BLUMEA 36 (1991) 165–178

PAPUACALIA (COMPOSITAE) A NEW GENUS FOR THE WOODY SENECIOS OF NEW GUINEA

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SUMMARY

The woody *Senecio* species occurring in New Guinea belong to a distinct genus, *Papuacalia*. Ten new combinations are made and three new species and one subspecies are described. *Brachionostylum* Mattf. and *Bedfordia* DC. are distinct.

INTRODUCTION

In the mountains of New Guinea about a dozen of species of woody Compositae–Senecioneae occur. One has been placed in the monotypic genus *Brachionostylum* Mattf. (1932), the others traditionally in *Senecio* L. However, whenever comments were made on the exact generic position of the latter species doubt was expressed, or the place in *Senecio* rejected without giving an alternative. They were not mentioned by Jeffrey et al. (1977) nor by Nordenstam (1978) in their discussions on generic and sectional delimitation in *Senecio* and allies.

Brachionostylum pullei Mattf., only known from its type (B, holo, probably lost, BO, K, L, not found in U; Mr. E. Simonis, in litt.), was distinguished from *Senecio* by Mattfeld because of its monopodial mode of branching, where under the apparently terminal, but actually axillary inflorescence the terminal bud continues the branch, by its apparently dioecious capitules (only females known) with ligular yellow ray-florets, and by the absence of any hairs on the apically rounded, not truncate style branches.

The scanty specimens of *Brachionostylum pullei* confirm Mattfeld's observations. The inflorescences are axillary, the capitules have well-developed yellow ray-florets, which are absent to only little developed in the other species, and never yellow. The stamens are staminodial, not exserted, and have thin-walled, equal cells in the filament collar ('cacalioid', e.g. cylindrical, straight with cells of equal size, see Nordenstam, 1978: 8). The style branches lack hairs and papils, and the apex is more truncate than rounded.

In the other woody *Senecios* of New Guinea and the three species of *Bedfordia* DC. in Tasmania and Australia (Gray, 1974) the mode of branching is similar to that of *Brachionostylum*. The capitules are heterogamous in most species, but homogamous and bisexual in *S. glossophyllus* Mattf., in *S. versteegii* Mattf., in a species to be described below, and in *Bedfordia* spp. The marginal florets are said by Mattfeld (1940) to be similar to the disk florets, but smaller and female. The filament collar is

cacalioid. The style branches are variously papillose, the papils may be in a subapical collar but may also cover the abaxial side to the sinus.

In the other (heterogamous) species the marginal florets have no well-developed blade. Instead, they have an oblique, or an unequally 2–5-fid or -lobed limb, or a minute blade at most 2.5 mm long (*S. carstenszensis* Royen, *S. kandambren* Royen and *S. ottoensis* Royen).

The apparent dioeciousness and the presence of well-developed yellow ray-florets in *Brachionostylum pullei* sets the species apart and the recognition of a distinct genus for it seems appropriate.

Mattfeld (1932) mentioned some species as possibly related to *Brachionostylum*. Nordenstam placed *Senecio insularis* Benth. in the monotypic genus *Lordhowea* B. Nordenstam and *S. huntii* F. Muell. in *Brachyglottis* Forster. These have heterogamous capitules and basally dilated filament collars ('baluster-form' or 'senecioid'), and so do not seem so closely related.

Arrhenechthites Mattf. seems related. The species are also (sub)woody, but the branching seems sympodial. Shoots under the inflorescence when present and developed seem to end in an inflorescence as well. The capitules are heterogamous with female tubular marginal florets with an oblique to slightly dentate throat, disk florets only 1–3(–6), functionally male (Koster, 1970). The pappus-hairs are apically tapered, not clubbed. The filament collar is cacalioid, but the endothecial cells have thickened longitudinal walls ('radial'), while in the woody New Guinea *Senecios* and *Bedfordia* the transverse walls are thickened ('polarized'). Finally, the chromosome number is 2n = c. 100 (Borgmann, 1964).

The 'group' was studied by Dr. P. van Royen in 1970 during the preparation of his Alpine Flora of New Guinea (1980–1983), where a number of new species were described. The solution of their generic position was beyond the scope of his work, so he provisionally included them in *Senecio*, although on some sheets he identified them as *Bedfordia*, as was also previously suggested by Mattfeld (1940), in casual reports by other authors [e.g. by Wade & McVean (1969)], and on identification slips. Dr. R.O. Belcher studied them again in 1977 and 1981. The sheets in L are provided with copies of the latter's notes, in which he excluded them from *Senecio*, once remarking 'why not a *Bedfordia*?' (on *NGF 40264*), which notion was taken over by Dr. C.G.G.J. van Steenis, who identified some species as such.

Drury (1973: 544) in his study on the classification of Australasian shrubby Senecioneae used 30 characters based on indument and node and leaf anatomy, and found a strong correlation between some of these and groups of taxa. He mentioned (l.c.: 544) to have seen two New Guinea species of *Senecio* which turned out to represent an undescribed species mistakenly identified as *S. gandin* and *S. kandambren* (q.v.), and concluded that these could not belong to *Bedfordia*, because of:

a) the presence of a hypodermis in the leaf blades;
b) the presence of vascular bundles with a lignified bundle sheath;
c) the presence of glandular hairs in *S. kandambren*, but of a different type (A) than in *Bedfordia* (D);

d) young leaves infolded and overlapping, not revolute as in *Bedfordia*;
e) capitules with an outer whorl of female florets with short tubular or abbreviated ligulate corollas.

