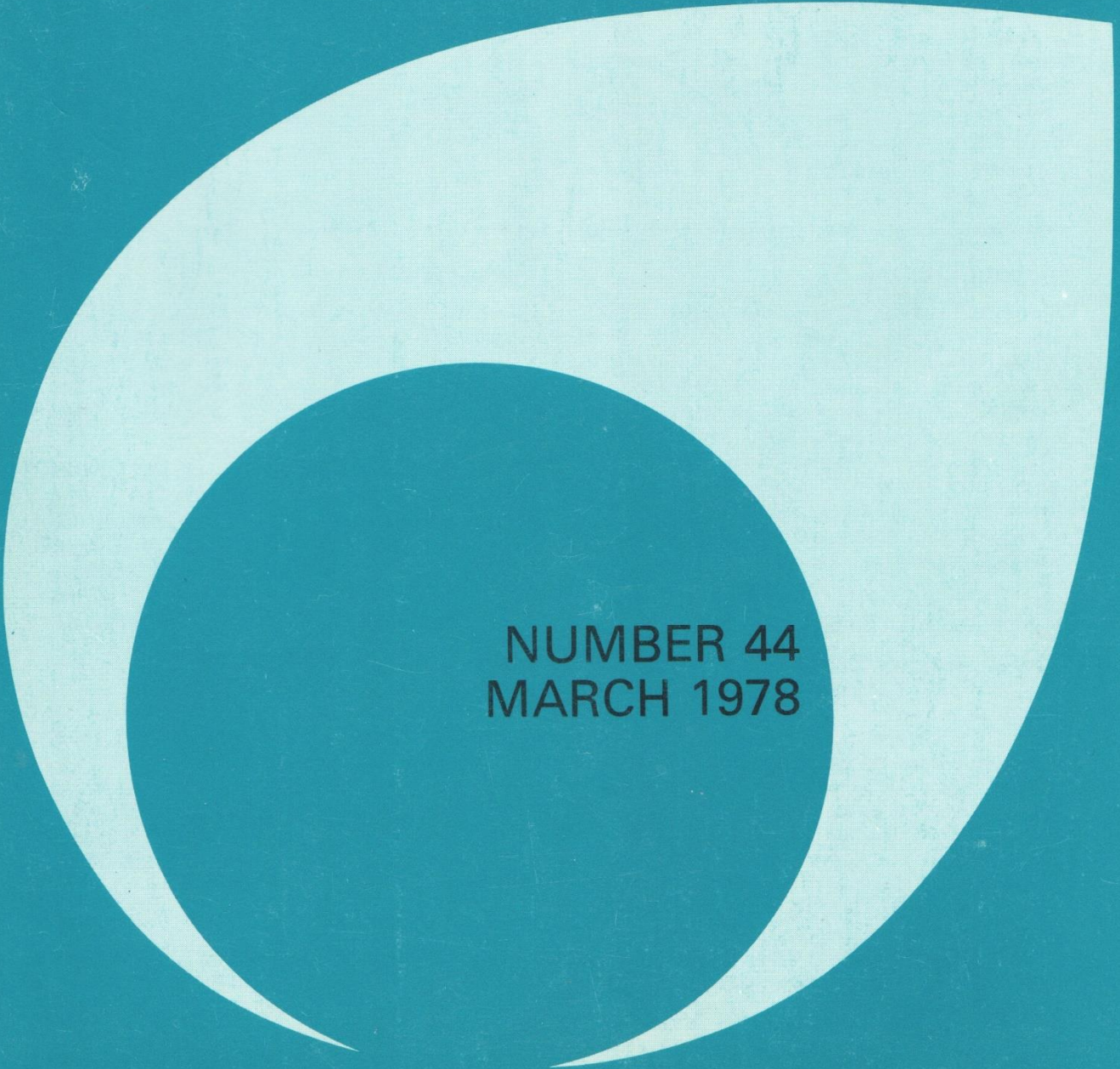


# OPERA BOTANICA

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**Taxonomic studies in the tribe Senecioneae  
(Compositae)**

Bertil Nordenstam



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The same is true of *Pericallis*, which comprises white-, pink- and purple-flowered taxa, and the white-rayed species of otherwise yellow-flowered genera, e.g. *Brachyglottis hectori* (but not *Dolichoglottis scorzonerooides*, see below).

