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First Record of the Tropical Asian-Pacific Genus Powellia (Racopilaceae, Bryopsida) for the East African Islands: P. pócsii Zanten spec. nov. and P. elliptica (Ren.) Zanten comb. nov.

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Abstract. *Powellia pócsii* Zanten is described from Madagascar and *Racopilum ellipticum* Ren., also from Madagascar, is transferred to the genus *Powellia* as *P. elliptica* (Ren.) Zanten. A discussion on their origin is presented.

Introduction

The family of the *Racopilaceae* is characterized by its dorsi-ventrally flattened, dimorphous leaves and its abundant rhizoid growth from the abaxial side of leaf insertion on ventral side of the stems. The dorsal leaves are usually smaller than the lateral leaves and differently shaped.

There are two genera, *viz.*: *Racopilum* P. Beauv. and *Powellia* Mitt. The genus *Racopilum* is widely distributed in the tropics and temperate regions of the Southern Hemisphere and comprises ca. 35 species, which number will almost certainly be reduced when studied monographically, especial the African taxa. The genus *Powellia* was up till the present paper restricted to the southern Pacific, North Queensland and the Malesian region and comprises 6 species (including the two Madagascan species).

The most important differences between the two genera are in the sporophyte. *Powellia* has an erect, not furrowed capsule when dry and a papillose exostome that may be striate at base only and the endostome lacks cilia. The leaves are unbordered or bordered by elongate cells. The leaf rib is excurrent or ending in or below apex. *Racopilum* has usually an inclined, furrowed capsule, striate exostome and a normally well-developed endostome. The leaf rib is nearly always excurrent. The species of *Powellia* are usually smaller than those of *Racopilum* and the lateral leaves are undulate, at least at their base, which is not the case in *Racopilum*. For further differences see Zanten (1970).

Acknowledgements: I thank the curator of herb. P for the loan of the type of *Racopilum ellipticum* and the curator of herb. MO for the loan of

several unidentified species of *Racopilum* from the Malagasy Region which turned out to belong to *Powellia*.

Powellia pócsii Zanten spec. nov. Fig.1 A,B

Latin description. Planta gracilis, caespites eius densi, laete virides, caulibus repentibus, irregulariter pinnatim ramosis, ventraliter dense tomentosis, foliis lateralibus late ovato-ellipticis, obtusis, leviter undulatis, marginibus integris, in aristam brevissimam, 40 μm longam productis, cellulis laminalibus hexagonis, 10–14 μm longis et 6–10 μm latis, parietibus orassiusculis, (sub)lavibus. Folia stipulaeformia late ovata, apice acuminata, basi cordata, integerrima, costa in aristam brevem (60–80 μm longam) producta.

Seta 9–10 mm longa. Theca erecta, elongata-elliptica sine operculo 1.5 mm longa, sicca non plicata. Peristomium duplex: dentes exostomii cca. 420 μm longi, lineari-lanceolsalis endostomii membranacea cca. 100–120 μm alta, processis 120 μm longis, sine ciliis. Operculum leviter oblique rostratum, rostro 0.5 mm longo. Sporae minute papillosae. Calyptra non vidi.

Slender plants in dense, green mats; stems creeping, irregularly pinnately branched, ventrally densely tomentose. Lateral leaves ovate-elliptic, 0.8–1.0 mm long, somewhat undulate when dry, rib excurrent in a short point of ca. 40 μm length, margins entire, lamina cells hexagonal, 10–14 μm long and 6–10 μm wide, firm-walled, smooth or nearly so. Dorsal leaves (without arista) smaller, 0.4–0.5 mm long, broadly ovate, acuminate with cordate base, entire, rib excurrent in a mucro of 60–80 μm length.

Perichaetial leaves ovate, gradually acuminate, hardly narrowed at base, entire, rib excurrent in a short mucro, areolation lax. Seta 9–10 mm long, brownish, turned clock-wise in upper part and anti-clockwise further down. Capsule erect, elongate elliptic, ca. 1.5 mm long, without furrows when dry, exothecium cells irregularly quadrate-hexagonal, ca. 50 μm long and 20–30 μm wide, walls slightly incrassate. Annulus consisting of one row of separating cells. Lid with a slightly oblique or nearly straight, ca. 0.5 mm long rostrum. Peristome double, exostome teeth pale, ca. 420 μm long and 30 μm wide at base, with indistinct median line, papillose, at base striate-papillose, endostome on a ca 100–120 μm high papillose basal membrane, processes ca. 120 μm long, papillose, perforated, irregular, cilia absent. Spores 14–16 μm, minutely papillose.