To these arguments may be added the chromosome counts for two other species made by Borgmann (1964), *S. dindondl* Royen and *S. mogrere* Royen, which have 2n = 72 against the 2n = 60 reported for *Bedfordia*. A basic number of 9 (or 18, 36) is very exceptional in the Senecioneae, only reported for some clearly unrelated genera (Nordenstam, 1977), and rarely in *Senecio* proper (see also Jeffrey et al., 1977). It may be noted in passing that the number 2n = 64 given by Borgmann for *S. brassii* Belcher is again a unique number for the Senecioneae and for *Senecio* L. s.s. (Jeffrey, oral comm.). He gave 2n = 84 for the enigmatic *S. gnoma* Royen, said to be lactiferous. Borgmann remarked that this species presumably belonged to *Lactuca* L., or might be closely related to it. Because of the homogamous capitules with tubular florets this cannot be correct. It probably is not a *Senecio*, either, as suggested by Van Royen with some doubt, because of the cacalioid filament collar, but the endothecial cells appear to be radial.

Finally, flower colour seems to be of generic diagnostic value here (Nordenstam, 1978). In *Bedfordia* the florets are bright yellow, while in the 'group' they are usually white, sometimes pale pink or yellowish or creamy white, once dirty purple (senescent?), but never yellow. In *Arrhenechthites* they are said to be cream coloured, dirty yellow, or pale green, with the lobes sometimes purple with pale stripes.

However, not all differences given by Drury hold when more material is studied. The pubescence in the 'group' is very variable. The arachnoid cover on the lower surface of the blades and in the inflorescences is usually more or less well-developed, consisting of uni- or multicelled entwined hairs. Such hairs are found in *Bedfordia* as well. Next to these there are other appendages, either made up of uniseriate cells ('glandular hairs'), which may have a globose tip, or with multiseriate ones ('papils' or 'vesicular hairs', as in *'yuleensis'*, a new species described below).

The lower surface of the blades is of special interest, as under the indument (when present) there may be various curious structures. The surface is smooth in *S. mogrere* and *S. ottoensis* and nearly so on the smaller blades of *'valentini'*, described below. The surface may be strongly latticed by the thickened veinlets in the two subspecies of *'aurea'* (idem), while the stronger veins have flat, horizontal appendages in *S. dindondl*. In *S. carstenszensis* the surface is strongly vesicular papillose. *Senecio gandin* is irregularly, minutely tessellate, while in *S. glossophyllus, S. kandambren, S. kukul, S. saruwagedensis, S. versteegii, 'valentini'* (larger leaves), and *'yuleensis'* it is variously densely papillose.

In *Brachionostylum, Bedfordia arborescens* Hochr., and *B. salicina* DC. the surface is smooth, and presumably so in *B. linearis* DC., where the leaves are so narrow that it is difficult to see.

Small glandular cells are present in many species, e.g. in *S. carstenszensis* (ranging to very long ones!), *S. dindondl, S. gandin, S. glossophyllus*, etc.

In view of the variability in indument type it is difficult to use it in a distinction between the 'group' and *Bedfordia,* as was also remarked by Van Steenis after Dr. P. Baas (L) had studied the hair types [see their notes on *NGF (Coode et al.) 40284*].

As far as the aestivation is concerned Drury's observation seems incorrect: the young leaves are revolute, as in *Bedfordia.*

The homogamous capitules in *Bedfordia* offer no distinctive feature, as these are also present in three species of the 'group'.

Bedfordia is indeed very close, and at first I thought it best to include the species of the 'group' in it. Discussions with Mr. Jeffrey (K), a leading authority of the subtribe, however, have persuaded me to the contrary.

Nevertheless, when the species of *Bedfordia* and the 'group' are compared, the overall impression is that two distinct complexes are involved, and that the 'group' should be regarded as a genus by itself. As the affinities seem to be cacalioid, not senecioid, *Papuacalia* seems better than *Papuasenecio,* an unpublished name used by Van Royen on some labels ('-acalia' being a suffix in this alliance to indicate position within the cacalioid group of the Senecioneae).

PAPUACALIA Veldk., *gen. nov.*

Frutices arboresve monopodialiter ramosi pubescentia variabili saepe glandulosa, foliis simplicibus marginibus subintegris ad crenatis, inflorescentiis axillaribus paniculiformis, capitulis plerumque heterogamis tum flosculis marginalibus tubuliformibus ligulis nullis vel brevissimus ad 2,5 mm longis flosculis centralibus bisexualibus vel functionaliter masculis plerumque albis interdum dilute roseis luteolisve cremee albis semel sordide purpureis (senescentiter?), collo filamenti tubulari ('cacalioideo'), cellulis endothecii parietibus horizontalibus solum noduliferis, ramis styli variabiliter papillosis papillis in collo subapicali sed etiam pariem abaxialem ad sinum tegere possunt. — Typus: *Papuacalia dindondl* (Royen) Veldk.

Shrubs or trees, branching monopodially, variously pubescent, often glandular. Leaves simple, margins subentire to crenate. Inflorescences axillary, panicular. Capitules usually heterogamous, ray-florets female, ligule not or little developed, disk florets bisexual or functionally male, usually white, sometimes pale pink or yellowish or creamy white, once dirty purple (senescent?). Filament collar tubular ('cacalioid'). Endothecial cells polarized. Style branches variously papillose, the papils in a subapical collar but may also cover the abaxial side to the sinus.

Distribution – 14 taxa in the mountains of New Guinea.

Habitat – Edges of montane to subalpine forest and scrub with clearings and subalpine grasslands, 2590–4000 m.

