate stages. *P. dentatum* van Royen, *P. mülleri* Warming, *P. uruguayense* Warming,

and *P. galvone* Warming differ from the other species of this genus in the stipule which is inserted with a narrow, linear base on the petiole. The other species have a stipule which is inserted with a wide and concave base. *P. dentatum* resembles *P. galvone* in the presence of teeth along the upper part of the petiole, but differs in the latter's sudden contraction towards the top, in the greater length of the stipule, and also in its small size.

*P. dimorphum* is remarkable on account of the disproportion between the large sterile stems and the minute, fertile ones, which bear but one flower. In its stipule it closely resembles *P. ceratophyllum*. The leaves resemble those of *P. ceratophyllum* but have wider and longer ultimate divisions.

*P. undulatum* also resembles *P. ceratophyllum*, and *P. aguirense* as well, in its leaves and stipules, but differs in the spatulate and longer ultimate divisions. It also resembles *P. schenckii* and *P. ostenianum* but differs from the first in the abrupt widening of the ultimate divisions and from the latter in the greater width of the ultimate divisions, which, moreover, are provided with a distinct nerve. The variety *angustifolium* has a longer stem, narrower ultimate divisions and longer stipules.

*Marathrum? ricciaeforme* is on account of its stipulate petiole transferred to *Podostemum*, but as long as its flowers are unknown, its true position remains uncertain.

The species of this genus are difficult to define. Floral details are useless, as the floral parts differ only in their dimensions and as these differences moreover are too small to be used as distinctive characters. More serviceable differences are found in the leaves and in the stipules.

### Geography (See map)

The distribution of this genus is anomalous. One part of its area covers the southern and eastern parts of North America, the West Indian islands and the eastern parts of Central America; the other and greater part extends from Central Brazil southwards to Uruguay, Argentina and Paraguay. Some species are reported from Africa but it is doubted whether these really belong to this genus. *P. ceratophyllum*, whose range extends from eastern North America over the West Indian islands to the Yucatan Peninsula in Central America, has the widest distribution. The most northern habitat is in the neighbourhood of Quebec.

### Key to the species <sup>1,2</sup>

- |     |  |   |                                     |   |
|-----|--|---|-------------------------------------|---|
| 1a. | Ultimate divisions of the leaf consisting of 2-5 irregularly whorled, triangular, up to 2.5 mm long segments . . . . . | 1.  | <b>P. distichum</b> (v. Cham) Wedd. |   |
|     | b.   | Ultimate divisions linear or spatulate to filiform, not whorled . . . . . |                                     | 2 |
| 2a. | Leaves entire . . . . .  |   |                                     | 3 |
|     | b.   | Leaves repeatedly forked . . . . .  |                                     | 6 |
| 3a. | Upper part of leaf-base provided with a single marginal tooth . . . . .  |   |                                     | 4 |
|     | b.   | Such a tooth not present . . . . .  |                                     | 5 |
| 4a. | Leaf-base gradually passing into the wider limb. 15.   |   | <b>P. galvone</b> Warming           |   |

<sup>1</sup> The characters of stipules and leaves are those observed in the uppermost leaves.

<sup>2</sup> **Podostemum comatum** Hicken is not included in the key (See p. 244).



- b. Leaf-base abruptly narrowed before passing into the limb . . . . . 13. **P. dentatum** van Royen
- 5a. Stipule inserted either near the top or slightly shifted towards the middle of the leaf-base, triangular to trapezoid, acute. Leaf-bases numerous, spatulate, 2-5 × 1-2 mm, flaccid, sometimes provided with an about 3 cm long filiform petiole and a forked upper part with spatulate ultimate divisions . . . . . 16. **P. mülleri** Warming
- b. Stipule in the basal leaf-bases inserted in the middle of the leaf-base, quadrangular to ovate, acute to obtuse. Leaf-bases few, irregularly trapezoid, acute, 4-8 × 2-5 mm, coarse, sometimes keeled above . . . . . 14. **P. uruguayense** Warming
- 6a. Leaves with a single stipule . . . . . 8
- b. Leaves with two marginal stipules . . . . . 7
- 7a. Ultimate divisions subfiliform to linear, 2-4 mm long; stipules obtuse, inconspicuous . . . . . 12. **P. fruticosum** (Tul. & Wedd.) Wedd.
- b. Ultimate divisions spatulate, about 1 × 0.5 mm; stipules acute, well developed . . . . . 9. **P. ostenianum** Warming
- 8a. Stipules inserted with a wide, concave, base, boat-shaped . . . . . 9
- b. Stipules inserted with a laterally flattened base, crest-like . . . . . 27
- 9a. Stipules entire . . . . . 10
- b. Stipules divided into 2-6 lobes . . . . . 16
- 10a. Leaves 1.5 cm or shorter; ultimate divisions rhomboid . . . . . 11
- b. Leaves 3 cm long or shorter; ultimate divisions filiform to spatulate . . . . . 12
- 11a. Styles shorter than the ovary; leaves up to 8 mm long, 2 or 3 times forked; ultimate divisions 0.5-1.5 mm long . . . . . 11. **P. rutifolium** Warming
- b. Styles nearly as long as the ovary; leaves 5-10 mm long, once forked; ultimate divisions 2-4 mm long 12. **P. fruticosum** (Tul. & Wedd.) Wedd.
- 12a. Ultimate divisions filiform . . . . . 13
- b. Ultimate divisions spatulate or linear . . . . . 14
- 13a. Stipules entire, top irregularly shaped . . . . . 2. **P. ceratophyllum** Mx
- b. Stipules divided into 2-6 narrow and acute lobes 4. **P. schenckii** Warming
- 14a. Fertile and sterile stems on different shoots along the same root; the fertile stem up to 3 mm high; sterile stem 20-60 cm high . . . . . 3. **P. dimorphum** van Royen
- b. Fertile and sterile stems on the same individual . . . . . 15
- 15a. Ultimate divisions subfiliform to linear, 0.05-2 cm long; stipules with an irregularly formed top . . . . . 2. **P. ceratophyllum** Mx
- b. Ultimate divisions spatulate, 0.5-1 cm long; stipules entire or shortly lobed; top or tops acute . . . . . 5. **P. undulatum** van Royen
- 16a. Stipules wide, subamplexicaul, squamiform, coriaceous; leaves 1-7 mm long . . . . . 6. **P. glaziovianum** Warming
- b. Stipules narrow, concave, usually not amplexicaul, membranaceous . . . . . 17
- 17a. Ultimate divisions filiform or subfiliform . . . . . 18
- b. Ultimate divisions spatulate, quadrangular or linear . . . . . 20
- 18a. Top of thecae acute; tepals about 1 mm long; stipules c. 1.5 mm long . . . . . 7. **P. aguirense** Chod. & Visch.
- b. Top of thecae obtuse; tepals 1-2 mm; stipules 0.5-5 mm long . . . . . 19
- 19a. Inner loculi of the anthers shorter than the outer ones . . . . . 2. **P. ceratophyllum** Mx
- b. Inner loculi as long as the outer ones . . . . . 4. **P. schenckii** Warming
- 20a. Leaves 2-18 mm long, with rhombiform ultimate divisions . . . . . 11. **P. rutifolium** Warming
- b. Leaves 0.5-15 cm long, with spatulate to linear ultimate divisions . . . . . 21
- 21a. Leaves 2-15 cm long; stems 0.1-80 cm high . . . . . 23
- b. Leaves 0.5-2.5 cm long; small herbs, stem not more than 1.5 cm high 22
- 22a. Stipules obtuse . . . . . 10. **P. ricciiforme** (Liebmann) van Royen
- b. Stipules acute . . . . . 9. **P. ostenianum** Warming
- 23a. Fertile stems not more than 3 mm high, separate from the sterile ones but springing from the same root. Leaves of sterile plant 2-12 cm long, stems 20-60 cm high; ultimate divisions 2-6 mm long, nerveless . . . . . 3. **P. dimorphum** van Royen

- b.* Each specimen with flowers and leaves; stems 0.2-20 cm high. Leaves 1-20 cm long . . . . . 24
- 24a. Ultimate divisions spathulate, abruptly widened at the top, one-nerved . . . . . 5. *P. undulatum* van Royen
- b.* Ultimate divisions else and not abruptly widened at the top . . . . . 25
- 25a. Top of thecae acute; tepals about 1 mm long; stipules 0.5-1 mm long . . . . . 7. *P. aguireense* Chod. & Visch.
- b.* Top of thecae obtuse; tepals 1-2 mm long; stipules 0.5-5 mm long . . . . . 26
- 26a. Inner loculi of the anthers shorter than the outer ones . . . . . 2. *P. ceratophyllum* Mx
- b.* Inner loculi as long as the outer ones . . . . . 4. *P. schenckii* Warming
- 27a. Top of leaf non-apiculate . . . . . 28
- b.* Top apiculate . . . . . 29
- 28a. Stipules inserted near the top of the leaf-base, triangular to trapezoid, acute . . . . . 16. *P. mülleri* Warming
- b.* Stipules inserted at the middle of the leaf-base, irregularly quadrangular to ovate, acute to obtuse . . . . . 14. *P. uruguayense* Warming
- 29a. Leaf-base gradually passing into the petiole. Stems 1-10 cm high . . . . . 15. *P. galvone* Warming
- b.* Leaf-base abruptly narrowed before passing into the petiole. Stems 2-10 mm high . . . . . 13. *P. dentatum* van Royen

1. *Podostemum distichum* (v. Cham.) Wedd., (1873) 73-74; Warming (1888) 454-455, t. 19 f. 5-7; Warming (EP 1891) 21—*Podostemon distichus* (v. Cham.) Warming, Engler (1930) 63—*Lacis disticha* v. Cham., (1833) 653; idem, (1835) 504, t. 5—*Podostemon chamissonis* Tul., (1849) 103; idem, (1852) 133-135; Walpers (1852) 438; idem (1858) 784; Tul. (1863) 255-256, t. 74 f. 2—Plate 2 f. 7-13.

Small to medium-sized, 1-15 cm high herb, roots 3-4 mm wide. Stem compressed, flexuose, quadrangular, 1-2 mm diam, internodes 1-4 mm. Leaves repeatedly forked, 1-2 cm, petiole decurrent, triangular in transverse section, up to 5 mm long, stipule with 2 long, acute, inner teeth and 2 smaller, acute, outer ones, ultimate divisions of the leaf provided with 2-5, triangular, acute, sometimes 2-topped, up to 2.5 mm long irregularly whorled segments. Flowers not seen by me but according to Warming similar to those of the other species. Anthers emarginate with 2 unequal, emarginate thecae each containing two unequal loculi. Fruit obliquely ellipsoidal to globose, 1.5-2 × 1-1.5 mm, provided with 8 ribs, 2 of them very closely approaching each other, ribs on the caducous valve slightly S-shaped, on the persistent valve straight or slightly bent; pedicel 0.5-1 mm.

Type: Sellow s.n. in W.

Distr.: Brazil. (Prov. São Paulo, Sta Catharina and Rio Grande do Sul)

*São Paulo* — without loc., Sellow s.n., (BR, L, M, P, W); idem Gaudichaud 10 (P) — *Sta Catharina* — Rio Capivare, in Serra Geral, Ule 1877, Jan. (P) — *Rio Grande do Sul* — Serra dos Taypea, Schwacke 2675, March (C); Aparados da Serra (Bom Jesus), Fazenda Bernardo Velho, Rambo 34957, Jan. (S).

2. *Podostemum ceratophyllum* A. Michaux, (1803) 164, t. 44; Nuttall (1818) 202; Persoon (1819) 532; Sprengel (1825) 95; v. Chamisso (1835) 505; Hooker (1836) 23, t. 20; Schleiden (1839) 54, t. 7 f. 114-117; Torrey (1843) t. 98; Schnitzlein (1843) t. 85 f. 1-2; Tulasne (1849) 103; idem (1852) 129-132; Walpers (1852) 784;

idem (1858) 784; Weddell (1873) 72; Baillon (1888) f. 262; Warming (1881) t. 1-4; idem (1882) t. 7; idem (EP 1891) 21, f. 1; Chapman (1865) 39; idem (1897) 420-421; Nash (1905) 6; Engler (1930) 63, f. 1 & 18; Sprague (1933) 46; Hammond (1937) 417, 36 fgs; Moscoso (1943) 183.

**var. *ceratophyllum***

*Podostemum abrotanoides* Nuttall (1834) 105-107—*P. ceratophyllum* Mx, var. *abrotanoides* (Nuttall) Wedd. (1873) 73—*P. ceratophyllum* Mx, var. *abrotanoides* (Nutt.) Fassett, (1939) 526—*P. ceratophyllum* Mx, var. *chondroides* Fassett (1939) 526—*P. ceratophyllum* Mx, var. *fluitans* Weddell (1873) 73—*Lacis ceratophylla* Bongard (1835) 78—*Aphyllon aquaticum virginianse petraeum* Plukenet (1692) t. 138, f. 1; idem (1696) 16.<sup>1</sup>

Small to large, unbranched or slightly branched, 4-20 cm high herb. Stem terete to subterete, flexuose, 0.5-1.5 mm wide. Leaves repeatedly forked, 1-20 cm, usually provided with a 0.5-5 mm long stipule, divided into 1-3, obtuse or acute, irregularly shaped lobes; ultimate divisions at first spatulate, obtuse, 0.5-1.5 mm, with a single indistinct nerve, afterwards filiform, subfiliform, linear, or spatulate and up to 20 mm long. Rests of leaves on the basal part squamiform, triangular, with a wide base, subamplexicaul, 0.5-1.5 mm, always provided with a stipule. Flowers few; pedicel 2-8 mm; juvenile spathe clavate, umbonate, mature one infundibuliform, up to 4 mm; tepals 2 or 3, filiform, acute, 1-1.5 mm, andropodium 1.5-2 mm, membranous, filaments 0.5-1 mm, anthers quadrangular, 1-1.5 mm, outer thecae longer than the inner ones, base of the thecae obtuse, connective widened and slightly longer than the thecae, sometimes bifid, pollen grains 2-celled, c. 40  $\mu$  long; ovary obliquely ellipsoid, 2-3  $\times$  c. 1.5 mm wide, elliptic in transverse section, provided with 8 ribs, styles 2, filiform, subpapillate, up to 1.5 mm. Fruit with one caducous valve, both valves with 5 nerves.