Remarkable exceptions to the rule are the two monotypic genera *Urostemon* and *Dorobaea*. The former has white ligules with a smooth epidermis, and the latter is the only example known to me in the tribe of a yellow-rayed taxon with a papillose ligule epidermis (Fig. 11 B). Finally, the white-rayed *Dolichoglottis scorzonerooides* has a smooth ligule epidermis, like the closely related, yellow-flowered *D. lyallii*.

#### **Sinacalia** Robinson & Brettell

Robinson & Brettell, *Phytologia* 27:274 (1973).

This is a small satellite genus to *Cacalia*, said by its authors to be related also to *Miricacalia*. The radiate capitula also provide a link with *Ligularia*. All species of *Ligularia* have a creeping rhizome, whereas *Sinacalia* has an underground tuber. However, herbarium specimens of *Sinacalia* are rarely complete enough to reveal this character.

Although clearly cacalioid, the genus is somewhat aberrant in the character of its stigmatic areas and filament collar, as pointed out by Robinson & Brettell (1973 b). The stigmatic areas of the disc styles are largely confluent, but are separated basally to a variable degree (Fig. 12 E). Distinct sweeping-hairs are lacking on the style branch tips, which are merely papillate and more or less truncate. The filament collar is essentially 'cacalioid', i.e. uniformly thick and consisting of more or less equal-sized cells, but a distinct swelling below the collar is often observable (Figs 4 B, 12 G). The endothelial cells of the anther wall are very neatly 'polarized', as in all truly cacalioid genera (Fig. 1 B). The apical appendage is coloured and somewhat keeled, with a darker median line, and the anther base is auriculate, or shortly tailed.

Robinson & Brettell (1973 b) founded the genus on the single species *Senecio henryi* Hemsl., but they mentioned the probable existence of a second species, represented by a specimen misidentified as *S. palmatisectus* C. F. Jeffr. I have seen such specimens (e.g. Fang 4323 in K) and regard them as conspecific with the type, as will be further elucidated below.

*Senecio henryi* Hemsl. is obviously a synonym of the earlier *S. tanguticus* Maxim., which has also been variously referred to *Cacalia*, *Ligularia* and *Senecillis* (cf. Handel-Mazzetti 1938 p. 300, Hu 1966 p. 9, 1967 p. 73). The material examined (more than 15 collections) gives the impression of constituting a single and variable species, with a wide distribution in China. It is known from the provinces of Hupei, Szechuan, Hopei, Shensi, Shansi and Kansu. Specimens from Szechuan tend to have rather wide sinuses between the leaf-lobes, which are somewhat obtuse and mucronate. Material from Kansu (where the type of *S. tanguticus* was collected) has similar leaves, but a narrower and less branched synflorescence. Collections from the more easterly part of the range (including the type of *S. henryi*) have less deeply lobed leaves with closer and more acuminate lobes, and the thyrsoid synflorescence is often very broad and richly branched.

The correct name and synonymy of the single species is as follows.

#### **Sinacalia tangutica** (Maxim.) B. Nord., comb. nov.

Basionym: *Senecio tanguticus* Maxim., Bull. Acad. Imp. Sci. Pétersb. 27: 486 (1881), et Mém. Biol. 11: 244 (1881). – *Ligularia tangutica* (Maxim.) Mattf., Jour. Arnold Arb. 14: 40 (1933). – *Cacalia tangutica* (Maxim.) Hand.-Mazz., Acta Horti Gothob. 12: 300 (1938). – *Senecillis tangutica* (Maxim.) Kitam., Acta Phytotax. Geobot. 8: 87 (1939).

*Senecio henryi* Hemsl., Jour. Linn. Soc. London (Bot.) 23: 452 (1888). – *Sinacalia henryi* (Hemsl.) Robinson & Brettell, *Phytologia* 27: 275 (1973), non rite publ.