KEY TO THE TAXA

1a. Capitules homogamous 2
b. Capitules heterogamous 4

2a. Petioles present. Blades 2.5–3.5 cm wide, base cuneate, underneath floccose 3
b. Petioles absent. Blades 5–6.5 cm wide, base auricled, underneath pusticulate with small, glandular hairs . . . . . **5. P. glossophylla**

3a. Blades linear-lanceolate, 15.5–19 by 3 cm, margin finely dentate. Panicle many-flowered ..... **11. P. valentini**
b. Blades oblong, 6.5–8 by 2.5–3.5 cm, margin coarsely dentate. Panicle few-flowered ..... **12. P. versteegii**

4a. Blades underneath densely floccose 5
b. Blades underneath setose to woolly 6

5a. Petioles 0.8–1.5 cm long. Blades 2.5–3 cm wide, margins inconspicuously dentate. Panicles 5–10 cm long. Phyllaries 8–10 mm long . **3. P. dindondi**
b. Petioles 2–3.5 cm long. Blades 3–5 cm wide, margins crenate, teeth incurved. Panicles 11–13 cm long. Phyllaries 7–8 mm long ..... **7. P. kukul**

6a. Leaves more than 5 by 0.7 cm. Marginal florets 1.25–8 mm long..... 7
b. Leaves up to 5 by 0.7 cm. Marginal florets c. 1 mm long. — Blades underneath isabel-woolly mixed with glandular hairs. Otto, Wilhelm ... **8. P. mogrere**

7a. Leaves elliptic to linear lanceolate, up to 8 times as long as wide 8
b. Leaves linear, more than 10 times as long as wide. — Blades with 70 or more pairs of nerves, underneath thin isabel-woolly, intervenium more or less visible. Kerigomna ..... **4. P. gandin**

8a. Leaves above glandular-setose or papillose-scabrous..... 9
b. Leaves above soon glabrous, smooth 10

9a. Blades sparsely to subdensely glandular-setose on both sides, base auricled. Panicle few-flowered, 8–10 by c. 4 cm. Phyllaries 11–13 mm long. Disk florets 5.8–6.5 mm long. Carstensz ..... **2. P. carstenszensis**
b. Blades above papillose scabrous, underneath white arachnoid barely covering the intervenium, base cuneate. Panicle many-flowered, c. 20 by 19 cm. Phyllaries 5–5.5 mm long. Disk florets c. 4.5 mm long. Yule **13. P. yuleensis**

10a. Blades underneath white-woolly 11
b. Blades underneath dirty brown to golden-woolly 12

11a. Blades 18–21 by 4–6 cm, base auricled, underneath woolly all over. Phyllaries 7–9 mm long. Marginal florets 7–8 mm long, disk florets 7–9 mm long **6. P. kandambren**
b. Blades 5.5–12 by 0.7–3.5 cm, base cuneate, underneath thinly but densely woolly between the nerves. Phyllaries 5.5–6.5 mm long. Marginal florets 4–4.5 mm long, disk florets 5–6 mm long ..... **9. P. ottoensis**

12a. Blades lanceolate to linear-lanceolate, more than 5 times as long as wide, 7.5–11 by 1.2–2 cm, underneath yellowish brown to golden-woolly 13
b. Blades elliptic, up to 2.5 times as long as wide, 6–8 by 2.5–4 cm, underneath dirty brown-woolly. — Saruwaged ..... **10. P. saruwagedensis**

13a. Blades with more than 50 pairs of nerves. Peduncle and axes glandular-hairy, not woolly. Achenes glandular-hairy, the marginal ones sometimes glabrous. Michael, Wilhelm ..... **1a. P. aurea** subsp. **aurea**
b. Blades with less than 50 pairs of nerves. Peduncle and axes eglandular, white-woolly. Achenes glabrous. Giluwe .... **1b. P. aurea** subsp. **giluweensis**

1. Papuacalia aurea Veldk., *spec. nov.*

Senecio gandin auct., non Royen: Royen Alp. Fl. N. G. 4 (1983) 3426, excl. type.
Asteraceae sp.: Wade & McVean, Mt Wilhelm Studies 1. The alpine and subalpine vegetation (1969) 109. — Voucher: *ANU 7566* (CANB, LAE).
Senecio sp. 3: Johns & Stevens, Bot. Bull., Lae 6 (1971) 20.

a. subsp. aurea

Ramuli dense auree lanati eglandulosis. Folii lamina lineariter lanceolata 7,5–11 cm longa 1,2–2 cm lata, basi attenuata acuta, margine subintegro glandibus inconspicuis, apice acuto, infra dense auree lanata, supra glabra plus quam 50 nervis conspicuis. Pedunculus axesque dense patentiter glandulosi. Capitula heterogama. Phyllaria oblineariter lanceolata 8–9 mm longa 1–1,25 mm lata breviter glandulose pubescentia. — Typus: *van Balgooy 447* (L, holo; CANB, LAE, etc.), Papua New Guinea, Chimbu Dist., Mt Wilhelm, 3650 m alt., 24 May 1965.

Shrub or treelet, 2–3.5 m high, branchlets yellowish brown to golden-woolly (i.s.), glabrescent, no conspicuous glands seen. Petioles 0.25–0.9 cm long. Blades linear-lanceolate, (i = 5–7.3), 7.5–11 by 1.2–2 cm, base narrowly cuneate, acute, margins subentire, teeth as small inconspicuous glands, apex gradually acute with a black gland, lateral nerves conspicuous, immersed above, in more than 50 pairs, above glabrous to punctate, smooth, underneath yellowish brown to golden-woolly also over the nerves, nervature strongly latticed by the thickened veinlets. Panicle few-flowered, 7.5–12 by 2.5–6.5 cm, peduncle and axes densely patently brown glandular, glands multicellular with a small globose topcell, branches erecto-patent. Heads heterogamous. Phyllaries oblong to linear-lanceolate, 5.5–9.5 by 1–2.25 mm, the outer ones narrowest, glandular-puberulous, apex acute, pilose. Marginal florets 1.25–3.75 mm long, limb truncate to bifid, 0.25–0.5 mm long; disk florets 5–7 mm long, white to yellowish white. Achenes glandular-hairy, the marginal ones sometimes glabrous (see note).