Type: Richard s. n. in P.

Distr.: NE Canada, S and E regions of the U.S.A., Honduras, Dominican republic.

Vernacular name: river weed (Northern America), ova (Dominica)

*Canada*: Ottawa-river, Allen s.n., Aug. (C, NY); Hull, Macoun s.n., (C, GH, MO, NY); Eel-river, near Woodstock, Macoun 22593, (F, GH); Brighams Creek, near Ottawa, Macoun 5907, (F, GH); St Eustache, M.-Victorin 3212, Aug. (GH, MO, NY); idem, Rivière des Mille-Iles, M.-Victorin 43791 (GH); Ile Bizard, M.-Victorin 22081, (F, GH, MO, P); Saint Joseph, Rivière-des-Prairies, M.-Victorin & Rolland Germain 33998, (C, F, GH); Rivière-des-Prairies, Brunel & Lanouette 45771, (GH).

*United States*: Maine — Kennebec Co., West Gardiner, Collin's Dam, Fassett 18295, fl. fr. Aug., (F, GH, MO, NY); Bradley, Chemostream, Merrill s.n., Oct. (NY); idem, Ricker 628, Oct. (US); Penobscot Co, Gilman falls, Ogden & Babel 2178, Aug. (GH); idem, Steinmetz & Ogden 840, fl. fr. Aug. (F, GH, MO, NY, P, S, US) — Vermont — West river, Jamaica, Dobbins s.n., fl. fr. Aug. (GH); Woodstock, Winslow s.n., July (US) ( Massachusetts — Stony brook, Blankinship s.n.,

<sup>1</sup> The literature has been restricted to the more important items as this species is incorporated in practically every handbook dealing with the North American flora.

(GH); Southampton, Chapman s.n., (MO); South Natick, Charles river, Faxon s.n., fl. fr. July (C, GH, US); idem, E. & C. E. Faxon s.n., Aug. (GH, NY); South Natick, Morong s.n., Sept. (NY, US) — Rhode Island — East Providence, Hunts Mill, Collins s.n., (GH, MO, US); idem, Leland s.n., Aug. (MO); idem, Ten Mile river, Williams s.n., Aug. (GH); Cumberland, Olney s.n., July (GH, NY) — Connecticut — Pequonnock river, Eames 11722, fl. fr. Aug. (GH); Mill river at Samp Mortar, Johnson s.n., fl. fr. April — New York — Jefferson Co, Cramer s.n., fl. fr. (GH); Watertown, Cramer 1 A, (GH); Franklin Co, St Regis river, Muenscher & Maguire 1197, fl. fr. Sept., (F, GH, MO, S); idem, Chateaugay Chasin, Muenscher & Maguire 1196, Sept., (GH); idem, Muenscher & Justice 839, fl. fr. Aug. (F, GH, MO, NY, P, S); St Lawrence Co., Grasse river below Massena, Muenscher & Maguire 1198, Sept. (F, GH, MO, US); Oneido lake, Sartwell s.n., (F); idem, Wright s.n. (F) — Pennsylvania — Allegheny Creek, Berks Co., Brumbach 670-33, (GH); Water Gap, Britton s.n., (BR, C); Brandywine near Westchester, Darlington s.n., (GH); Pike Co., Winona falls near Bushkill, Fassett 19486, Sept. (F, GH); idem, Fassett & Calvert 19488, Sept. (F, GH, MO, P); Delaware river, near Easton, Garter s.n., (NY); idem, Porter s.n., Aug. (F, GH); Cuihuita river, Gattinger 2468, Aug. (F, MO, NY); Delaware Co., Chester Creek, Pennell & Adams 591, Sept. (GH, MO); Chester Co., Canby s.n., fl. fr. (F, P); Monroe Co., Marshall Creek, Howenke 19, Aug. (NY); Northampton Co., Raw s.n., (MO); idem, Martius creek, Williamson s.n., Aug. (NY); without loc., Gray s.n., fl. fr. (P, S); idem, Lesquereux 491, (C); idem, Schweinitz s.n., (BR, P) — Ohio — Ohio river near Louisville, Richard s.n., fl. fr. (B, P) — New Jersey — without loc., Austin s.n., (NY); — Delaware — Brandywine creek, Wilmington, Canby s.n., fl. fr. (GH); idem, Commons s.n., Aug. (US); Red Clay creek, Greenbank, Commons s.n., June/Sept., (MO, NY, US) — Maryland — Swallow falls of Deep Creek, Garrett Co., Drouet 2346, Aug., (F); Prince George Co., Patuxent river, Hermann 9940, Oct., (F, NY); idem, Anocosta river, Hotchkiss 7107, July (US) — District of Columbia — Potomac river, Holm s.n., June (US); Chain bridge, Holm s.n., June (S); Howard Co., Patuxent river, House 1521, Sept. (MO) — Virginia — Bull Run below Beverley Hill, Allard 8152, (GH); Guyandott river, Berkley 431, (MO); Cacapou river near Wardensville, Berkley 1574, (MO); Catawba river, Burke s.n., (NY); Bedford Co., Curtiss s.n., fl. fr. July (F, MO, S); idem, Curtiss 7668, fl. fr. July (GH, MO); Twelve Pole Creek, Plymale 620, Aug. (GH) — Kentucky — Whitley Co., Cumberland, Cumberland falls, Braun 2623, (GH, NY); idem, Clarke s.n., (US); idem, Mac Farland 95, fr. Oct., (GH, MO, NY); Harlan Co., Harlan Court House, Kearney 19, Aug., (GH, NY, US); Kentucky river, Peter s.n., July (L); Lexington, Short s.n., (NY) — North Carolina — Frenchbroadriver, Hot Springs, Biltmore 738, (NY); idem, Beyrich s.n., (C, L, MO, P); Person Co., Earl Hall s.n., Febr. (NY); Tuckazeigee falls, Thaxter s.n., (GH); Rutherford Co., Rainbow falls, Wherry s.n., March (NY); Asheville, Beyrich s.n., (MO); without loc., Schweinitz s.n., (BR, P) — South Carolina — Chutu Co., Landsford, Catawba river, Green 3, (F) — Tennessee — Tellico Plains, Tellico river, Everman s.n., Oct. (F); Unana Mts, Cattering s.n., July (F, GH, NY, US); Conaranga river, Gattinger s.n., Sept. (US); idem, Gattinger s.n., Aug. (GH); Pigeon river, Sevierville, Svenson 4007, Aug. (GH); Grundy Co., Collins river below Altamont, Aug. (GH); Little river, Gattinger s.n., July/Aug., (MO, US); Green Co., Paint Rock creek, Redfield 7669, Aug. (L, MO) — Arkansas — Montgomery Co., Caddo creek, Watts & Fassett 18693, April (F, GH, MO, NY) — Mississippi — Chickasawha river, Enterprise, Tracey 3257 & 3258, Dec. (NY); Meridion, Tracey 3259, Febr. (US); idem, Tracey 3262, March (NY) — Alabama — Covington Co., Patsaliga creek, near River Halls, Haroer 106, June (GH, MO, NY); Mussel Shoals, Lauderdale Co., Tennessee river, Harper s.n., Oct. (US); idem, near Florence, Harper s.n., Oct. (NY); Butler creek, Lauderdale Co., Harper 3870, April (F, GH, MO, US); Goosa river, Chiokwa creek, Rugel s.n., Sept. (C, MO, NY) — Georgia — Tallotah falls, Ascherson 19 (P); Chattahoochee river, Boykins s.n. (NY); idem, near Columbus, Nuttall s.n. (NY); Flint river, near Albany, Chapman s.n. (NY); Goosa river, Chapman (F, GH, MO); Dougherty Co., Muckafoonee creek, Harper 1950, fl. fr. Aug. (F, GH, MO, NY); Rabun Co., Tallulah falls, Seymour s.n., Sept. (GH); idem, Small s.n., Sept. (F, MO, NY); Estotoak falls, Small s.n., Aug. (NY); without loc. Torrey s.n., fl. (GH, MO, NY, P); Warm Springs, Beyrich s.n., (MO); Oglethorpe

Co., S. Broad river, Pyron & Mac Vaugh 41, Nov. (GH, MO, US) — Wyoming — Wyoming Co., Guyandot river, below Baileysville, Morris 1210, (F, US) — State unknown — Little river, Oxford Co., Harper s.n., Aug. (GH); Onigham (?) creek, Hull, Scott s.n., Aug. (C); Delto creek, Garrett Co., J. D. Smith s.n., July (US) — Without loc. — Léman s.n., fl. fr. (P); Joor, (MO); Thurber s.n. (GH).

*Dominican Republic*: Prov. Santiago — distr. San José de las Matas, Rio Magua, near Moncion (Guaraguano), Valeur 130 (C, F, MO, S and herb. San Domingo); idem, Ekman H 12640, May (S); idem, Ekman H 14600, April (S).

var. **circumvallatum** v. Royen, nov. var.—P. 258

Differs from var. *ceratophyllum* in the shorter rigid and coarse stems, the densely congested and more numerous rests of leaves on the basal part of the latter and the obtuse stipule. It grows moreover in a different region. Flower and fruit are unknown.

Type: Standley 56080 in US.

Distr.: Honduras. (Department Comayagua)

Siguatopeque, Rodriguez 2671, April (F); idem, Standley & Chacon 6158, 6451 & 6463, March/April (F); idem, Standley 56071 & 56080, Febr. (F).

3. **Podostemum dimorphum** v. Royen, nov. sp.—P. 258 and plate 2 f. 14–16.

Sterile and fertile individuals on different stems springing from the same root. Sterile individuals 20–60 cm high, stem 2–3 mm diam, unbranched, lax, sometimes slightly winged, compressed. Leaves bipinnate, 2–12 cm, main axis terete or subterete, 1–1.5 mm diam, pinnae of the first order pinnate or forked, ultimate divisions linear, 2–6 mm, stipule inserted with a broad base, concave, membranous, 2–3 mm long, 1–1.5 mm high, with 1 or 2 acute tops. Fertile individuals stemless or with an up to 3 mm high stem, leafless, with markedly widened, lobed bases, subopposite along 2–3 mm wide, compressed roots, each individual provided with a single flower. Flower known in bud only; spathe clavate, umbonate, 2–2.5 mm, rigid, somewhat coarse; tepals 3, linear to filiform, acute, two of them c. 1 mm, the third one in the fork between the two filaments and slightly shorter than the other two, andropodium quadrangular, membranous, c. 1 × 0.5 mm, filaments c. 0.8 mm, membranous, widened at the top, anthers irregularly quadrangular, 1 mm long, top widely emarginate, base emarginate, thecae unequal, obtuse, pollen grains 28 × 15.6  $\mu$ , 2-celled; ovary globose, 0.5 mm diam, incompletely known, styles filiform, acute, 0.5 mm. Fruit unknown.

Type: Dusén 16540 in C.

Distr.: Brazil.

Moringava, near Itarapé, Dusén 16540, fl. buds Jan., (C, S, U).

4. **Podostemum schenckii** Warming, (1888) 451–454, 480, t. 18 f. 1–18, t. 19 f. 1–4; idem, (EP 1891) 21; idem (1899) 128–129, f. 24; Engler (1930) 63; Herter (1930) 65—Plate 2 f. 17–19.

Small to medium-sized coenobia, the individuals subopposite along 1–2 mm wide, compressed, strongly branched roots. Stems 0.5–15 cm high, 1–2.5 mm diam., quadrangular, winged, slightly branched in the

basal parts, more strongly branched towards the top, internodes 0–20 mm. Leaves a few times forked, 0.8–11 cm; petiole narrow, 0.4–4 cm, terete to quadrangular but triangular and sulcate at the base, subamplexicaul and decurrent, margins membranous, ultimate divisions of the leaf spatulate to linear, filiform or subfiliform, nerveless, 2–10 mm, provided with a 1–2.5 mm long stipule which is inserted with a broad base and divided into 2–6, from 0.5 to 1.5 mm long acute lobes, concave, subamplexicaul, basal stipules often subobtuse and 2-lobed, sometimes shifted to the margin. Basal rests of leaves squamiform, convave, with obtuse, irregularly shaped top and amplexicaul base, the lowest ones with an indistinct, narrowly concave, acute or obtuse stipule. Flowers terminal or axillary, solitary; pedicel 2–3 mm; juvenile spathella clavate, umbonate, membranous, mature one campanuliform to infundibuliform, 2–3 mm; tepals 3, filiform, two of these 1.5–2 mm, the 3rd tepal 1–1.5 mm, andropodium membranous, keeled, with a single distinct nerve, 1–3.5 mm, filaments 0.5–1.5 mm, anthers 1–1.5 mm, top and base emarginate, thecae unequal, top of thecae obtuse, base acute, pollen grains 2-celled,  $32.6 \times 22.5 \mu$ ; ovary ellipsoid,  $1.5\text{--}2 \times c. 1$  mm, consisting of 2 oblique, unequal cells and provided with 8 ribs, but the sutural ribs very closely approaching each other, ribs straight or slightly bent, styles 2, pyramidal, with a narrow base, c. 0.5 mm, acute. Fruit with 2 valves, each valve with 5 ribs.

Type: Schenck 328 in C.

Distr.: Brazil. (Province Goyaz, Minas Geraes, Sao Paulo, Santha Catharina, Rio Grande do Sul) and Uruguay.