Madagascar, route de Farafangana, Vangarindrano, foret de basse altitude, sur tronc, J. Bosser 17.769, 12-1963, holotype: MO, iso: GRO; Madagascar, Toliara, 25 m, epiphytic, G. McPherson et al.14150F, 17-10-1989: MO; ibid. 14150D, on stump: MO; ibid. 14228A, 20 m, on trunk: GRO, MO; Mauritius, Robillard 2580, 1881: GRO, MO.

This species is vegetatively very near to *Racopilum ellipticum* Ren., a Madagascan species, described by Renauld (1898) which is transferred to the genus *Powellia* in this paper. Both species share the small size, the broadly ovate, cordate dorsal leaves, and the somewhat undulate lateral leaves. The excurrent part of the nerve of the lateral and dorsal leaves, however, is much shorter in *P. pócsii* (40 μm in lateral and 60–80 μm in dorsal leaves) than in *P. elliptica* (200 μm in lateral and 160–280 μm in dorsal leaves). The areolation tends to be slightly more irregular in *P. pócsii* and the lamina cells are somewhat smaller (10–14 μm in its longest diam.) than in *P. elliptica* (13–15 μm). The sporophytes of the two species could not be compared because that of *P. elliptica* is unknown.

The specimen from Mauritius deviates by the presence of flagelliferous branches with small, caducous leaves. This may be an independent taxon, but for the time being I prefer to treat this specimen as belonging to *P. pócsii*. Similar flagelliferous branches do occur also in *Powellia parvula* from New Guinea. In the genus *Racopilum* flagelliferous branches are quite common in *R. tomentosum* and *R. intermedium*, both American species and, but more rarely, also in *R. cuspidigerum* from tropical Asia, Pacific region and Australia.

The species is dedicated to Tamás Pócs because of his many important contributions to the bryophyte flora of East Africa and the East African Islands.

Phytogeographical discussion

The occurrence of two members of the genus *Powellia* (*P. pócsii* and *P. elliptica*) in the East African Islands is a remarkable range extension of this genus that was, up to the present paper, restricted to the southern Pacific, northern Queensland and the Malesian region, westwards up to Sumatra and the Malay Peninsula. I consider New Guinea as being the evolution centre of the genus because all 4 Asian-Pacific species (of which two are endemic) do occur there. The range extension of this genus to the East African Islands is by no means an isolated phenomenon. Pócs (1976 and 1992) enumerates 14 Malesian-Pacific species (mosses as well as liverworts) that penetrate into Madagascar, but not further into continental Africa. Of the 114 epiphyllous bryophytes known from Madagascar 6 are tropical Asian in distribution and do not penetrate further into continental Africa (Pócs 1997). Pócs et al. (2002) report 5 bryophyte species (out of 167) from the Réserve Spéciale de Manongarivo, Madagascar with a tropical Asian distribution reaching Africa only in the Malagasy Region. O'Shea (2003) mentions

another Malesian moss (*Clastobryophylum bogoricum*) penetrating, via Sri Lanka, into Madagascar and Seychelles.

As to the origin of the two African *Powellia* species there are in my view two options:

1. The genus *Powellia* is of Gondwanian origin and its ancient stock (probably a *Racopilum cuspidigerum*-like species) could, after the break-up of the continent, evolve in tropical Africa into *P. pócsii* and *P. elliptica* and in tropical Asia-Oceania into the 4 other species of the genus. In this case we have to assume that the genus is biphyletic and did not survive in America, continental Africa and Australia and New Zealand. The occurrence of *P. integrum* and *P. involutifolia* in northern Queensland may be the result of later introductions.

2. The genus evolved in the eastern part of the Malesian region (probably New Guinea) and one of the species reached in ancient times, via long-range wind dispersal, the East African Islands and evolved there into *P. pócsii* and *P. elliptica.* During the Jurassic or early Cretaceous there existed probably a subcontinent close to the North and East of Madagascar (see Pócs 1997) of which the Comores, Mascarenes and Seychelles are the remnants. In this view it is interesting to note that in Mauritius (Mascarenes) an aberrant flagelliferous form of *P. pócsii* occurs which may be the result of an independent evolution after the submerging of most of the subcontinent.

The characteristics in which *Powellia* deviate from *Racopilum* are probably derived. During the supposed evolution the sporophytes became upright and smooth going along with a reduction of the peristome. This phenomenon is also known in other genera, e.g. in the *Racopilum cuspidigerum*-complex (Koponen & Norris 1986). In the gametophyte the excurrent part of the nerve became shorter during evolution.