Distribution – Papua New Guinea: E Highlands (Michael), Chimbu Prov. (Mt Wilhelm).

Habitat – Subalpine grasslands, in forest edge, 3316–3800 m.

Notes – Van Royen (1983) included this in *S. gandin,* from which it differs considerably in its yellowish brown to golden indument, wider, glandular-dentate, and less-nerved leaves, smaller and shorter panicle, etc.

In *ANU 15493 (Smith)* (L) the achenes of the marginal florets are glabrous.

b. subsp. giluweensis Veldk., *subsp. nov.*

Senecio sp.: Drury, New Zeal. J. Bot. 11 (1973) 544 [*CHR 203553 = NGF (Wardle & Katik) 40284*].

A typo in foliis nervis paucioribus (plus quam 30 sed minus quam 50), pedunculo axibusque dense lanatis quam innovationibus sine glandibus multicellularibus, phyllariis microscopice glandulosis, acheniis glabris differt. — Typus: *NGF 40264 (Coode et al.)* (L, holo; K, LAE, CHR), Papua New Guinea, S Highlands Prov., Mt Giluwe, 3660 m alt., 19 June 1969.

Blades with more than 30 but less than 50 pairs of nerves. Peduncle and axes densely woolly as are the branchlets, eglandular. Phyllaries microscopically glandular. Achenes glabrous.

Distribution – Papua New Guinea: S Highlands (Mt Giluwe).

Habitat – Subalpine forest margins, 3350–3660 m.

Note – Drury (1973) briefly mentioned the pubescence and leaf anatomy of *NGF 46284 (Coode et al.)*.

2. Papuacalia carstenszensis (Royen) Veldk., *comb. nov.*

Senecio carstenszensis Royen, Alp. Fl. N. G. 4 (1983) 3412, t. 997. — Type: *ANU (Hope) 16016* (CANB, holo; L).

Shrub to 5 m high. Branchlets subdensely papillose (with spreading hairs). Petioles 0.2–1 cm long. Leaves oblong to lanceolate (i = 3.2–5), 8–26 by 2.5–7.6 cm, base auricled, margins crenate with glandular teeth, apex acute with a black gland, lateral nerves conspicuous, immersed above, 24–43 pairs, sparsely to subdensely pale yellowly glandular-setose on both sides, below strongly vesicular papillose. Panicles few-flowered, 8–10 by c. 4 cm diam. Peduncle and axes reddish brown, subdensely, patently glandular-pubescent, glands multicellular with a small globose topcell. Capitules heterogamous. Phyllaries oblong, 11–13 by 2.5–3.5 mm, acute, sparsely glandular-puberulous. Marginal florets 3.5–4 mm long, limb shortly ligulate, ligule 2–2.5 mm long. Disk florets 5.8–6.5 mm long, colour not noted. Achenes glabrous.

Distribution – Papua New Guinea, Irian Jaya (Carstensz).

Habitat – Edge of subalpine shrubberies, 3830 m alt.

3. Papuacalia dindondl (Royen) Veldk., *comb. nov.*

Senecio dindondl Royen, Alp. Fl. N. G. 4 (1983) 3420, t. 1000, pl. 227. — Type: *Hoogland & Pullen 5706* (BM, holo; CANB, K, L, LAE).

Bedfordia sp.: Wade & McVean, Mt Wilhelm Studies 1. The alpine and subalpine vegetation (1969) 67. — Vouchers: *ANU 5097* (A, CANB, L, LAE), *7138* (A, B, BISH, BO, BRI, CANB, G, K, L, LAE, NY, P, PNH, SING, US).

Senecio spec. nov.?: Borgmann, Zeitsch. Bot. 52 (1964) 145, 154. — Voucher: *Borgmann 67* (K, L, LAE).

Senecio sp. 2: Johns & Stevens, Bot. Bull., Lae 6 (1971) 20.

Shrubs, 2–5 m high. Branchlets isabel to brownish floccose. Petioles 0.8–1.5 cm long. Blades lanceolate (i = 4.6–4.8), 12–14 by 2.5–3 cm, base cuneate, acute, margins subentire, teeth as small inconspicuous glands, apex acute, with a black gland, lateral nerves conspicuous, immersed above, 30–45 pairs, above glabrous, underneath white to brownish floccose (covering the nerves and midrib), larger nerves with flat protuberances. Panicle few-flowered, 5–10 by 5–11 cm. Peduncle and axes isabel floccose, glands absent. Capitules heterogamous. Phyllaries linear-lanceolate, 8–10 by 1–1.5 mm, acute to rounded, glandular-puberulous. Marginal florets 4.8–6 mm long, limb oblique, 4–5 mm long. Disk florets 6–9 mm long, white. Achenes glabrous.

Distribution – Papua New Guinea: Chimbu (Wilhelm).

Habitat – Edges of forest and shrubberies along alpine grasslands, 3450–3575 m altitude.

Chromosome number – 2n = 72 (Borgmann, 1964).

Note – This species seems to be endemic to Mt Wilhelm: *van Royen 11610* from the Naitmambi Range, Finisterre Mts, Morobe Prov., is *P. glossophyllus*.

4. Papuacalia gandin (Royen) Veldk., *comb. nov.*

Senecio gandin Royen, Alp. Fl. N. G. 4 (1983) 3426, t. 1002, quoad typum solum! — Type: *Hoogland & Pullen 5568* (BM, holo; CANB, K, L, LAE).