*Brazil*: Goyaz — Rio Trindade, Glaziou 21994, fl. fr. Aug. (BR); Rio Douadinha, between Panga and João Visva, fr. Aug. (BR, C, F, P, S, US) — Minas Geraes — Rio Bugres, Mosén 738, Oct. (S) — Sao Paulo — Rio Piracicaba, Glaziou 19818, (C, P) — Santha Catharina — Salto, near Blumenau, Schenck 328, fl. fr. Sept. (C); Rio Itayahy, near Blumenau, Schenck 580, Oct. (C); Rio Tubarão, near Pedras Grandes, Ule 1875, July (P); Rio Capinzal, near Santha Catharina, Dusén 17870, fl. fr. Febr. (C, S); without loc., Schenck s.n., (C) — Rio Grande do Sul — Serra dos Tapes, cascade de Hermenegilda, Lindman A 775, Dec. (C, S); Silveira Martius, Lindman 1295, March (C, S) — Without loc. — Schwacke 6069, (C); Schwacke 2874, (C); Glaziou A & B, (C).

*Uruguay*: Rio Negro, Berro 3, March (C); Salto Grande, Berro 3328, April, (C); Barra de Vera, Berro 3394, 5158 & 5161, Febr. (C).

5. ***Podostemum undulatum***, nov. sp., var. ***undulatum***—P. 259 and plate 2 f. 20.

Small, slightly branched individuals, 2–5 cm high, opposite along thin, c. 1 mm wide roots; internodes subcompressed, 1–3 mm, flexuose, fragile. Leaves a few times forked, 2–7 cm, petiole 0.1–3 cm long, 0.5–1 mm in diam, subterete, triangular at the base, slightly decurrent, ultimate divisions spatulate,  $5\text{--}10 \times 0.2\text{--}0.5$  mm, abruptly widened at the top, subacuminate, with a single distinct nerve, membranous, margins undulate, stipules concave, 1–2 mm; subamplexicaul; apical stipules undivided, basal ones with 2 lobes which are 0.5–0.8 mm long, andropodium c. 0.5 mm membranous; filaments 0.5 mm, widened

at the top, anthers with unequal thecae, c. 1 mm long, top obtuse or emarginate, base of thecae obtuse; pollen grains 2-celled, incompletely known; ovary ellipsoid, c.  $0.5 \times 0.5$  mm, provided with 8 ribs, of which 2 approach each other very closely; styles filiform (?), cohering at the base. Fruit unknown.

Type: Ule 804 in P.

Distr.: Brazil, Uruguay and Paraguay.

*Brazil*: Rio Itayahy, near Blumenau, prov. S. Catharina, Ule 804, fl. April; Rio Itapua, prov. Corrientes, Bonpland s.n., (P).

*Uruguay*: Salto Chico, Uruguay river, dept. Salto, Herter 1708, Nov. (F, GH, MO, U, US).

*Paraguay*: between Rio Apa and Rio Aquidaban, Fiebrig 4990, (GH, M).

var. **angustifolium**—P. 259

Differs from the variety *undulatum* in its dimensions, i.e. in the 3–12 cm high stem, in the 5–8 cm long leaves, in the narrower, spatulate, ultimate divisions and in the longer, 1–3 mm long, stipules.

Type: Jörgensen 4989 in C.

Distr.: Known from the type-locality only.

Mbuvera, Arroyo Iguazu, Jörgensen 4989, May (C, F, MO, NY, S).

6. **Podostemum glaziovianum** Warming, (1899) 130–133, f. 26–28; Engler (1930) 63—Plate 2 f. 21–25.

Small, slightly branched individuals, subopposite along thin roots, prostrate or ascending. Stem up to 4 cm long and up to 2 mm diam, twisted, compressed. Leaves far apart, but the bases in the flowering region overlapping, a few times forked, up to 7 mm, ultimate divisions subfiliform, 0.5 mm long or less, petiole up to 2 mm, widened at the base, subamplexicaul, stipule widely squamiform, with 2 acute or obtuse tops, up to  $1 \times 1.5$  mm<sup>1</sup>. Basal rests of leaves squamiform, with a similar stipule as in the complete leaves. Juvenile spathella clavate, umbonate, firm, mature one campanuliform, up to 1.5 mm, pedicel up to 1.5 mm, tepals 2 or 3, lanceolate, two of them 0.8–1.5 mm, the third one sometimes absent, shorter than the other two, andropodium membranous, rectangular to cuneate, c. 1 mm, anthers obliquely quadrangular, c. 1 mm, top and base emarginate, outer thecae longer than the inner ones, pollen grains 2-celled,  $26.6 \times 15.9$   $\mu$ ; ovary ellipsoid, c.  $1.5 \times 1$  mm, provided with 8 ribs, styles filiform, 0.5 mm. Fruit slightly exceeding the spathella; with one valve caducous.

Type: Glaziou 21993 in C.

Distr.: Known from the type-locality only.

Rio Trinidad and Rio Cassu, Glaziou 21993, fl. fr. Aug. (C, P).

7. **Podostemum aguirense** Chodat & Vischer, (1917) 240–241, f. 195–196—*Podostemum warmingii* Chodat & Vischer, l.c. 240, f. 176–180, 183, 188–192, 194—Plate 3 f. 1–6.

<sup>1</sup> The leaves are said (WARMING) to bear numerous fine threads, but in the type-specimens these are not to be found. WARMING's threads may have been minute algae such as were found by WENT on some Suriname Podostemaceae.

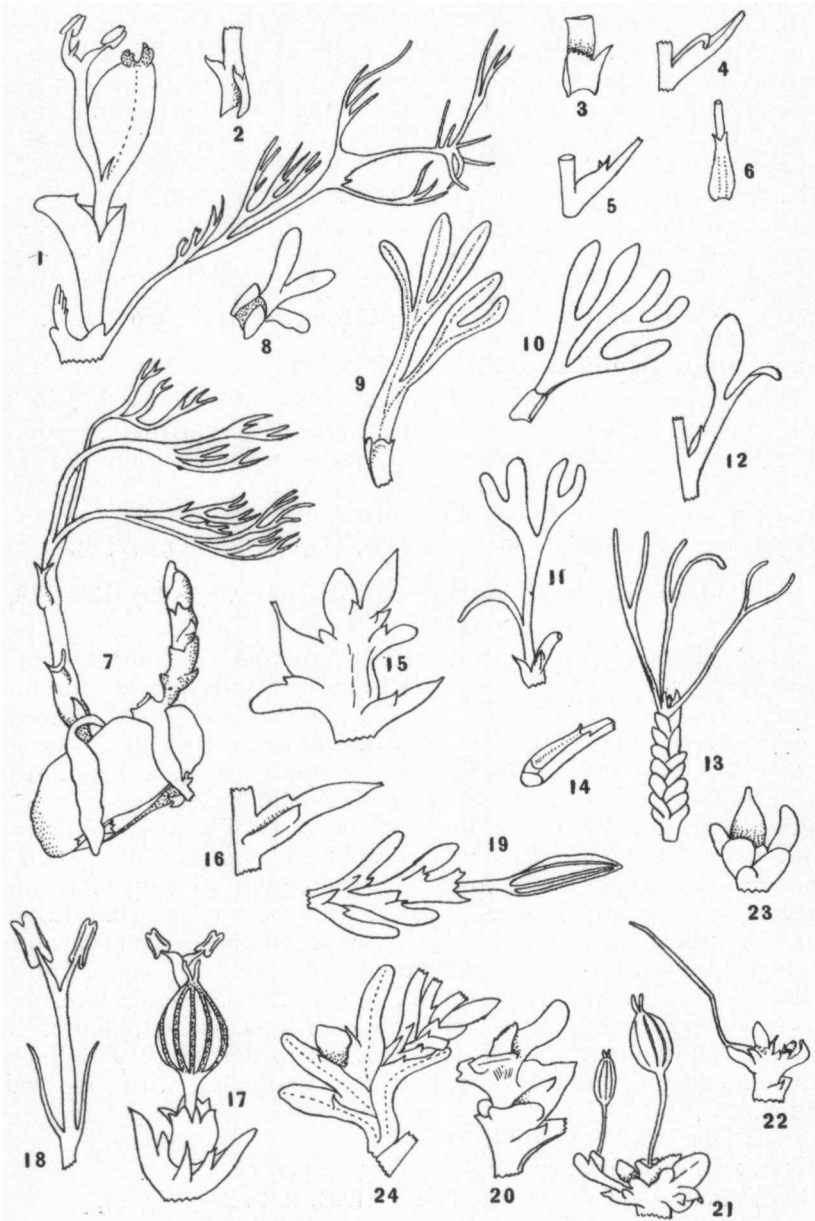


PLATE 3 — 1-6. *Podostemum aguirensis* Chod. & Visch. (*Chodat & Vischer 338*), 1. apical part of shoot; 2-3. stipule; 4-6. stipules, different views, (1-3 according to a drawing made by Chodat and Vischer) — 7. *Podostemum atrichum* Chod. & Visch. (*Chodat & Vischer 337*), roots with shoots (made after a drawing by Chodat and Vischer) — 8-9. *Podostemum ostenianum* Warming (*Osten 2903*), leaves with stipules — 10. *Podostemum ricciiforme* (Liebmann) v. Royen



Coenobia consisting of small shoots developing along 1–2 mm wide, flattened roots. Stem 0.1–7 cm, terete or quadrangular, c. 2 mm diam, branched or unbranched, with a few leaf-bases at the base and some complete leaves at the top. Basal rests of leaves squamiform, deeply and narrowly concave, amplexicaul, 1.5–2.5 mm, at either margin with a single short, obtuse, sometimes indistinctly developed tooth, on the outer surface with hard papillae, sometimes in the lower part of the stem united with each other. Leaves a few times forked, 1–3 cm, at the base with a c. 1.5 mm long stipule, which ends in 2 acute, 0.5–1 mm long teeth, petiole 2.5–10 mm long, c. 1 mm wide, compressed, concave at the base, ultimate divisions of the leaf very narrow, spatulate, acute, 2–6 mm. Flowers few, pedicel 2–5 mm, juvenile spathella clavate, umbonate, papillate, mature one widely campanuliform; tepals 3, linear, acute, two of them c. 1 mm, the third tepal sometimes absent, andropodium membranous, provided with a single nerve, sometimes subcarinate, 1–2 × c. 0.5 mm, filaments up to 0.5 mm; anthers c. 1 mm, quadrangular, top truncate, emarginate, base incised to one fourth, thecae unequal, acute at the top, base emarginate, pollen grains 2-celled, 24.9 × 15.9  $\mu$ ; ovary ellipsoid, c. 2 × 1 mm, terete, indistinctly 8-ribbed, styles at first pyramidal, afterwards subulate, compressed, acute, papillate, up to 1 mm. Fruit 2–3 mm, each valve provided with 5 straight, prominulous ribs. Type: Chodat & Vischer 338, in G-Del.

Distr.: Argentina, Brazil and Uruguay.

*Paraguay*: Salto Grande Yguazu, Chodat & Vischer 338 & 339, fl. fr. Oct. (G-Del).  
*Brazil*: Prov. Minas Geraes, Ribeirao da Caquero, Regnell III 2053, April (P).  
*Argentina*: Prov. Misiones, Yguazu, Osten & Rojas 8165 & 9166, Sept. (S).

8. **Podostemum atrichum** Chodat & Vischer, (1917) 241–242, f. 169–172, 181–182, 187—Plate 3 f. 7.

Small individuals arising from 1–1.5 mm wide, flattened roots. Stems opposite or subopposite, 0.1–7 cm high, quadrangular, compressed, 4-ribbed, branched or unbranched, at the base with the rests of leaves provided with a 1- or 2-topped intrapetiolar stipule. Leaves a few times forked, 1–3 cm, provided with a narrowly concave, amplexicaul base; stipule ending in three 1–1.5 mm long, acute teeth; petiole c. 1 cm long, compressed, sulcate at either side; ultimate

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(*Liebmann s.n.*), leaf with stipules — 11-12. **Podostemum rutifolium** Warming (*Schwacke 5053*), leaves with stipules — 13-14. **Podostemum fruticulosum** (Tul. & Wedd.) Wedd. (*Weddell s.n.*), 13. habit; 14. part of petiole, with stipule — 15-19. **Podostemum dentatum** v. Royen (*Ule 1876*), 15. apical part of shoot; 16. basal part of leaf with stipule; 17. apical part of a shoot with flower; 18. androecium; 19. apical part of shoot with part of fruit — 20-23. **Podostemum uruguayense** Warming (*Osten 2904*), 20. part of shoot; 21. apical part with flowers; 22. idem, with complete and incomplete leaves; 23. idem, with closed spathella — 24. **Podostemum mülleri** Warming (*Müller s.n.*), apical part of shoot with closed spathella.

divisions lanceolate, acute, nerveless, sometimes with an indistinct nerve, 1–9 × c. 0.2 mm. Flowers and fruit unknown.

Type: Chodat & Vischer 337 in G-Del.

Distr.: Paraguay and Brazil.

*Paraguay*: Salto Grande Yguazu, Oct. (G-Del.).

*Brazil*: Prov. Rio Grande do Sul, Arroio Alegre, Bornmüller 738, Oct. (GH).

9. **Podostemum ostenianum** Warming, (1899) 127, f. 23; Engler (1930) 63; Herter (1930) 65—Plate 3 f. 8–9.

Small, weak, up to 2 cm high individuals, opposite or subopposite along compressed, up to 2 mm wide, repeatedly branched roots. Stems up to 1.5 cm, subcompressed. Leaves a few times forked, 0.4–2.5 cm, petiole sheath-like at the base, amplexicaul, stipules either 2, one on either side of the petiole, and then triangular and acute, or one only and then concave and divided into two lobes, ultimate divisions of the leaf spatulate, acuminate, with a single distinct nerve or nerveless, c. 1 × 0.5 mm. Flowers terminal, pedicel up to 5 mm; juvenile spathella clavate, umbonate, coriaceous, mature one tubuliform, up to 3 mm, tepals 3, filiform, two of them 0.5–1 mm, the third tepal in young stages larger than the other two, andropodium membranous, 2–2.5 mm, filaments subulate, anthers irregularly quadrangular, 0.5–1 mm, top of thecae obtuse, emarginate, base acute, pollen grains 2-celled, incompletely known; ovary ellipsoid, 2.5 mm high or shorter, subacute, styles cylindrical, acute, up to 1 mm. Fruit similar to the ovary, each valve with 5 ribs.