#### **Pericallis** D. Don in Sweet

D. Don in Sweet, Brit. Flow. Gard. Ser. 2, text to Plate 228 (1834). – Type species: *P. tussilaginis* (L'Hérit.) D. Don in Sweet, l.c.

The 'pericalloid *Senecios*' form a very natural and homogeneous group, which is difficult to relate to any extant portion of *Senecio* s. str. It is probably a relict element derived from an ancient African stock, which seems to be no longer represented on the continent. Possibly the genus *Cineraria* has evolved from the same or a closely allied source, notwithstanding some very obvious differences, such as the basic chromosome number ( $x=10$ , cf. Nordenstam 1969) and the

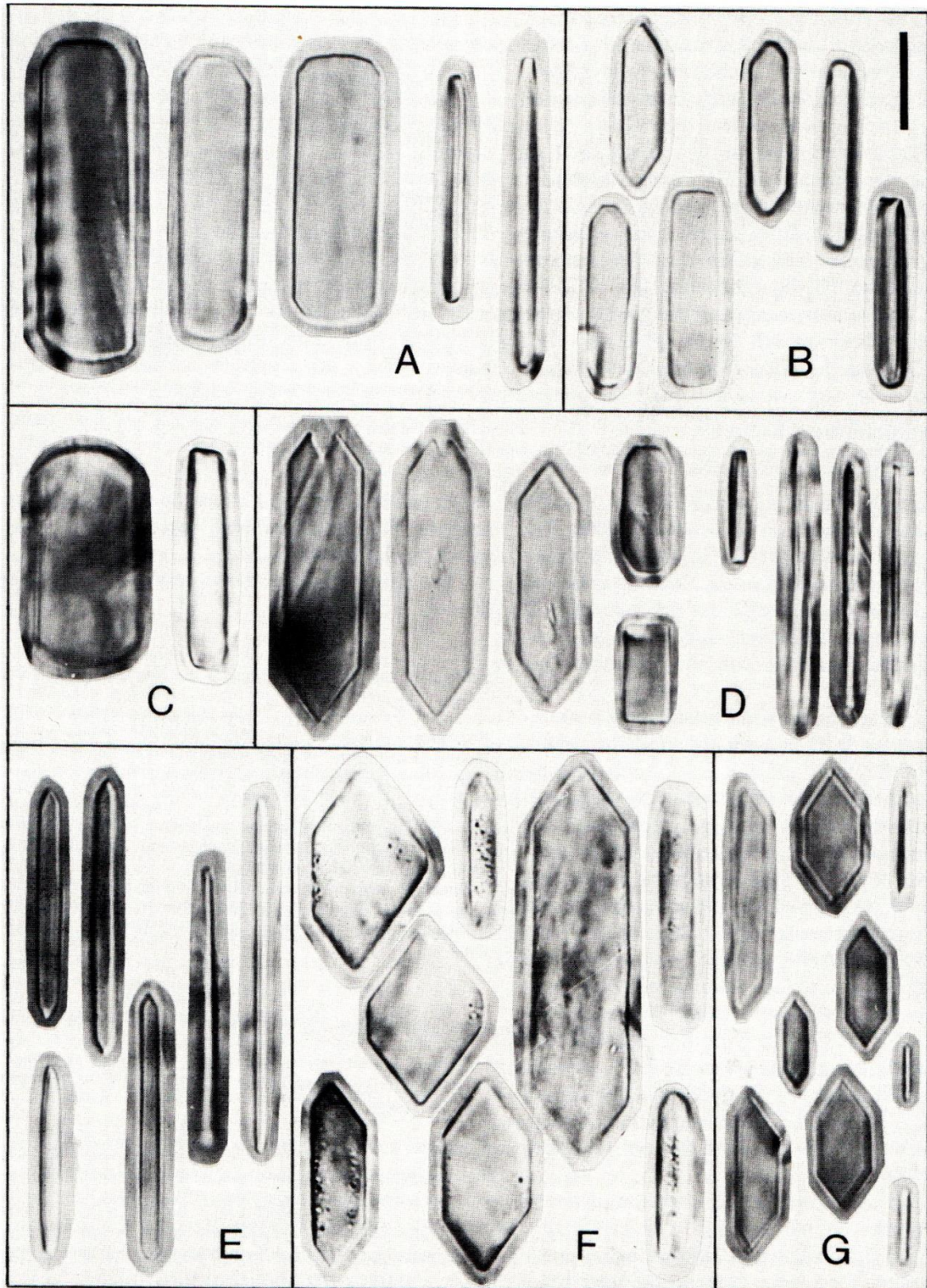


Fig. 9. Ovary wall crystals in the Senecioneae, in surface view and side view (to the right in each figure). - A: *Senecio* (sect. *Senecio*) *vulgaris* L. (Lindgren s.n. in S). - B: *Pericallis tussilaginis* (Asplund 727 in S). - C: *Stenops helodes* (Sanane 241 in K). - D: *Phaneroglossa bolusii* (Schlechter 10004 in S). - E: *Senecio* (sect. *Lobati*) *multilobatus* Torr. & Gray (Lloyd 2911 in S). - F: *Jacmaia incana* (Webster et al. 8273 in S). - G: *Dorobaea pimpinellifolia* (Harling 1508 in S). - All  $\times 1500$ . The black line in B is 10  $\mu\text{m}$ .