Personally I favour the second option.

Powellia elliptica (Ren.) Zanten comb. nov. Fig.1 C

Basionym: *Racopilum ellipticum* Ren. — Prodr. Fl. Bryol. Madag.: 268 (1898).

Type: Madagascar, entre Fianarantsoa et Mananjary, Besson 1880; holo: P-Card.

Although the sporophyte of this species is unknown I came to the conclusion that it most likely belongs to the genus *Powellia* because of its small size, somewhat undulate leaves and, most important, its resemblance to *P. pócsii* Zanten, the new species which certainly is a *Powellia* because of its erect, smooth capsule, papillose exostome and reduced endostome.

Distribution: Endemic to Madagascar, only known from the type collection.

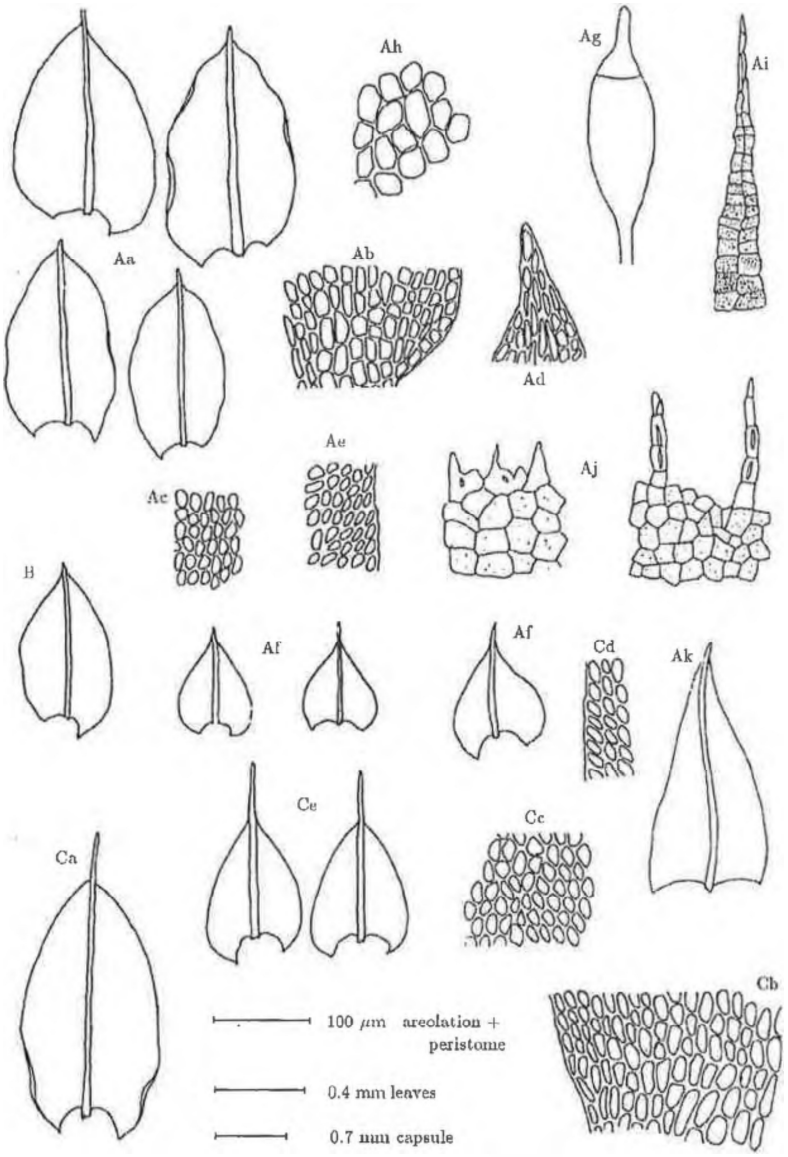

Fig.1 *Powellia pócsii* Zanten spec. nov.

(A) *Powellia pócsii* (from type), (Aa) lateral leaves, (Ab) basal leaf cells, (Ac) areolation in midleaf, (Ad) leaf apex, (Ae) leaf margin near apex, (Af) dorsal leaves, (Ag) capsule, (Ah) exothecial cells, (Ai) exostome tooth, (Aj) endostome, (Ak) perichaetial leaf. **(B)** *Powellia pócsii* (from Robillard 2580), leaf of flagelliferous branch. **(C)** *Powellia elliptica* (from type), (Ca) lateral leaf, (Cb) basal leaf cells, (Cc) areolation in midleaf, (Cd) leaf margin near apex, (Ce) dorsal leaves.

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