Type: Osten 2903 in C.

Distr.: Uruguay and Paraguay.

*Uruguay*: dept. Salto, Salto Grande, Uruguay river, Osten 2903, fl. fr. Dec. (B, C); idem, Berro 5160 & 5168, March (C); Barra de Vera, Berro 5157, Febr. (C).

*Paraguay*: between Rio Apa and Rio Aquidaban, near Caballero-ricé, Fiebrig 4990, Febr. (L).

10. **Podostemum ricciiforme** (Liebmann) v. Royen, nov. comb.—*Marathrum* ? *ricciaeforme* Liebmann, (1849) 512; Warming (1901) 49—Plate 3 f. 10.

Similar to *P. ostenianum*, but stipule hardly visible and provided with 1 or 2 obtuse tips. Flowers and fruits unknown.

Type: Liebmann s.n. in C.

Distr.: Mexico and Costa Rica.

*Mexico*: Baranca de Huitamalco, dept. Vera Cruz, Liebmann s.n., May (C).

*Costa Rica*: without loc., Endris (?) 181, (W).

11. **Podostemum rutifolium** Warming, (1899) 129–130, f. 25; Engler (1930) 63; Herter (1930) 65—Plate 3 f. 11–12.

Small, up to 7 cm high individuals with branched stems, opposite or subopposite along 2–3 mm wide compressed roots. Stems compressed, 1 mm diam. Leaves a few times forked, up to 8 mm; petiole

3–5 mm, amplexicaul, stipule concave, c. 0.5 mm, undivided or sometimes with two acute tips, ultimate divisions of the leaf ovate to quadrangular, obtuse to subacute, 0.5–1.5 mm, nerveless. Flowers terminal, pedicel 3–5 mm, juvenile spathella clavate, umbonate to acute, coriaceous, mature one infundibuliform, 3–4 mm, tepals 3, linear, acute, two of them 1–1.5 mm, but the third tepal c. 1 mm; andropodium membranous,  $1 \times 0.5$  mm, filaments 0.8 mm, anthers obliquely quadrangular, obtuse, base emarginate, outer thecae larger than the inner ones, in either case top obtuse, base acute, pollen grains 2-celled, yellowish,  $34.7 \times 21.3 \mu$ ; ovary ellipsoid, obtuse, up to 2 mm high, provided with 8 lighter coloured ribs, styles 2, pyramidal, base broad, top acute, 0.5 mm long or less. Fruit unknown.

Type: Schwacke 5053 in C.

Distr.: Brazil and Uruguay.

*Brazil*: Rio Itayahi, near Blumenau, Schwacke 5053, fl. (C); Garcia brook near Blumenau, Schenck 187, Sept. (C).

*Uruguay*: Rio Negro, Berro 2, March, (C); Salto Grande, Uruguay river, Berro 5199, April (C).

12. ***Podostemum fruticosum*** (Tul. & Wedd.) Wedd., (1873) 74; Engler (1930) 63—*Castelnavia fruticosus* Tul. & Wedd., Tul. (1849) 110; Tul. (1852) 176–178, t. 12 f. 3; Walpers (1852) 442; idem (1858) 790; Tul. (1863) 270–272, t. 76 f. 3—Plate 3 f. 13–14

Small, erect individuals with shoots in groups along thin roots. Stem 5–15  $\times$  0.5–1 mm, unbranched. Leaves forked, 5–10 mm, petiole subterete, amplexicaul, stipules 2, inconspicuous, marginal, obtuse, ultimate divisions 2, subfiliform to linear, 2–4 mm, obtuse. Rests of the leaves at the base of the shoot squamiform, close together, with the base enveloping each other, without stipule. Flower known in bud only, terminal, juvenile spathella clavate, membranous, stamens free or borne by an andropodium, tepals 3, two of them half as long as the stamens or the andropodium, the third one shorter; ovary ellipsoid; styles filiform, nearly as long as the ovary, markedly exceeding the spathella. (The description of the flower is extracted from the publication of WEDDELL as I was unable to find flowers).

Type: Weddell s.n. in P.

Distr.: Brazil, prov. Rio de Janeiro, Rio Piabanha in Serra da Estrella.

13. ***Podostemum dentatum*** v. Royen, nov. sp.—P. 259 and plate 3 f. 15–19.

Small, slightly branched or unbranched individuals, subopposite or opposite along thin roots. Stems 2–10 mm. Leaves entire, 0.5–2.5 cm  $\times$  0.2 mm, entire (or bifid?), base 0.5–2  $\times$  0.5–1 mm, obliquely inserted, abruptly narrowed into the linear limb, which is provided with a single nerve, stipule triangular to ovate, acute, 1–1.5  $\times$  0.5 mm, inserted with a narrow, linear base in the middle of the base of the leaf, top of the base of the leaf in the apical leaves provided with a short,

triangular, 0.5 mm long tooth. The squamiform rests of the leaves at the base spatulate, 0.5–2 × 0.5–1 mm. Flowers few, terminal and axillary, pedicel 1–3 mm, juvenile spathella clavate, umbonate, coriaceous, mature one campanuliform, 2–3 mm, tepals 2, the third one unknown, linear, acute, 0.5–1.5 mm, andropodium membranous, 2–2.5 mm, filaments lanceolate, 0.5 mm long, anthers sagittate c. 1 mm, with deeply emarginate top and base, thecae unequal with acute tops and subacute to acute bases, pollen grains 2-celled,  $31.7 \times 17.3 \mu$ ; ovary ellipsoid to ovoid, 2–2.5 × 1–1.5 mm, with 8 indistinct, wide, flattened ribs, styles filiform, 0.5–0.8 mm. Fruit with one persistent valve provided with 5 straight or slightly bent ribs, and one caducous valve with 5 slightly sinuous ribs.

Type: Ule 1876 in P.

Distr.: Brazil. (Prov. Santha Catharina).

Rio Tubarao, on Pedras Grandes, Ule 1876, fl. fr. July (P).

14. **Podostemum uruguayense** Warming, (1899) 133–135, f. 29 & 30; Engler (1930) 63; Herter (1930) 65—Plate 3 f. 20–23.

Small, up to 4 cm high individuals, subopposite along compressed roots. Stem twisted, compressed. Rests of leaves 4–8 × 2–5 mm, widely ovate to elliptic, obliquely inserted, amplexicaul, decurrent, sometimes keeled at the upper surface, rigid, abruptly passing into a narrowed, entire or a few times forked, up to 2 cm long limb with spatulate, ultimate divisions, stipule irregularly quadrangular to ovate, acute to obtuse, inserted with a narrow, laterally flattened base near the top, in the lower leaves shifted towards the middle of the leaf-base. Flowers few, along brachyblasts or axillary, pedicel 3 mm, juvenile spathella clavate, umbonate, mature one infundibuliform, 3–4 mm, coriaceous, not or very slightly exceeding the leaf-base, tepals 3, linear, acute, two of them 1–2 mm, but the third one at the most but slightly more than 1 mm, andropodium membranous, 1–3 mm, its midrib winged and decurrent along the pedicel, filaments subulate, compressed, 0.2–1 mm, anthers sagittate, c. 0.5 mm, top obtuse to subacuminate, base deeply emarginate, pollen grains 2-celled,  $32.9 \times 17.1 \mu$ ; ovary ellipsoid, 2–2.5 × c. 1.5 mm, provided with 8 flat, prominent ribs, styles conical, papillate, up to 0.5 mm. Fruit similar to the ovary, both valves with 5 ribs.

Type: Osten 2904 in C.

Distr.: Uruguay and Brazil.

*Uruguay*: dept. Salto, Salto Grande, Uruguay river, Osten 2904, fl. fr. Dec. (C); idem, Felippone 5255, fl. fr. (K, U).

*Brazil*: prov. Santha Catharina, Rio Itayahy, near Blumenau, Schwacke 5013, (C).

15. **Podostemum galvone** Warming, (1888) 450–451, t. 17 f. 16–20; Engler (1930) 63—Plate 4 f. 1–6.

Small, strongly branched individuals, subopposite or opposite along c. 2 mm wide roots. Stem 1–10 cm, subcompressed, fertile specimens shorter than sterile ones. Leaves entire or once or twice forked, up to

11 mm, sulcate at the base, subamplexicaul, decurrent, ultimate divisions spatulate, obtuse, up to 3 mm, margin undulate, with a single distinct nerve, stipules either two and then one at either margin of the base of the leaf, or but a single one, which is triangular, acute, c. 0.5 mm, base of the leaf gradually passing into the wider limb. Flowers few, pedicel 1–2 mm; juvenile spathella clavate, umbonate, coriaceous, mature one infundibuliform, 2–3 mm, tepals 3, linear, acute, two of them 1.5–2 mm, but the third one only c. 1 mm, anthers sagittate, 0.5–0.8 mm, acute, pollen grains 2-celled,  $26.1 \times 16 \mu$ ; ovary ellipsoid,  $1.5-2 \times 1$  mm, with subtruncate top, and 8 indistinct ribs, styles subpapillate, acute, 0.5 mm long. Fruit similar to the ovary. Type: Puiggari 852 in C. Distr.: Brazil and Paraguay.

*Brazil*: Rio Iguape, Iporanga, Puiggari 852, fl. fr. July (C); idem, Puiggari 889, (C); idem, Puiggari 279, (P); idem, Rocken 415 (?), Sept. (C); near Apiahy, Matas-Altas, Rocken 272, March (C); without loc., Glaziou 16358, (P); idem, Glaziou 16359, (C, F, P).

*Uruguay*: Uruguay river, Salto Grande, Berro 5159, April (C); idem, Salto Chico, Berro 5170, April (C).

16. **Podostemum mülleri** Warming, (1899) 445–449, 480, t. 16 f. 1–9, t. 17 f. 1–15; Engler (1930) 63, f. 7—Plate 3 f. 24.

Small, branched, up to 7 cm high individuals. Stem twisted, compressed, quadrangular. Leaves with a wide base which abruptly narrows into the up to 8 cm long, entire or repeatedly forked limb; base ovate to elliptic, obliquely inserted, decurrent, coarse,  $2-5 \times 0.5-2$  mm, stipule near the top or slightly shifted towards the middle, triangular to trapezoid, acute, 0.3–1 mm, inserted with a narrow, laterally flattened base, ultimate divisions filiform. Flowers numerous, pedicel 2–4 mm, juvenile spathella clavate, umbonate, coriaceous, mature one infundibuliform, up to 4 mm, tepals 3, linear, acute, two of them 1.5–2 mm, but the third one shorter and narrower, andropodium membranous, c. 1 mm, filaments subulate, 1–2 mm, anthers obliquely quadrangular, 0.5–1 mm, top truncate, emarginate, pollen grains 2-celled,  $30.8 \times 16.3 \mu$ ; ovary ellipsoid, up to 2 mm high, provided with 8 ribs, styles pyramidal to filiform, 1 mm, subpapillate. Fruit similar to the ovary, each valve with 5 ribs.

Type: Müller s.n. in B.

Distr.: Brazil (Provinces Santha Catharina, Sao Paulo, Rio Grande do Sul)

*Santha Catharina*: Rio Itayahy, Müller s.n., fl. fr. (B); idem, Schwacke 5055, (C); idem, near Blumenau, Schwacke 5010, (C); idem, idem, Ule 862, Aug. (P, US); idem, Schenck 330, 331 & 332, Sept. (C); Rio Garcia, near Blumenau, Schwacke 5012, (C); idem, Jordans brook between Garcia and Blumenau, Schenck 186, Sept. (C) — *São Paulo*: Rio Piracicaba, Glaziou 19816, fl. fr. (C, P); Rio Iguapé, Iporanga, Puiggari 86, July (C); idem, Puiggari 279, July (P); without loc., Glaziou 15443, 15444 C, 16358, (C, P); idem, Glaziou 16359, (P) — *Rio Grande do Sul*: Arroio Alegre, Bornmüller 737, fl. Oct. (GH) — *Without loc.*: Glaziou s.n., (P); Löfgren s.n., (C).

17. **Podostemum comatum** Hicken, (1917) 150–151.

As I had not seen the material I was unable to include this species in the key and to provide a description. For this reason I reproduce here, with a few corrections, the Latin description given by Hicken:

Caules duplicis naturae; alii steriles, repententes, herbacei, laeves, compressi, 2.3–4 mm lata et 20–30 cm longi flexuosi e margine singulo tantum folia multisecta petiolata fere ad nervos ramosos reducta emittentes. Caules alii fertiles, erecti, herbacei sed magis rigidi et rugosi, minus compressi, 6–8 cm alti, simplices, sursum foliiferi et floridi, deorsum nudi, sed stipulis auriculiformibus vel vaginiformibus caulem semi-amplexantibus. Lamina multifida, ad lacinas filiformes ramosas reducta usque ad 10 cm longa. Folia ramorum fertilium similia sed multo minora, petiolo brevissimo 2–3 mm longo et laciniis 20 mm longis, alternis et distichis, stipulis 2 semi-amplexicaulibus brevibus. Flores solitarii axillares in foveola caulis insiti. Spathella duriuscula cum clausa pyriformi, obovata. Androceum pedicelli apice laterali inseritur; filamenta 3 libera, lateralia castrata filiformia subulata, fertili multo breviora ovarium medium attingentia. Filamentum bifurcum parte communi ovario duplo longius et intra crura appendicem subulatum, filiformem, brevem gerens; brachii 1.5 mm longis, antheriferis. Antherae ellipsoideum sessile biloculare stigmatibus 2 linearibus planis liberis ornatum. Capsula matura pedicellata 1.25 mm longa, 8-costata; semina numerosa badia compressa.

Type: Rodriguez 791, Rio Iguazu, Argentine. fi. fr. April.

### DUBIOUS SPECIES

1. **Podostemum ? dichotomum** Klotsch, Schomburgk (1848) 930.

This species is reported from the Essequibo, Mazaruni and Cuyuni river but as no specimens are indicated I was unable to trace this species.

6. **CASTELNAVIA** Tul. & Wedd.