Treelet, 3.5–8 m high, branchlets rather thinly isabel-woolly, mixed with small, multicellular, subcapitate glands, glabrescent. Petioles 1.1–1.2 cm long. Blades linear, (i = 11–13.3), 15.5–16 by 1.2–1.4 cm, base cuneate, rounded, margins finely glandular-dentate, apex gradually acute, lateral nerves inconspicuous, in more than 70 pairs, above often with some curious submarginal, fold-like lines, smooth, glandular-papillose on the midrib, underneath thinly isabel-woolly, midrib subglabrous, the minutely, irregularly tessellate intervenium more or less visible. Panicle many-flowered, 9–29 by 5–11 cm, peduncle and axes more or less appressedly strigose and glandular-hairy, glands multicellular with a small globose topcell, branches erecto-patent. Capitules heterogamous. Phyllaries lanceolate, 6–7.5 by 0.75–1.5 mm, acute, glandular-papillose, the outer ones slightly narrower. Marginal florets 4–4.5 mm long, throat oblique, limb 0.5–1.25 mm long; disk florets 6.5–7 mm long, colour not known. Achenes glandular-hairy.

Distribution – Papua New Guinea: Chimbu Prov. (Kerigomna).

Habitat – Inside and along edges of subalpine forest, 3250–3500 m.

Note – In Van Royen's concept this also included *P. aurea* Veldk. from the Wilhelm, from which, however, it is widely divergent in its isabel-coloured indument, narrower, finely dentate, and more-nerved leaves, larger and longer panicle, etc.

5. Papuacalia glossophylla (Mattf.) Veldk., *comb. nov.*

Senecio glossophyllus Mattf., Bot. Jb. 69 (1939) 293; Hartley, Lloydia 36 (1973) 303; Royen, Alp. Fl. N. G. 4 (1983) 3414, t. 998. — Type: *Clemens 5688* (B, holo, lost; iso in A, according to note by Belcher on *Hoogland 9717, 9942, 9993* in L). — Neotype: *Hoogland 9717* (CANB, holo; L, K).

Shrubs to treelets, up to 6 m high. Branchlets greyish puberulous to glabrescent mixed with small, capitate, multicellular glandular hairs. Leaves sessile. Blades elliptic to lanceolate (i = 1.6–3.7), 8–24 by 5–6.5 cm, base auricled, margins finely glandular-dentate, apex acute, with a black gland, lateral nerves conspicuous, 40–50 pairs, immersed above, above glabrescent, underneath nerves woolly-setose to glandular-hairy, intervenium densely papillose. Panicle few-flowered, 10–25 cm by 8–20 cm diam. Peduncle and axes densely patently, brown, multicellular glandular-pubescent. Capitules homogamous. Phyllaries oblong to linear-lanceolate, 8–9 mm by 1–3 mm, acute, sparsely glandular-puberulous. Disk florets 8–9.5 mm long, white, or pale pink (rarely yellowish). Achenes glandular-puberulous.

Distribution – Papua New Guinea: Morobe Prov. (Saruwaged).

Habitat – Edge of subalpine forests and shrubberies, 2895–3385 m alt.

Note – Hartley (1973) noted the absence of alkaloids in bark and leaves, as was to be expected in the Compositae.

6. Papuacalia kandambren (Royen) Veldk., *comb. nov.*

Senecio kandambren Royen, Alp. Fl. N. G. 4 (1983) 3416, t. 999, pl. 226. — Type: *Hoogland & Pullen 5507* (BM, holo; CANB, K, L, LAE).

Senecio sp.: Drury, New Zeal. J. Bot. 11 (1973) 544 [*CHR 203552 = NGF (Wardle & Katik) 40285*].

Shrubs to treelets, up to 7 m high. Branchlets cinereous (or rusty) woolly. Petioles 0.5–3.5 cm long. Blades obovate-lanceolate (i = 3.5–4.5), 18–21 by 4–6 cm, base auricled, margins crenate with glandular teeth, apex gradually acute, with a black gland, lateral nerves conspicuous, immersed above, 30–40 pairs, above sparsely puberulous, or glandular-puberulous to glabrescent, underneath white-woolly all over, intervenium densely papillose. Panicle few-flowered, up to 40 by 6–17 cm. Peduncle and axes densely patently glandular-pubescent to floccose, glands, when present, multicellular with a small globose topcell, sometimes mixed with thorn-like scales. Capitules heterogamous. Phyllaries lanceolate, 7–9 by 1.5–2 mm, acute, sparsely pilose. Marginal florets 7–8 mm long. Limb shortly ligulate, 1.5–2 mm long. Disk florets 7–9 mm long, white. Achenes glabrous.

Distribution – Papua New Guinea: S Highlands (Kerewa, Giluwe), W Highlands (Hagen), Chimbu (Wilhelm, Kerigomna), Madang (Abilala), Morobe Prov. (Naitmambi, Rawlinson Range).

Habitat – Edges of montane to subalpine forest and scrub, 2680–3560 m altitude.

Notes – Drury (1973) briefly mentioned the pubescence and leaf anatomy of this species.

The indument of the panicle in this species appears to be quite variable. It ranges from glandular-puberulous without any wool (Naitmambi Range, *van Royen 11660*) to densely floccose without any visible glands (Saruwaged, *Clemens 12346-bis*). Some specimens from the Giluwe (*NGF 40285*, perhaps also *Schodde 1857*, very old inflorescence) have small, thorn-like scales among the indument.

7. Papuacalia kukul (Royen) Veldk., *comb. nov.*

Senecio kukul Royen, Alp. Fl. N. G. 4 (1983) 3424, t. 1001. — Type: *Hoogland & Schodde 7170* (BM, holo; CANB, L, LAE).