Very small to small, liverwort-like herbs. Leaves known in a few species only, and these rather variable. Flowers numerous, in cavities of the thalloid base, distinctly zygomorphous, shortly pedicellate with the pedicel often sinuous; tepals 2 or 3, lanceolate, acute, alternate with the stamens; stamens 1–3, free or united at the base; filaments membranous, decurrent on the pedicel and cohering with the base of the ovary; anthers sagittate, introrse; pollen grains one-celled, ellipsoid, 3-colpate; ovary mostly perpendicular to the pedicel, 1-celled by reduction of the septum; one of the carpels smaller, almost free of the pedicel, without ribs or with 3–5 ribs, glabrous or with numerous small papillae in the apical part; the other carpel large, saucer-like, sometimes united at the base with the pedicel and perpendicular to the latter, and with the base of the filaments, provided

with 5 to 9 lighter coloured ribs, sometimes with minute papillae at the top; styles 2, filiform, unequal; placenta with 2 unequal lobes, attached by 2 short and thin stalks to the top and the base of the ovary; ovules relatively few. Fruit similar to the ovary, the smaller valve deciduous.

Type: *Castelnavia princeps* Tul. & Wedd. emend. Warming.

Distr.: 9 species in southeastern Brazil. (See map)

This genus is very sharply defined by the pronounced zygomorphy of the flower, a character that is not developed to such a high degree in one of the other American genera. It occurs, however, in the Asiatic genus *Farmeria*. The septum in the ovary disappears during the flowering period. The pollen grains are ellipsoid, 3-colpate, and they therefore agree with those found in the tribe *Lacideae* in the sense of ENGLER (1930). This character, in combination with some other ones compelled the present author in the first part of his study of the American Podostemaceae (1951, p. 12) to unite the tribes *Eupodostemoneae* and *Lacideae* of ENGLER to a single tribe *Eupodostemeae*.

The genus *Castelnavia* is subdivided by TULASNE and WEDDELL in two sections, viz. *Eucastelnavia*, comprising the species provided with a fastigiate base and the section *Castelnella*, in which the species with a linear base were brought together. Whether this subdivision may be regarded as natural, seems doubtful, as in *Castelnavia princeps* intermediate stages are found. But as there was too little material for study I had to leave this question undecided. The species themselves are quite easily distinguishable, though the lack of leaves in part of the material restricts the number of characters that can be used for the construction of a key to the species.

One new species is described, viz. *C. cuneifolia* which resembles *C. princeps* in its leaves, but differs from the latter in the shorter anthers and in the presence of 8 nerves instead of 10 in the ovary. The flower resembles that of *C. lindmaniana* and *C. serpens* in the lack of the small papillae at the top of the smaller valve. The leaves of the new species are pinnatilobed to pinnatipartite, while the leaves of the two species mentioned are repeatedly pinnate.

### Geography (See map)

The genus seems to be confined to a comparatively small area; it has so far mainly been found in the Rio Araguay and its tributary the Rio Tocantin, where the species grow, according to WEDDELL in great abundance.

### Key to the species:

- |   |   |
|---|---|
| 1a. Stem distinctly widened, thalloid. Individuals solitary . . . . .                     | 2 |
| b. Stems small or absent. Individuals springing from the flanks of narrow roots . . . . . | 6 |
| 2a. Smaller valve at the top with several small teeth . . . . .                           | 5 |
| b. Smaller valve without teeth . . . . .  | 3 |

- 3a. Both valves with 5 ribs . . . . . 4  
 b. Smaller valve with 3 ribs; the other one without ribs . . . . . 4. *C. lindmaniana* Warming
- 4a. Anthers 1-1.5 mm. Ovary with 10 ribs . . . . . 1. *C. princeps* Tul. & Wedd. em. Warming  
 b. Anthers 0.5-0.8 mm. Ovary provided with 8 ribs . . . . . 5. *C. cuneifolia* v. Royen
- 5a. Stem c. 1 mm; tepals up to 0.25 mm; stamens 2-2.5 mm . . . . . 2. *C. fimbriata* Tul. & Wedd.  
 b. Stem up to 0.5 mm; tepals c. 0.5 mm; stamens up to 1 mm. . . . . 3. *C. multipartita* Tul. & Wedd.
- 6a. Styles as long as or longer than the ovary . . . . . 7  
 b. Styles shorter than the ovary . . . . . 6. *C. serpens* Tul. & Wedd.
- 7a. Two stamens; smaller valve with 7 ribs . . . . . 8  
 b. One stamen; smaller valve with 5 ribs . . . . . 7. *C. monandra* Tul. & Wedd.
- 8a. Styles 1.5-2 times as long as the ovary. Leaves 1-2 mm . . . . . 8. *C. pusillima* Tul. & Wedd.  
 b. Styles 3-4 times as long as the ovary. Leaves 1-3 cm . . . . . 9. *C. fluitans* Tul. & Wedd.

Section: EUCASTELNAVIA Tul. & Wedd.

Individuals solitary, with thalloid fastigiate base and distinct leaves. Flowers numerous, developing from cavities in the thallus—5 species in Central Brazil.

1. *Castelnavia princeps* Tul. & Wedd. emend. Warming (1882), Tul. (1849) 108; Tul. (1852) 164-166, t. 11 f. 1; Walpers (1852) 441; idem (1858) 789; Tul. (1863) 264-265, t. 76 f. 4; Weddell (1873) 80; Warming (1882) 79-89, 118-120, t. 13-15; idem (EP 1891) 22, f. 9; Engler (1930) 65, f. 57—Plate 4 f. 7-11.

Small, solitary herb, with a flattened base, the latter developing from a narrow area of attachment, repeatedly forked, ending in 2.5-6 cm long, flabelliform lobes with a membranous margin along which the leaves are inserted. Leaves 1.5-20 cm, a few times forked or pinnate, attached to the base with a slightly widened foot, ultimate divisions filiform, 0.5-4 mm. Flowers in cavities, which protrude with their margin above the thallus in the form of 2-3.5 × 1-2 mm large lobes, pedicel 1-3 mm, juvenile spathe ellipsoid, sessile, membranous, with numerous papillae at the top, 3-4.5 × 1-2 mm, tepals 2, linear to spatulate, acute, 2.5-3.5 mm, one on either side of the andropodium and united with the latter above its zone of attachment with the ventral valve, in this way forming with the basal part of the andropodium a discoid organ which extends over the basal part of the dorsal valve, stamens 2 or 3, from 3-5 mm, filaments lanceolate, membranous, 2.5-4.5 × 0.2-0.8 mm, widened and united at the base and also with the basal part of the ventral valve, anthers sagittate, obtuse, 1-1.5 mm long, base of thecae obtuse, pollen grains 16 × 13 μ; dorsal carpel concave, 1 mm high, 2.5-3.5 mm long, 1.5-2.5 mm wide<sup>1</sup>, cuneate at the base, provided with 5 ribs, ventral carpel

<sup>1</sup>. With high, long and wide of the carpels is meant in the case of the genus *Castelnavia*: the distance from the septae to the sides, the distance from top to base,



deeply concave, 2–3 mm long, 2–2.5 mm wide, 1.5–2 mm high, with undulate margin and united with the sinuous pedicel, provided with 5 ribs of which the marginal ones are indistinct, styles filiform to subulate, sometimes sinuous, 1–1.5 mm. Fruit similar to the ovary, with one persistent valve.

Type: Weddell s.n. in P.

Distr.: Brazil. (Provinces Goyaz, Minas Geraes and Rio Grande do Sul).

*Goyaz* — Rio Araguay, Weddell s.n., fl. fr. July (C, F, P); Rio Tocantin, Weddell 91, (B); Rio Uruhu, Glaziou 22014, fl. fr. July (C, P) — *Minas Geraes* — Caldas, Regnell III 1117, fl. fr. June (S, US); idem, Regnell III 2053, fl. fr. Febr. (C, P); idem, Regnell II 117 & II 1114, fl. fr. (P); idem, Mosén 1692, fl. fr. April (P); Dibaixo, Regnell s.n. (P); Rio Verde, Mosén 1694, fl. fr. April (S); Rio Capivary, Mosén 1695, fl. fr. May (S) — *Rio Grande do Sul* — Rio Bugres, without coll. 4, fl. fr. April (P).

2. ***Castelnavia fimbriata*** Tul. & Wedd., Tul. (1849) 108; Tul. (1852) 166–167, t. 11 f. 2; Walpers (1852) 441; idem (1858) 789; Tul. (1863) 265–266, t. 76 f. 1; Weddell (1873) 80–81—Plate 4 f. 12–16.

Very small herb with flattened, 2–3 cm wide, fleshy, flabelliform base with  $5-10 \times 2-3$  mm large lobes with a membranous margin and passing into a few narrow, membranous, a few times forked, up to 12 mm long segments. Flowers in cavities in the lobes, juvenile spathe clavate, very thin, not or slightly protruding beyond the thallus; mature one infundibuliform, 1–1.5 mm long, pedicel 1–1.5 mm, tepals 2, linear, acute, one on either side of the andropodium, c. 0.25 mm, stamens 2–2.5 mm, filaments lanceolate, membranous, widened and united at the base, subcarinate, at the union obtusely saccate; anthers obtuse, c. 1 mm; pollen grains incompletely known; dorsal carpel shallowly concave, ovate, c. 1 mm long, up to 0.5 mm high at the top, with 5 ribs which are provided at the top with numerous small teeth; ventral carpel deeply concave, c. 1 mm wide and long, provided with 5 ribs; styles filiform, c. 1 mm. Fruit similar to the ovary, slightly exerted.

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (P).

3. ***Castelnavia multipartita*** Tul. & Wedd., Tul. (1849) 110; Tul. (1852) 168–169, t. 11 f. 3; Walpers (1852) 442; idem (1858) 789; Tul. (1863) 266–267; Weddell (1873) 81; Warming (EP 1891) 22; Engler (1930) 65—Plate 4 f. 17–24.

Base  $3-6 \times 0.2-0.5 \times 0.1-0.2$  cm, repeatedly forked; lobes with membranous margin. Leaves linear to ovate-elliptic or spatulate,  $2-5 \times$  c. 1 mm, very thin, entire, inserted along the margin of the

and the distance from side to side. This is done as the structure of the ovary differs from those known in the American part of the Podostemaceae.

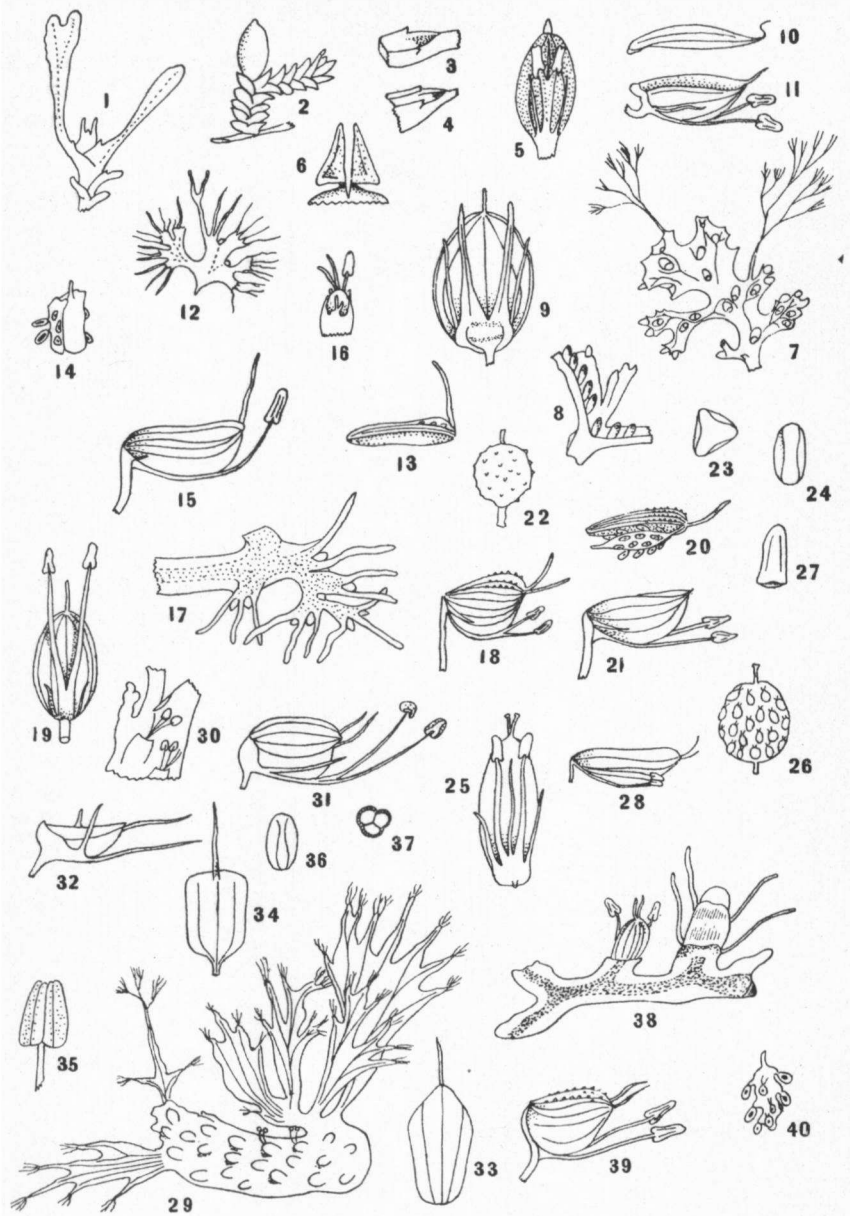


PLATE 4 — 1-6. *Podostemum galvone* Warming (*Puiggari 852*), 1. apical part of shoot; 2. shoot with closed spathe; 3-4. basal part of petiole with stipule; 5. flower; 6. styles — 7-11. *Castelnavia princeps* Tul. & Wedd. (*Regnell III 1117*), 7. habit; 8. base with buds; 9. flower; 10. smallest carpel; 11. largest carpel, with androecium — 12-16. *Castelnavia fimbriata* Tul. & Wedd. (*Weddell s.n.*), 12. habit; 13. flower; 14. flower in spathe; 15. smallest carpel; 16. placenta — 17-24. *Castelnavia multipartita* Tul. & Wedd. (*Weddell s.n.*), 17. habit; 18.

base. Flowers solitary, in the forkings, pedicel 0.8 mm, sinuous, juvenile spathella clavate, subacute, mature one infundibuliform, 1–2 mm, tepals 2, lanceolate, c. 0.5 mm, one on either side of the andropodium; stamens nearly 1 mm, filaments lanceolate, united at the base over a short distance, anthers very small, obtuse, pollen grains incompletely known, dorsal carpel ovate, conchiform, c. 1 mm long, provided with 7 ribs, of which the 2 marginal ones are indistinct, and with numerous small papillae at the top, ventral carpel deeply concave, c. 1 mm long. 0.5 mm high, at the base cohering with the pedicel and the base of the andropodium, which extends slightly over the top of the pedicel, provided with 9 ribs of which the marginal ones are indistinct, styles subulate, c. 0.5 mm. Fruit similar to the ovary. Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (P).

This species was found to grow on wood, perhaps on a part of a root of a overhanging tree.

4. **Castelnavia lindmaniana** Warming (1899) 140–143, f. 35–37—Plate 4 f. 25–28.

Base irregular in outline, branched, thalloid, c.  $3.5 \times 2 \times 0.3$  cm. Leaves inserted along the margin at the end of the lobes, up to 18 cm, pinnate, the pinnae repeatedly forked, the ultimate divisions fasciculate, filiform, acute, up to 2 mm long (or more?). Flowers known in the bud stage only, enclosed in the thalloid base, alternating with the leaves, subsessile, spathella clavate, slightly constricted in the upper half, up to 4 mm, mature one unknown, tepals 3, lanceolate, acute, up to 2.5 mm, united at the base with the filaments, stamens 2, up to 3 mm, united at the base with the tepals, with the top of the pedicel and the base of the ovary, filaments lanceolate, up to 2 mm, anthers ovoid, obtuse or emarginate, base slightly incised, base of thecae obtuse, pollen grains incompletely known; ovary obovoid, obtuse, narrowed towards the base, obtusely triangular in transverse section, up to  $2.5 \times 1.5$  mm, smaller carpel with 3 ribs, the larger one without ribs. Fruit unknown. Type: Lindman A 2957 in S.

Distr.: Brazil. (Province Mato Grosso).

Serra do Itapirapuan, near Diamantino, fl. May (S).

5. **Castelnavia cuneifolia** v. Royen, nov. sp.—P. 259 and plate 4 f. 29–37.

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flower; 19. flower from underneath; 20. smallest carpel; 21. largest carpel with androecium; 22. placenta from above; 23–24. pollen grains — 25–28. **Castelnavia lindmaniana** Warming (*Lindman A 2957*), 25. flower; 26. placenta from above; 27. anther; 28. flower, lateral view — 29–37. **Castelnavia cuneifolia** v. Royen (*Burck 9122*), 29. habit; 30. base with flowers; 31. flower; 32. large carpel with androecium; 33. large carpel from beneath; 34. small carpel from above; 35. stamen; 36–37. pollen grains — 38–40. **Castelnavia serpens** Tul. & Wedd. (*Weddell s.n.*), 38. habit; 39. flower; 40. placenta.

Base small, irregularly shaped, thalloid, branched or unbranched. Leaves along the margin of the base, cuneate to lanceolate, lobed to partite,  $1-2.5 \times 1$  cm, papyraceous, distinctly palmatinerved; lobes lanceolate to triangular, at the top divided into subfiliform, branched segments; ultimate divisions lanceolate, c. 1 mm long, obtuse. Flowers numerous, in cavities in the thalloid base, pedicel very short, c. 1 mm, spathe clavate to campanulate, obtuse to umbonate, c. 3 mm, tepals 2, lanceolate, 2-2.5 mm, acute, one on either side of the andropodium, stamens 2, from 3-6 mm, filaments lanceolate, cohering at the base with the pedicel and the basal part of the larger carpel, up to 5 mm, anthers ovoid to cordate, obtuse, c. 0.8 mm, base emarginate, base of the thecae obtuse, pollen grains ellipsoid, 3-colpate,  $16.6 \times 11.4 \mu$ ; smaller carpel with 5 ribs, but the marginal ones indistinct, larger carpel with 5 ribs, but the marginal ones indistinct, up to  $2 \times 1.5$  mm, styles subulate, 1.5-2 mm, free, unequal. Both valves of the fruit with 5 ribs.

Type: Burckell 9122 in W.

Distr.: Brazil. (Province Goyaz).

Near Sao Jeao do Araguay, Burckell 9122, fl. fr. (K, W).

#### Section: CASTELNELLA Tul. & Wedd.

Individuals either with a tubular base or provided with a distinct stem, arising along linear roots, and provided with well-developed leaves. Flowers one to numerous—4 species in Central Brazil.

6. *Castelnavia serpens* Tul. & Wedd., Tul. (1849) 109; Tul. (1852) 169-171, t. 12 f. 2; Walpers (1852) 441; idem (1858) 789; Tul. (1863) 267-268, t. 76 f. 5; Weddell (1873) 81; Engler (1930) 65, f. 57—Plate 4 f. 38-40.

Very small, up to 1 mm high individuals scattered along branched 1-1.5 mm wide, 5-10 mm long roots with an obtuse top. Leaves distichous, 1.5-4 mm, linear, entire, obtuse, at the base united to a membranous tube which opens with a ventral slit (? always), each individual with one flower, pedicel c. 1 mm, juvenile spathe clavate, membranous, slightly exserted, mature one tubuliform, 1.5-2 mm, tepals absent, stamens 2, from 2-2.5 mm, united at the base over a short distance, the andropodium united with the basal half of the ovary and decurrent on the pedicel, anthers obtuse, 0.5-1 mm, twisted when dry, base of thecae obtuse, pollen grains known in an incomplete state only, smaller carpel conchiform, subtruncate at the top, c.  $0.8 \times 0.5$  mm, provided with 5 ribs, with numerous small papillae at the top, larger carpel deeply concave, c.  $0.8 \times 0.5$  mm, obtuse, provided with 7 ribs, decurrent on the pedicel; styles filiform, c. 0.5 mm. Fruit similar to the ovary.

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (P).

7. **Castelnavia monandra** Tul. & Wedd., Tul. (1849) 109; Tul. (1852) 171-173, t. 12 f. 1; Walpers (1852) 441; idem (1858) 789; Tul. (1863) 268, t. 76 f. 2; Weddell (1873) 81; Engler (1930) 65, f. 57—Plate 5 f. 1-5.

Very small individuals along membranous, 1 mm wide, branched roots; each individual provided with 4 to 6, distichous, linear, 5-20 mm long leaves. Basal leaves shorter than the apical ones, all widened and united at the base into a 1-1.5 mm long, 0.5-1 mm wide tube, which is shortly pubescent without, and develops a single flower. Pedicel 0.5-1 mm, juvenile spathella clavate, mature one tubuliform, 2-4 mm, tepals absent, stamen 1, 6-8 mm, filament filiform, 5-6 mm, at the base united with the ovary, decurrent on the pedicel, anthers obtuse, c. 0.6 mm, base of thecae obtuse, pollen grains incompletely known, smaller carpel elliptic, obtuse, 0.7-1 × c. 0.5 mm, provided with 5 ribs, but the marginal ones indistinct, with small papillae, the latter numerous at the top and diminishing in number towards the pedicel, larger carpel deeply concave, 0.5-0.8 × c. 0.5 mm, provided with 7 ribs, but the marginal ones distinct, styles linear, membranous, 1.5-2 mm. Fruit similar to the ovary.

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (P).

8. **Castelnavia pusillima** Tul. & Wedd., Tul. (1849) 109; Tul. (1852) 174-175; Walpers (1852) 442; idem (1858) 790; Tul. (1863) 269-270; Weddell (1873) 81-82; Engler (1930) 65—Plate 5 f. 6-12.

Very small individuals along branched, compressed roots. Leaves 1-2 mm (according to Tulasne 6-7 mm), linear, widened at the base and united there into a minute thallus. Flowers between the leaves, pedicel 0.5-1 mm, juvenile spathella clavate, mature one campanuliform, 1-2 mm, tepals absent, stamens 2, from 2-3 mm, filaments lanceolate, 2-2.5 mm, membranous, over a short distance united with each other, with the basal part of the larger carpel and decurrent on the pedicel, anthers ovoid to obovoid, acute, base of the thecae obtuse, smaller carpel patelliform, 0.5-1 mm, provided with 5 ribs of which the marginal ones are indistinct, and with numerous small papillae especially at the top, larger carpel urceolate, 0.5-0.7 mm long, provided with 9 ribs of which the marginal ones are indistinct, at the base over a short distance united with the pedicel, styles filiform, 1-1.5 mm. Fruit similar to the ovary.

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (P).

9. **Castelnavia fluitans** Tul. & Wedd., Tul. (1849) 109; Tul. (1852) 173-174; Walpers (1852) 441; Walpers (1858) 790; Tul. (1863) 269; Weddell (1873) 32; Engler (1930) 65—Plate 5 f. 13-16.

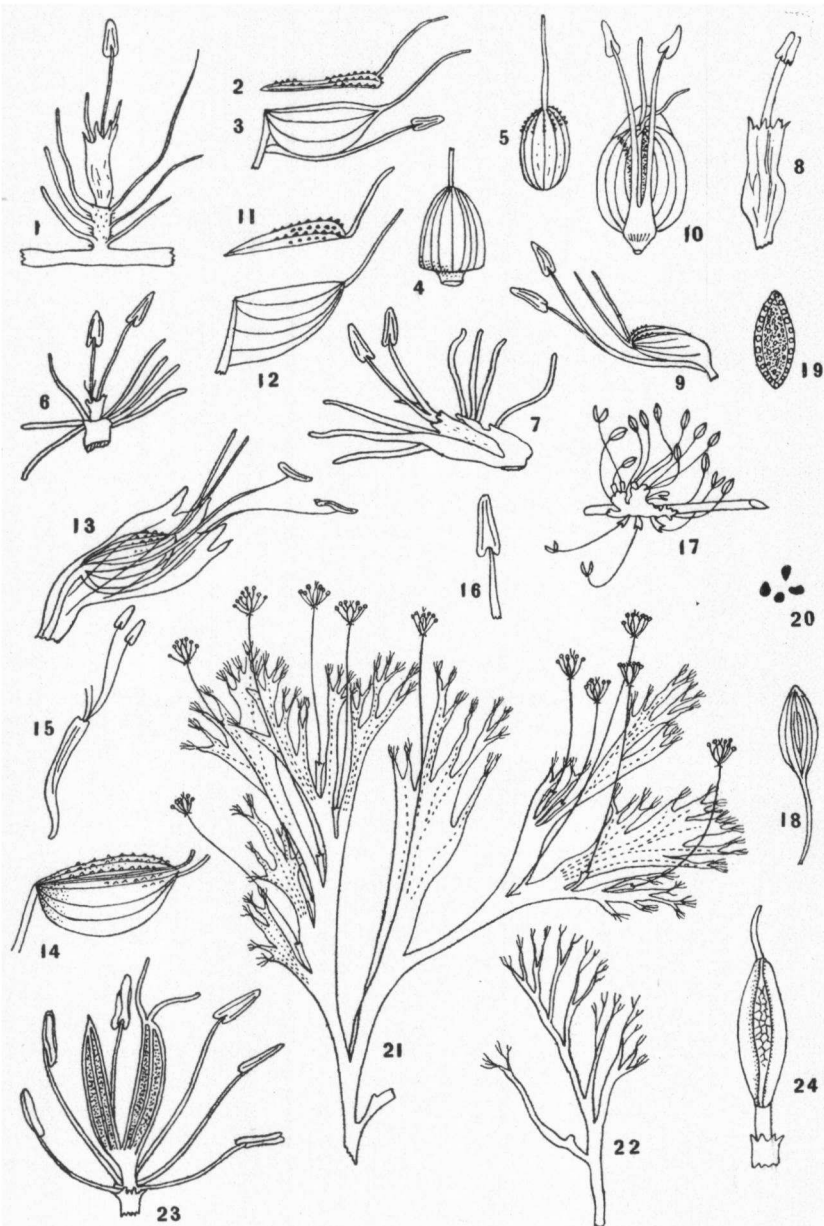


PLATE 5 — 1-5. *Castelnavia monandra* Tul. & Wedd. (*Weddell s.n.*), 1. habit; 2. smallest carpel; 3. largest carpel with stamen; 4. smallest carpel from above; 5. largest carpel from beneath — 6-12. *Castelnavia pusillima* Tul. & Wedd. (*Weddell s.n.*), 6-7. habit; 8. flower in spathe; 9-10. flower; 11. smallest carpel; 12. largest carpel — 13-16. *Castelnavia fluitans* Tul. & Wedd. (*Weddell s.n.*), 13-15. flower, different views; 16. stamen — 17-20. *Blandowia striata* Willdenow (*redrawn after the picture made by Willdenow*), 17. habit; 18. fruit; 19. placenta; 20. seeds — 21-24. *Apinagia aripecuruensis* v. Royen (*Ducke 15025*), 21. habit; 22. leaf; 23. flower; 24. inner side of flower.

Small individuals formed along thin roots, almost stemless or the stem widened and forked (?). Leaves up to 3 cm, entire or divided into a few subfiliform segments, widened at the base and here shortly united into a small thallus. Flowers in fascicles of 2 to 4, arising between the leaves, pedicel 1–2 mm, sinuous, juvenile spathella clavate, mature one infundibuliform, 4–5 mm, tepals absent, stamens 2, from 7 to 8 mm, filaments filiform-linear, 6–7 mm, over a short distance united at the base and with the basal part of the ventral carpel and the top of the pedicel, anthers sagittate, c. 1 mm, obtuse, base of thecae obtuse, pollen grains known in an incomplete state only, smaller carpel elliptic, concave, 1–1.5 mm long, 0.5 mm high or less, provided with 7 ribs of which the marginal ones are indistinct, with numerous small papillae especially at the top, larger carpel deeply concave, 1–1.5 mm long, c. 1 mm high, with 9 ribs of which the marginal ones are indistinct, with some small teeth along the margin, styles compressed, linear, 4–4.5 mm. Fruit similar to the ovary.