Shrubs or treelets, up to 3.5 m high. Branchlets cinereous floccose. Petioles 2–3.5 cm long. Blades lanceolate (i = c. 4), 12–21 by 3–5 cm, base cuneate, rounded to auricled, margins crenate with incurved glandular teeth, apex rounded, with a black gland, lateral nerves conspicuous, immersed above, 25–35 pairs, above soon glabrescent, underneath cinereous floccose all over (covering the nerves), intervenium densely papillose. Panicle few-flowered, 11–13 by 8–14 cm. Peduncle and axes cinereous floccose, glands absent or minute, multicellular, capitate, sometimes mixed with thorn-like scales. Capitules heterogamous. Phyllaries linear-lanceolate, 7–8 by 1–1.5 mm, acute, sparsely pilose. Marginal florets 5.5–6 mm long. Limb bifid, 1.5 mm long. Disk florets 7–8 mm long, white. Achenes glabrous.

Distribution – Papua New Guinea: W Highlands Prov. (Sugarloaf, Giluwe, Mt Hagen, Kegum).

Habitat – Edges of montane to subalpine forest, 2895–3260 m alt.

8. Papuacalia mogrere (Royen) Veldk., *comb. nov.*

Senecio mogrere Royen, Alp. Fl. N. G. 4 (1983) 3404, t. 995. — Type: *Hoogland & Pullen 5643* [BM, holo (?, see note); CANB, L, LAE].

Senecio sp.: Borgmann, Zeitsch. Bot. 52 (1964) 145, 154, t. 19. — Voucher: *Borgmann 44* (K, L, LAE).

Senecio sp. 4: Johns & Stevens, Bot. Bull., Lae 6 (1971) 20.

Shrubs, 2–3 m. Branchlets glandular-puberulous. Petioles 0.4–0.7 cm long. Blades linear-lanceolate (i = 5.75–7.1), 2.3–5 by 0.4–0.7 cm, base cuneate, rounded, margins finely glandular-dentate, apex gradually acute, with a black gland, lateral nerves conspicuous, 15–25 pairs, immersed above, above glabrous, underneath isabel-woolly (mixed with minute, multicellular glands), intervenium smooth, hardly reticulate. Panicle few-flowered, 4–8 by 3–4 cm. Peduncle and axes dark brown densely patently glandular-pubescent, glands multicellular with a small globose topcell. Capitules heterogamous. Phyllaries lanceolate, 6.5–7.5 mm by c. 1.5 mm, rounded, glandular-puberulous and sparsely woolly. Marginal florets c. 1 mm long. Limb shortly ligulate, 0.3 mm long. Disk florets 4–5 mm long, white. Achenes hairy, mainly in the upper half.

Distribution – Papua New Guinea: Chimbu (Otto, Wilhelm).

Habitat – Subalpine forest and scrub edges, 3500–3570 m alt.

Chromosome number – 2n = 72 (Borgmann, 1964).

Note – The holotype is not present in BM, its citation is possibly a bibliographical error. The isotype in CANB was not seen by Van Royen.

9. Papuacalia ottoensis (Royen) Veldk., *comb. nov.*

Senecio ottoensis Royen, Alp. Fl. N. G. 4 (1983) 3432, t. 1003. — Type: *NGBF (Johns) 1204* (L, holo; A, BRI, CANB, E, K, QRS, UPNG).

Shrubs, 2–4 m high. Branchlets densely sericeous. Petioles 0.8–1.2 cm long. Blades lanceolate to linear-lanceolate (i = 3.4–7.9), 5.5–12 by 0.7–3.5 cm, base cuneate, acute, margins finely glandular-dentate, apex acute, with a black gland, lateral nerves inconspicuous above, (14–)17–22 pairs, above glabrous, underneath between the nerves with a thin (but the smooth, not reticulate intervenium not visible), sericeous-woolly indument. Panicle few-flowered, 6–12 by 5–14 cm. Peduncle and axes reddish brown densely patently multicellular-glandular-pubescent. Capitules heterogamous. Phyllaries oblong to lanceolate, 5.5–6.5 mm by 1.5–2.5 mm, rounded, woolly in the middle or sparsely multicellular puberulous. Marginal florets 4–4.5 mm long. Limb shortly ligulate, 1.5–1.8 mm long. Disk florets 5–6 mm long, creamy white. Achenes glabrous.

Distribution – Papua New Guinea: E Highlands (Michael), Chimbu Prov. (Otto, Mt Oga, 18 km E of Mt Hagen).

Habitat – Montane forest edges, 2800–2895 m alt.

10. Papuacalia saruwagedensis (Mattf.) Veldk., *comb. nov.*

Senecio saruwagedensis Mattf., Bot. Jb. 70 (1940) 480; Royen, Alp. Fl. N. G. 4 (1983) 3410. — Type: *Clemens 7306* (B, holo, lost).

Small treelets, height not noted. Branchlets crispy thin-woolly. Petioles 1–2 cm long. Blades oblong (i = 2.0–2.4), 6–8 by 2.5–4 cm, base shortly cuneate from a rounded base (somewhat hastate to) rounded, margins subentire to dentate, apex acutish, lateral nerves inconspicuous above, number not noted, above soon glabrous, underneath dirty brown-woolly, intervenium densely papillose. Panicle few-flowered, 10–15 by 5–12 cm. Peduncle and axes woolly, mixed with multicellular, glandular hairs. Capitules heterogamous. Phyllaries oblong to lanceolate, 6–8 mm by 1.2–2.5 mm, obtuse to acute, subglabrous to woolly. Marginal florets 2.5–4.5 mm long, limb bifid, or shortly ligulate, or 3–5-lobed, 0.75–3 mm long. Disk florets 5.5–8 mm long, colour not noted. Achenes glabrous.

Distribution – Papua New Guinea: Morobe Prov. (Saruwaged).

Habitat – Subalpine forest edges, 3000–3600 m alt.

Note – Van Royen (1983) had no material available, but it would seem to me from Mattfeld's description and the provenance that *Clemens s.n.*, 19 May 1939 (L) represents this species. The description above is based on both.

11. **Papuacalia valentini** Veldk., *spec. nov.*

Folii lamina lineariter lanceolata 15,5–19 cm longa circa 3 cm lata in vel supra medium latissima, basi anguste cuneata, margine tenue dentato, apice acuto, infra dense cineree lanata, supra praeter costam glandulose pubescentem glabra plus quam 30 nervis inconspuis. Pedunculus axesque dense patentiter glandibus multicellularibus. Capitula homogama. Phyllaria oblineariter lanceolata 8–9 mm longa 1–1,25 mm lata breviter glandulose pubescentia. — Typus: *Mangen 2075* (L, holo; A, LUX), Irian Jaya, Jayawijaya Prov., Valentijn Mts, track from Korapun to Angguruk, Munmungona Camp, 139° 33' E, 4° 20' S, 3330 m, 20 Aug. 1988.

Treelet, c. 3 m high. Branchlets densely cinereous-woolly, indument mixed with long, multicellular, glandular hairs with a dark content. Petioles up to 2.5 cm long. Blades linear-lanceolate (i = 5–6.3), widest in or above the middle, 15.5–19 by c. 3 cm, base gradually narrowed into the petiole, margins finely dentate, teeth glandular, apex acute, lateral nerves rather inconspicuous, in more than 30 pairs, above glabrous, except for the mainly glandular-hairy midrib, smooth, underneath cinereous floccose, indument covering the nerves and the minutely papillose intervenium (papils nearly absent on the smaller leaves). Panicle corymbose, many-flowered, c. 10 by 19 cm, branches erecto-patent, densely multicellular, brown, glandular-setulose. Capitules homogamous. Phyllaries oblinear-lanceolate, 8–9 by 1–1.25 mm, shortly glandular-hairy, apex acute, ciliolate. Florets c. 7 mm long, colour not noted. Achenes glabrous.

Distribution – Irian Jaya, Jayawijaya Prov., Valentijn Mts.

Habitat – Shrubby subalpine grassland, 3330 m.

Notes – The other two homogamous species, *P. glossophylla* Mattf. and *P. versteegii* Mattf. differ by the rounded to cordate leaf base. The first, moreover, has leaves with a subglabrous lower side with a finely, irregularly tesselate intervenium. The second has leaves with less nerves, a coarsely dentate margin and rounded apex, the indument is more brownish, mixed with shorter, concolorous glandular hairs.

Named for its provenance (and the day on which it was described).

12. Papuacalia versteegii (Mattf.) Veldk., *comb. nov.*

Senecio versteegii Mattf., Nova Guinea 14/4 (1928) 529; Royen, Alp. Fl. N. G. 4 (1983) 3406, t. 996. — Type: *Versteeg 2543* (B, holo, lost; BO, lost?).

Shrubs, 2–6 m high. Branchlets yellowish brown to golden-woolly to floccose, or glabrescent (with many sessile or shortly stalked glands). Petioles 0.5–1 cm long. Blades oblong (i = c. 2.5), 6.5–8 by 2.5–3.2 cm, base cuneate, rounded, margins coarsely dentate with glandular teeth, apex rounded, with a black gland, lateral nerves inconspicuous above, 18–25(–35) pairs, above soon glabrescent, underneath woolly to floccose, intervenium densely papillose. Panicle few-flowered, 5–10 by 4–11 cm. Peduncle and axes densely patently glandular-pubescent to woolly floccose, mixed with small, multicellular glands. Capitules homogamous. Phyllaries lanceolate, 8–11 mm by 2–2.5 mm, acute, glandular-puberulous. Disk florets 8–9 mm long, white. Achenes hairy to glabrous in the same capitule.

Distribution – Irian Jaya (Lake Habbema, Quarles Valley, Wilhelmina).

Habitat – Subalpine forest edges, grasslands, 3225–4000 m alt.

13. Papuacalia yuleensis Veldk., *spec. nov.*

Cortex, petioli, lamina folii, axes inflorescentiae papillis cellularum multiserialium densissimis gaudens, flores sordide purpurei, ideo ab omnibus congeneribus differt. — Typus: *Veldkamp & Kuduk 8547* (L, holo, no duplicates), Papua New Guinea, Gulf Prov., Mt Yule, Repeater Station on summit, 8° 12' 37" S, 146° 47' E, 3270 m, 16 Nov. 1989.

Treelet, 2 m high, densely covered by many-celled papils of multilayered cells. Petioles c. 2 cm long. Blades oblong (i = 2.8–3.2), 13–17 by 4–6 cm, base cuneate, margins distantly dentate, teeth mammiform, apex acutish, lateral nerves inconspicuous, in more than 20 pairs, above glabrous, papillose-scabrous, underneath white arachnoid, barely covering the densely papillose intervenium. Panicle many-flowered, c. 20 by 19 cm, branches erecto-patent. Capitules heterogamous. Phyllaries lanceolate, 5–5.5 by 1–1.25 mm, the outer, smaller ones sparsely arachnoid, the inner, longer ones glabrous but for the ciliolate, acutish apex. Marginal florets 3–3.5 mm long, throat oblique, limb 0.25–0.5 mm long; disk florets c. 4.5 mm long, dirty purple (senescent?). Achenes glabrous.