Type: Weddell s.n. in P.

Distr.: Brazil. (Province Goyaz).

Rio Araguay, Weddell s.n., fl. fr. July (F, P).

### EXCLUDED SPECIES

1. **Castelnavia warmingiana** Glaziou, (1911) 576, nomen nudum.

This is no *Castelnavia*, but an *Apinagia*. However, as the type-specimen consists of fruits and leafless stems only, I am not able to identify it. The equal carpels are a distinct feature for *Apinagia* and are never found in *Castelnavia*.

Type: Glaziou 22004 in P.

Distr.: Brazil. (Province Goyaz).

Rio Macaco, Glaziou 22004, fr. June (B, K, P).

### III DUBIOUS GENERA

1. **BLANDOWIA** Willdenow

• Willdenow (1809) 100–101, t. 4 f. 2; Weddell (1873) 85; Engler (1930) 68—*Dicraea* Du Pet. Th., § *Blandowia* Tul. (1849) 101; Gray (1849) 419–420—*Apinagia* Tul., § *Blandowia* Tul. (1852) 106–108.

The original description given by WILLDENOW is: *Capsula bivalvis bilocularis. Semina dissepimento oblongo affixa.*

Type: *Blandowia striata* Willdenow.

Distr.: Chili.

WILLDENOW's description of the genus is rather meagre, but the material does not permit of giving more details. Until not only one species is known, viz. *B. striata*, and of this species only fruits and an incomplete base are present. The material is according to the drawings

and the description so poor that I am unable to decide whether it really is a *Podostemaceae*, though I must admit that it has a distinct podostemaceous habit. WILLDENOW's statement that this species lives on trees, makes its taxonomic position even more dubious.

STURM in 1835 described under the name *B. striata* another species from Italy living on trees and in moss-cushions. BARONI in 1900 proved that this species was *Targionia epiphylla*, a liverwort. As the name *B. striata* was used by STURM for a different species, TULASNE in 1852 correctly changed the name used by the latter; he called it *Apinagia preissi*. However, not only this species was given another name, but the type-species, *B. striata* from Chili received also a new name, viz. *Dicraea willdenowii* Tul. as TULASNE (1849) regarded this species as belonging to *Dicraea*. Moreover a new species of *Lacis* described by BISCHOF (1835) under the name *L. fallacissima* was recognized by TULASNE as conspecific with *Blandowia striata*. In 1905 NASH placed *Neolacis myriophylla* Weddell in this genus *Blandowia*, but this is obviously a mistake as it is clear that it belongs to *Marathrum*, in fact it is conspecific with *M. tenue* Liebmann.

1. ***Blandowia striata*** Willd. (1809) 100–101, t. 4 f. 2; Sprengel (1827) 139 & 236; Engler (1930) 68—*Lacis fallacissima* Bischof, (1835) 963—*Dicraea willdenowii* Tul. (1849) 101; Gay (1849) 419–420—*Apinagia ? willdenowii* (Tul.) Tul. (1852) 106—*Apinagia striata* Grisebach p.p. in msc.—Plate 5 f. 17–20.

As I have not seen the material I must confine myself to reproducing WILLDENOW's description:

Frons plana depressa lobata laevis facie Collemae, lobis adscendentibus obtusis. Perichaetium tubulosum breve lacerum. Seta filiformis. Capsula elliptica striata bivalvis ab apice ad basin dehiscens, bilocularis. Dissepimentum contrarium oblongum, post dehiscentiam capsulae deciduum. Semina oblonga brevi pedicello margini dissepimenti affixa.

Type: Lehmann s.n. in B, duplicates in P and C.

Distr.: Chili.

## EXCLUDED SPECIES

***Blandowia preissii*** (Tul.) Wedd., (1873) 85; Engler (1930) 68—*Apinagia ? preissii* Tul. (1852) 108—*Blandowia striata* Corda in Sturm (1805) 107–116, t. 33 non Willdenow.

As BARONI has shown, this species is identical with the hepatic *Targionia epiphylla*.

## 2. CARAJAEA (Tul.) Wedd.

As I have not seen the material I reproduce here the description given by WEDELLE:



Flores hermaphroditi, nudi, angulis bifurcationum frondis solitarie impositi, erecti, singuli spathella urceolata primum clausa deinceps apice pervia pro parte inclusi. Stamina 2, libera, unilateralia, filamentis planis elongatis seorsum attenuatis, antheris ovatis ore spathellae longiuscule exsertis. Staminodia nulla? Ovarium sphaericum, in fundo spathellae sessile, laeve. Stigmata 2, elongata, linearia, libera, exserta. Capsula non visa.

Type: *Carajaea orthocarpa* (Tul. & Wedd.) Wedd.

Distr.: Rio Araguay, Santa Maria falls, Brazil.

1. ***Carajaea orthocarpa*** (Tul. & Wedd.) Wedd., (1873) 85—*Castelnavia* ? *orthocarpa* Tul. & Wedd., Tul. (1849) 110; Tul. (1852) 175; Tul. (1863) 270.

Description according to WEDDELL:

Pusillima, fronde lineari dichotoma ramisque primariis membranaceo-spongiosis, ramulis filiformibus. Rami frondis vittiformes, plus minus elongati ramulique mire recti et textura firmiore ad dorsum lapidis cui arcte haerent magis minus inter se occurrentes. Flores ad angulos bifurcationis frondis praesertim occurrentes, spathella sessili late ovata, ore contracto acute 4–6 dentato. Stamina e fundo spathellae erecto-divergentia illamque dimidia longitudine superantia, antheris filamentis circiter triplo brevioribus, connectivo ultra loculos nonnihil protracto. Ovarium sessile, sphaericum, laeve, spathella omnino inclusum, stigmatibus ovarii diametrum longitudine nonnihil excedentibus acutus divergentibus in vivo pallide rubentibus oreque spathellae longiuscule exsertis.

Type: Weddell s.n. in P?

Distr.: Known from the type-locality only.

Rio Araguay, Santa Maria falls, Weddell s. n. (P?), fl. fr.

### 3. **VELOPHYLLA** Clarke

DURAND (Index Gen. Phan., 1888, 364) refers to B. CLARKE, 'A new arrangement of the Phanerogamous plants (1866), tab. 4', but this apparently is a mistake. Even with the expert cooperation of Mr SANDWICH of the Kew Herbarium and of Dr TAYLOR of the British Museum, I was unable to trace this genus.

### 4. **ARIADNEA** Klotsch

This genus with one species *A. pectinata* Kl. is published in Schomburgk, 'Reisen in British-Guiana 3 (1848) 930' and is reported from the Essequibo, Mazaruni and Cuyuni river, but as no specimen are mentioned I was unable to trace this genus.

### 5. **ARIORISTRA** Klotsch

This genus with one species, *A. marathrioides* Kl., is published on the same page as the genus *Ariadnea* and also here I was unable to trace the material.

## IV. ADDITIONS AND CORRECTIONS TO PART I

## Page

3. 7th line from below read: In 1933 Sprague . . .  
5th line from below add after Engler (1926): Beitr. Fl. Afrika 52, Engl. Bot. Jahrb. 60 (1926) 453.  
Read the last sentence as follows: According . . ., which existed already when the continents were connected to each other and birds could transport the seeds . . .
10. In the 8th line read: Bentham, i.s.o. Hooker.  
13. Add in the 21st line: Macarenia.  
22. Add in the 5th line from below: (p. 29).  
23. Read in the 2nd line: solitary, i.s.o. fascicled.  
25. Fl. in the 4th and fr. in the 5th line have to be changed.  
29. Read in the 11th line: VON CHAMISSO, i.s.o. SCHIEDE.  
In view of some objections raised against the use of the name *Apinagia* Tul. the following can be added to the 2nd alinea. VON CHAMISSO in 1835 distinguished in the genus *Lacis* 3 sections and used these names as a generic name when describing the species, viz. *Mourera*, *Marathrum* and *Lacis*. ENDLICHER in 1837, also distinguished 3 sections, *Mourera*, *Marathrum* and *Neolacis* but in the genus *Mourera*. LINDLEY, finally, in 1846, mentions *Neolacis* as a genus but in the synonymy of *Mourera*. This name, therefore, can not be regarded as a valid publication of the genus *Neolacis*. WEDDELL in 1873 was the first who used *Neolacis* as a genus-name and who gave a description of it. But already in 1852 TULASNE described the genus *Apinagia* including the species of the section *Neolacis* of *Lacis* or *Mourera* of earlier authors. Therefore *Apinagia* has a priority over *Neolacis* of 24 years and not *Neolacis* over *Apinagia* of 6 years.
32. In the KEY read 2a as follows: Fruit and ovary with 10-14 ribs.  
40. In *Apinagia staheliana* the fruit is provided with 2 long ribs and 4 shorter ones.  
42. In the 9th line add after "Mussoemba-falls: Tresling 110."  
52. In the 10th line from below delete: Plate 3 f. 8-13.  
53. In the 5th line from below add: Plate 3 f. 8-13.  
69. In the 15th line add after "unknown": but the description is extracted from that of TULASNE.  
89. In the 6th line read Aitken and not Aitkers.  
92. Add in the 15th line: and the three Guianas.  
98. 3d line: delete fr.  
102. Add to *Rhyncholacis dentata*: ultimate divisions mainly 0.2 mm long or shorter but sometimes up to 1.2 mm; tepals 0.5-1.5 mm; styles 1-3 mm.  
117. Delete in the 25th line: Rio Guama, Huber 1815, Dec. (G.-Boiss.).  
121. Add after 2. *Jenmaniella jenmanii* (Engler) van Royen, nov. comb.: Plate 14 f. 4-6.  
131. In the 10th, 11th and 12th line change "Var." in "forma".  
139. Change Aitkers in Aitken.  
145. Delete after C. Sprengel: Linnaeus, Species Plantarum etc.  
148. *Apinagia intermedia* Warming must be printed in italics.

## PLATE

2. Delete: The scales are given in millimetres.  
8. Add: 18-19. *Marathrum minutiflorum* Engler, forma *minutiflorum* (Rothschuh 411), 18. flower; 19. primary pinnae.

The following new collections came to my attention:

*Apinagia flexuosa*, van Royen (1951) 36 — British Guiana, Essequibo-river, Kurupukari-falls, N. Beccari 141, fl. fr. Nov. (FI, U).

*Apinagia staheliana*, van Royen, l.c. 40 — British Guiana, Berbice-river, Itabru-falls, near Marlissa, N. Beccari 139 & 140, fl. fr. Dec. (FI, U).

*Apinagia tenuifolia*, van Royen, l.c. 42 — Brazil, Cachoeira do Rio Branco, Kuhlmann 197, fl. fr. (CGE).

**Apinagia richardiana**, van Royen, l.c. 44 — British Guiana, Essequibo-river, Kurupukari-falls, N. Beccari 142, fl. fr. Dec. (FI, U).

**Apinagia glaziovii**, van Royen, l.c. 46 — Brazil, Cachoeira do Alta Ariramba, Ducke 14892, fr. Sept. (CGE).

**Apinagia riedelii**, van Royen, l.c. 47 — Brazil, Rio Taquary, Hoehne 1201 (3921?), fl. fr. May (CGE).

**Apinagia exilis**, van Royen, l.c. 53 — British Guiana, Essequibo-river, Kurupukari-falls, N. Beccari 152, fl. fr. Nov. (FI, U); Berbice-river, Marlissa-falls, N. Beccari 153, fl. fr. Dec. (FI, U).

**Apinagia dissecta** (Montagne) Engler (1930) 38; erroneously as the first author always WEDDELL has been regarded — *Apinagia dissecta* (Wedd.) Engler, van Royen, l.c. 68 — *Neolacis dissecta* Wedd. (1873) 62 — *Anthoceros dissectus* Montagne (1838) 38-57; Proskauer (1953) 65-67, f. 1.

By the courtesy of Dr BOR, editor of the Kew Bulletin, I have been allowed to consult a paper, which will not be published, by Dr PROSKAUER, Berkely, California on "Anthoceros" dissectus Montagne. Dr PROSKAUER draws the attention to this Anthoceros because he supposes that it must be a Podostemaceae. In the Synopsis hepaticorum (1844) 590, this is already suggested by GOTTSCHÉ, and WEDDELL in 1873 described it as a Neolacis species, unfortunately without referring to MONTAGNE's publication. As I was unaware of this oversight I had used WEDDELL's name as the original author, but Dr PROSKAUER kindly drew my attention to MONTAGNE's paper. However, it seems to me, that WEDDELL did not know this publication, as he quoted "Anthoceros dissectus Montagne, in msc.". I here wish to express my sincere thanks to Dr PROSKAUER for his kind advice.

**Apinagia** nov. sp.?, van Royen, l.c. 69 — Brazil: Huber 1783 (CGE).

**Marathrum minutiflorum**, forma **indifferens**, van Royen, l.c. 81 — El Salvador, dept. San Salvador, Las Cataractes, Panchimalco, Fassett 28669, Jan. (WI, U).

**Rhyncholacis hydrocichorium**, van Royen, l.c. 96 — British Guiana, Essequibo-river, Kurupukari-falls, N. Beccari 144, fl. fr. Nov. (FI, U); Berbice-river, Marlissa-falls, N. Beccari 146, fl. fr. Dec. (FI, U); Itabru-falls, near Marlissa, N. Beccari 147, Dec. (FI, U).

**Rhyncholacis palmettifolia**, var. **rosea**, van Royen, l.c. 99 — British Guiana, Essequibo-river, Acuri-falls on top of Kurupukari-falls, N. Beccari 145, fr. Nov. (FI, U).