Distribution – Papua New Guinea: Gulf Prov., Mt Yule.

Habitat – Edge of subalpine coppice, 3270 m.

REFERENCES

BORGMANN, E. 1964. Anteil der Polyploiden in der Flora des Bismarckgebirges von Ostneuguinea. Zeitsch. Bot. 52: 118–172.

DRURY, D.G. 1973. Nodes and leaf structure in the classification of some Australasian shrubby Senecioneae – Compositae. New Zeal. J. Bot. 11: 525–554.

GRAY, A.M. 1974. The status of Bedfordia on the Australian mainland. Muelleria 3: 64–66.

JEFFREY, C., P. HALLIDAY, M. WILMOT-DEAR & S.W. JONES. 1977. Generic and sectional limits in Senecio (Compositae): I. Progress report. Kew Bull. 32: 47–67.

KOSTER, J.Th. 1970. The Compositae of New Guinea II. Blumea 18: 139–145.
MATTFELD, J. 1932. Compositae. Nova Guinea 14/4: 527–529, t. 15 B, f. 1–7.
MATTFELD, J. 1940. Einige neue Compositen aus dem Gebiet des Saruwaged-Gebirges in Neuguinea. Bot. Jb. 70: 480–482.
NORDENSTAM, B. 1977. Senecioneae and Liabeae – systematic review. In V.H. Heywood et al., The biology and chemistry of the Compositae 2: 799–830. London, etc.
NORDENSTAM, B. 1978. Taxonomic studies in the tribe Senecioneae (Compositae). Opera Bot. 44: 1–84.
ROYEN, P. VAN. 1983. Alpine Flora of New Guinea 4: 3392–3434. Vaduz.
WADE, L.K., & D.N. McVEAN. 1969. Mt. Wilhelm Studies. 1. The alpine and subalpine vegetation: 67. Canberra.

ACKNOWLEDGEMENTS

This synopsis was based on the material available in L and that seen during too brief visits to BM, CANB, CBG, K, NSW, and US. Mr. C. Jeffrey (K) is thanked for the discussions we had on the generic disposition of the species. Dr. B.H. Macmillan (CHR) kindly informed me about the collector's numbers of the specimens cited by Drury (1973). The letters sent by Dr. B. Nordenstam (S) and Dr. P. van Royen (Novato, Calif.) were very enlightening.

COLLECTORS LIST

ag = *Papuacalia aurea* Veldk. subsp. *giluweensis* Veldk.
au = subsp. *aurea*
ca = *Papuacalia carstenszensis* (Royen) Veldk.
di = *Papuacalia dindondl* (Royen) Veldk.
ga = *Papuacalia gandin* (Royen) Veldk.
gl = *Papuacalia glossophylla* (Mattf.) Veldk.
ka = *Papuacalia kandambren* (Royen) Veldk.
ku = *Papuacalia kukul* (Royen) Veldk.
mo = *Papuacalia mogrere* (Royen) Veldk.
ot = *Papuacalia ottoensis* (Royen) Veldk.
sa = *Papuacalia saruwagedensis* (Mattf.) Veldk.
va = *Papuacalia valentini* Veldk.
ve = *Papuacalia versteegii* (Mattf.) Veldk.
yu = *Papuacalia yuleensis* Veldk.
T = type
( ) = not seen

ANU (Walker) 5097: di; (Wheeler) 6357: ku; (McVean & Wade) 7138: di; (Wade) 7566: au; (Hope) 10813: (di); (Smith) 15103: mo; (Smith) 15447: di; (Smith) 15493: au; (Hope) 16016: ca (T).
van Balgooy 263: di; 411: di; 425: mo; 447: au (T); 587: mo; 843: di; 853: au; 938: au — Borgmann 44: mo; 67: di — Brass 9146: ve; 29845: di; 29981: au; 30003: mo; 31393: ot — Brass & Meijer Drees 9799: ve; 9832: ve.
Clemens 24-4-1939: gl; 19-5-1939: sa; 5597: gl; 5688: (gl); 7306: (sa; T); 12346-bis: ka — Coode, see NGF-series.
Hartley 11253: gl — Hoogland 9717: gl (neo-T); 9942: gl; 9993: gl — Hoogland & Pullen 5507: ka (T); 5568: ga (T); 5643: mo (T); 5706: di (T) — Hoogland & Schodde 7170: ku (T) — Hope, see ANU-series.
Johns, see NGBF-series.
Kairo, see NGF-series — Kalkman 4799: ka.
LAE (Stone) 53229: mo; (Stevens) 54585: ka; (Stevens & Grubb) 54644: ga.
Mangen 169: ve; 656: ve; 2075: va (T) — McVean & Wade, see ANU-series.
NGBF (Johns) 1204: ot (T) — NGF 8872 (Womersley): mo; 11498: au; (Coode) 32540: ka; (Vandenberg) 35013: mo; (Kairo & Streimann) 35762: di; (Kairo & Streimann) 35763: mo; (Coode et al.) 40264: ag (T); (Coode et al.) 40284: ag; (Coode et al.) 40285: ka.

Pullen 142: ot; 6098: ka.
Robbins 424: ku; 1163: mo — van Royen 11610: gl; 11660: ka.
Schodde 1857: ka — Smith, see ANU-series — Stevens, see LAE-series — Stone, see LAE-series.
Vandenberg, see NGF-series — Veldkamp & Kuduk 8547: yu (T) — Veldkamp & Obedi 8616: mo — Veldkamp & Vinas 7649: ku — Versteeg 2543: (ve).
Wade, see ANU-series — Walker, see ANU-series — Wheeler, see ANU-series — Womersley, see NGF-series.