**Rhyncholacis minor**, van Royen, l.c. 102 — Brazil, Rio Guama, Cachoeira do Ourem, Huber 1792, fr. Dec. (CGE); Rio Capim, Huber 865, fl. fr. (CGE).

**Rhyncholacis brevistamina**, van Royen, l.c. 107 — British Guiana, Demerara, Great falls, N. Beccari 148, fl. fr. Sept. (FI, U).

**Rhyncholacis jenmanii**, forma **laciniata**, van Royen, l.c. 110 — British Guiana, Demarara-river, Canister-falls, N. Beccari 143, fr. Nov. (FI, U).

**Jenmaniella fimbriata**, van Royen, l.c. 122 — Brazil, Rio Guama, Cachoeira do Ourem, Huber 1806 (CGE).

**Macarenia clavigera**, van Royen, l.c. 126 — Colombia, San Juan de Arama, left bank of Rio Güejar near "Los Micos", alt. 500 m, Idrobo & Schultes 717, fl. fr. Dec. (COL, U, US); idem, Idrobo & Schultes 553, fl. fr. Dec. (COL, U, US). In this material the species is said to have red latex.

**Apinagia aripecuruensis** van Royen, nov. sp.—P. 260 and plate 5 f. 21-24.

Small, branched herb, 3-7 cm high; internodes terete to compressed, 0.5-1 cm long, 2-5 mm wide. Leaves 2-5 cm long, at the base 1-5 mm wide, repeatedly forked or flabelliform with repeatedly forked segments, palmatinerved with prominulous ribs, membranous; ultimate segments narrowly linear, acute, nerveless, 1.5-3 mm long. Flowers solitary, pedicel 1.5-5.5 cm long, provided with two wings, tepals 7-9, linear, acute, c. 0.5 mm long, stamens 7-9, in a complete whorl, 3-4.5 mm long, anthers sagittate, 1-1.5 mm long, mucronate, truncate or

emarginate at the top, emarginate at the base, base of thecae mucronate, obtuse or emarginate; pollen grains ellipsoid, 3-colpate,  $16 \times 12 \mu$ ; ovary ellipsoid,  $2-3.5 \times c. 1$  mm, subobtuse at the top, borne by a 0.5-1 mm long, terete, gynophore and provided with 6 or 8 prominent ribs; the ribs on the sutures thin and closely approaching each other or absent; styles 2, from 1-2 mm long, subulate or, sometimes, ribbon-like flattened, obtuse, papillate. Fruit similar to the ovary, each valve provided with 3 or 5 ribs.

Type: Ducke 15025 in CGE, duplicate in U.

Distr.: Rio Eripecurú, Cachoeira do Inferno, fl. fr. Oct. (CGE, U).

This species resembles *Apinagia digitata* in its leaves but has no tufts of filaments on the latter. From *Apinagia exilis* it differs in the 6 or 8 long ribs, while in *A. exilis* which closely resembles this species, there are 6 short ribs. From the other *Apinagia* species it differs in the distinct gynophore. This character was only known until now in the genus *Jenmaniella* and *Apinagia divertens*, thus obscuring the limits between *Jenmaniella* and *Apinagia*.

## V. LATIN DESCRIPTIONS OF THE NEW TAXA

***Oserya minima*** van Royen — Cf p. 220 et tab. 1 f. 8-11.

Individua pusilla, subopposita vel opposita secundum radices tenues, ramosas, applanatas; basi thalloidea vel tubuliformi. Foliis 1 - 3  $\times$  furcatis, ad 5 mm longis, laciniis angustissimis. Floribus solitariis, pedicello circa 1 mm longo; spathella juvenili clavata, obtusa, sessili, robusta, basem thalloidam paulo excedente, matura tubuliformi; tepalis 2 vel 3, duobus in latera, tertio in dorsum filamenti inserto, interdum lateralium altero absente, c. 0.3 mm longis; stamen 1; filamentum subulato; antheris obtusis vel emarginatis; basi ad medium vel minus incisus; thecis interdum inaequalibus; lobis obtusis, basifixis, extrorsis, circa 0.5 mm longis; granulis pollinis ellipsoideis; ovario oblique ellipsoideo vel globoso, obtuso, basi attenuato, 8-costato, circa 1.5 mm longo; carpellis 2 inaequalibus; stylis brevibus, paulo papillatis, cylindricis, obtusis, basi cohaerentibus, c. 0.3 mm longis. Fructu maturo ignoto.

Typus: *Went, s.n., in fluvio Surinamei prope Kabelstation, Suriname, in herb. U.*

*Hac species Oseryae flabelliferae affinis est, sed differt tepalis 3 filiformibus et ovario 8-costato. Descriptio Oseryae sphaerocarphae in paucis singulis cum descriptione supra data convenit, propter materiam im probam O. sphaerocarphae junctionem duarum specierum hacum incertum est.*

***Podostemum ceratophyllum*** Michaux, var. ***circumvallatum*** van Royen — Cf p. 235.

A var. *ceratophylo* differt caulibus brevioribus, cicatricibus in caulis parte basali congestis et numero dioribus, stipulis obtusis, caulibus rigidis et scabris. Flores et fructus ignoti.

Typus: *Standley 56080 in Honduras collectum, in herb. US.*

***Podostemum dimorphum*** van Royen — Cf p. 235 et tab. 2 f. 14 - 16.

Caules steriles a fertilibus separati. Caulis sterilis 20 - 60 cm altus, simplex, laxus, interdum subulatus, compressus. Folia bipinnata, 2 - 12 cm longa, rachi tereti vel subtereti, pinnis pinnatis vel furcatis, segmentis ultimis linearibus, 2 - 6 mm longis; stipula cum basi lata inserta, concava, membranacea, apice integra vel bifida. Specimina fertilia acaula vel in caulem 0.5 - 3 mm altum producta, efoliata, basi conspicue elata et lobata, caulibus suboppositis in radicibus compressis, uniflora. Flores in alabastro solum cogniti, spathella clavata, mammillata, rigida, scabriuscula; tepala 3, linearia usque filiformia, acuta, circa 1 mm longa, tepalo tertio in filamentorum bifurcatione, quam altera dua paulo breviora; andropodium 4-angulatum, membranaceum, circa 1 mm longum, filamentis circa 0.8 mm longis, membranaceis, apice dilatatis, antheris irregulariter obtusis; granulis pollinis 2-

loculatis, ceterum incomplete cognitis; ovarium globosum, incompletae cognitum; styli filiformes, acuti, 0.5 mm longi. Fructus ignotus.

Typus: *Dusen 16540*, in prov. Parana, Brasilia, collectum, in herb. U.

*Haec species facile distinguenda est anthesi differente et individuis fertilis nati ex eadem radice. Stipulae eisdem P. ceratophyllae similes, sed folia segmentis ultimis longioribus et latioribus.*

**Podostemum undulatum** van Royen — Cf p. 236 et tab. 2 f. 20.

Individua parva, subramosa, 2 - 5 cm alta, opposita in radicibus tenuibus, circa 1 mm latis; internodia subcompressa, flexuosa, fragilia. Folia paucifurcata, 2 - 7 cm longa, petiolo subtereti, basi triangulari, subcurrente, segmentis ultimis spatulatis, subacuminatis, distincte uninerviis, membranaceis, marginibus undulatis; stipulae concavae, 1 - 2 mm longae, subamplexicaulae, apicibus 1 vel 2, brevibus, acutis; stipulae foliorum apicalium apice integrae, basales bifidae. Flores pauci, terminales, in alabastro tantum cogniti, pedicello ignoto, spathella juvenili clavata, acuta, matura ignota; tepala 3, filiformia, circa 1 mm longa, andropodio circa 0.5 mm longo, membranaceo, filamentis 0.5 mm longis, apice dilatatis, antheris thecibus inaequalibus, apice obtusis vel emarginatis, thecis basi obtusis; granulis pollinis 2-loculatis, incomplete cognitis; ovarium ellipsoideum, 8-costatum, sed e numero costarum 2 valde approximatis; styli filiformes (?), basi coherentes. Fructus ignotus.

Typus: *Ule 804*, in Brasilia collectum, in herb. P.

*Haec species P. ceratophyllo et P. aguirensi foliis et stipulis similis, sed differt ab iis segmentis ultimis spatulatis et longioribus. Etiam P. schenckii et P. osteniano similis sed differt ab specie priori segmentis ultimis abrupte elatis et ab specie posteriori segmentis ultimis latioribus insuper nervi munitis.*

**Var. angustifolium** — Cf p. 237.

Differt a var. undulato magnitudine, segmentis ultimis angustioribus, spatulatis, stipulis longioribus, 1 - 3 mm longis. Caulis 3 - 12 cm altus, folia 5 - 8 cm.

Typus: *Jörgensen 4989*, in Paraguay collectum, in herb. C.

**Podostemum dentatum** van Royen — Cf p. 241 et tab. 3 f. 15 - 19.

Individua parva leviter ramosa vel simplicia, subopposita vel opposita secundum radices tenues. Caulis 2 - 10 mm longus. Folia 0.5 - 2.5 cm longa, integra (vel bifida?), basi 0.5 - 2 mm longa, oblique inserta, abrupte in laminam linearem uninerviā attenuata; stipula triangularis vel ovoidea, acuta, cum basi angusta, lineari ad folii basem mediam inserta; apice in foliis superioribus dente brevi triangulari, 0.5 mm longo munita. Cicatrices basi spatulatae. Flores pauci, terminales et axillares, pedicello 1 - 3 mm longo; spathella juvenilis clavata, umbonata, coriacea, maturitate campanuliformis; tepala nota 2, linearia, acuta, tertium ignotum; andropodium membranaceum, filamentis lanceolatis, 0.5 mm longis; antherae sagittiformes, basi et apice profunde emarginatae, thecis inaequalibus apicibus acutis et basibus subacutis ad acutis; granulis pollinis 2-loculatis, incomplete cognitis; ovarium ellipsoideum ad ovoideum, costis 8, indistinctis, latis, compressis; styli filiformes, 0.5 - 0.8 mm. longi. Fructus bivalvus, valva altera costis 5 erectis vel subcurvatis munita, altera caduca, costis 5 leviter S-formibus munita.

Typus: *Ule 1876*, in Brasilia collectum, in herb. P.

*Haec species P. galvoni similis denti in petioli parte superiori, sed differt petiolo abrupte contracto apud speciem posteriorem, stipulis longioribus et statura minori.*

**Castelnavia cuneifolia** van Royen — Cf p. 249 et tab. 4 f. 29 - 37.

Individua parva, acaula, basi irregulariter thalloidea, ramosa vel simplicia. Folia marginalia, cuneata ad lanceolata, pinnatilobata ad pinnatipartita, papyracea, distincte nervosa, palmatinervia; lobi lanceolati ad triangulares apice in laciniis subfiliformes ramosas divisi, segmentis ultimis lanceolatis, circa 1 mm longis, obtusis. Flores numerosi, in basi thalloidea e cavitatibus erumpentes, pedicello brevissimo circa 1 mm longo, spathella clavata ad campanulata, obtusa ad umbonata; tepala 2, lanceolata, acuta; stamina 2, 3 - 6 mm longa, filamentis lanceolatis, basi in pedicellum decurrentibus et cum carpelli maioris parte basali conjunctis, usque ad 5 mm longis; antherae ovoideae usque cordatae, obtusae, basi emarginatae, thecarum basi obtuso; granulis pollinis ellipsoideis, 3-colpatis; ovarii carpellum

minus 5-costatum, costa marginali indistincta, usque 2 mm longum; styli subulati, 1.5 - 2 mm longi, liberi, inaequales. Fructus valvae ambae 5-costatae.

Typus: *Burckell 9122, in Brasilia collectum, in herb. W.*

*Haec species C. pricipi similis foliis, sed differt antheris brevioribus et nervis 8, non 10, in ovario. Flos eo C. lindmanianae et C. serpentis similis papillis parvis carentibus ad apicem valvae minoris. Folia C. cuneifoliae pinnatilobata usque pinnatipartita ex contrario folia specierum duarum iteratim pinnata.*

**Apinagia aripecuruensis** van Royen, nov. sp. — Cf p. 257 et tab. 5, f. 21 - 24.

Herba parva ramosa, 3-7 cm alta; internodia teretia ad compressa, 0.5-1 cm longa, 2-5 mm lata. Folia 2-5 cm longa, basi 1-5 mm lata, iteratim furcata vel flabelliformia, segmentis iteratim furcata, palmatinervia, costis prominulis membranaceae; segmenta ultima anguste linearia, acute, nervia, 1.5-3 mm longa. Flores solitarii; pedicellus 1.5-5.5 cm longus, alis duobus munitus; tepala 7-9, linearia, acuta, circiter 0.5 mm longa; stamina 7-9, in verticillam completam posita, 3-4.5 mm longa; antherae sagittatae, 1-1.5 mm longae, apice mucronatae, truncatae vel emarginatae, basi emarginatae; thecarum basis mucronata, truncata vel emarginata; pollinia ellipsoidea, 3-colpata, 8  $\mu$  alta, 6  $\mu$  diam; ovarium ellipsoideum, 2-3.5 mm altum, circiter 1 mm diam, apice subobtusum, gynophoro tereti, 0.5-1 mm longo sustentum et costis prominentibus 6 vel 8 munitum; costae in suturis tenues et valde se approximatae vel desunt, styli 1-2 mm longi, subulati vel interdum applanati, lineati, obtusi, papillati. Fructus ovario similis, utraque valva costis 3 vel 5 munita.

Typus: *Ducke 15025, in Brasilia collectum, in herb. CGE.*

*Haec species Apinagia digitata foliis similis, sed differt foliis fasciculis filamentorum destitutis. Differt ab Apinagia exilis costis longis 6 vel 8: in Apinagia exilis ad 6 costae breves sunt. Differt ab Apinagiae speciebus ceteris gynophoro conspicuo. Hic character usque adhuc in generi Jenmaniella et in Apinagia divertens solum cognitus, ergo obscurans delimitationes inter Jenmaniellam et Apinagiam.*

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