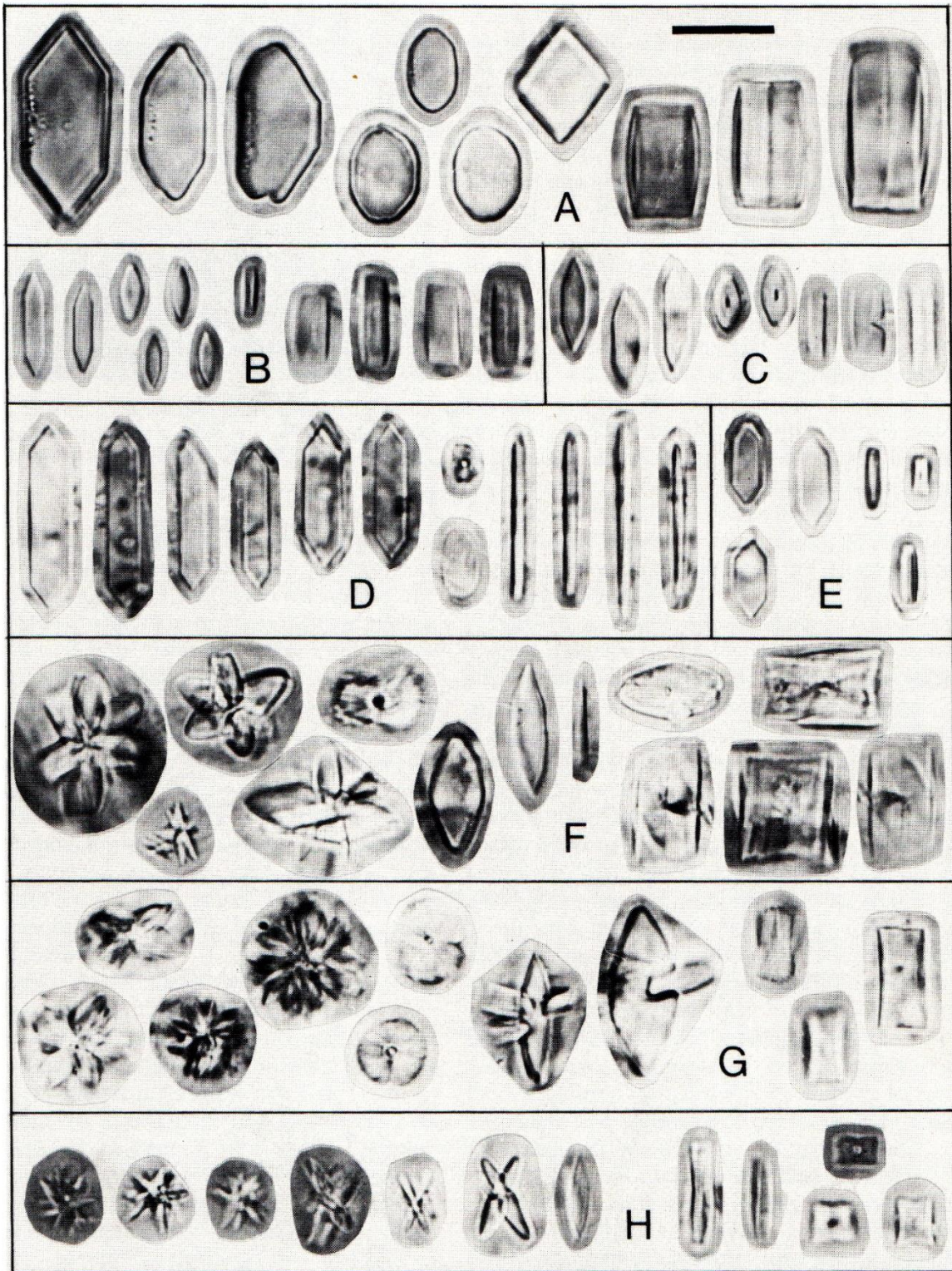


Fig. 10. Ovary wall crystals in the Senecioneae, in surface view and side view (to the right in each illustration). – A: *Dendrosenecio keniodendron* (Hedberg 1950 in S). – B: *Tephroseris integrifolia* subsp. *aurantiaca* (Karo s.n. in S). – C: *Sinosenecio sungpanensis* (Smith 3857 in S). – D: *Sinosenecio savatieri* (Handel-Mazzetti 117 in C). – E: *Senecio* (sect. *Bethencourtii*) *palmensis* (Hansen s.n. in C). – F: *Notonia grandiflora* (Wright 1665 in S). – G: *Notoniopsis abyssinica* (Holm 65 in S). – H: *Notoniopsis coccinea* (Hagos 194 in K). – All  $\times 1500$ . The black line in A is 10  $\mu\text{m}$ .

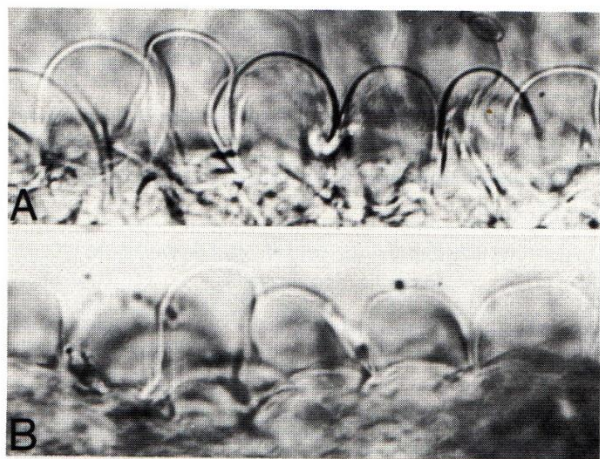


Fig. 11. Papillose upper ligule epidermis. – A: *Pladaroxylon leucadendron* (Rendle 50 in BM). – B: *Dorobaea pimpinellifolia* (Harling 1508 in S). –  $\times 500$ .

flower colour (yellow in *Cineraria*). There are close similarities between the two genera in the morphology of styles and stamens and in the corolla lobes, which are provided with a median resin duct. It is perhaps not mere coincidence that the strong compression of the achenes in *Cineraria* is paralleled by a similar, but much less pronounced, tendency in *Pericallis*. The striking similarities in habit, indumentum and leaf shape and venation induced L'Héritier and other early authors to place the group in *Cineraria*. Although perhaps remote, the possible affinity between *Pericallis* and *Cineraria* provides another example of the floristic link between Macaronesia and East Africa (and secondarily, to South Africa).

*Pericallis* is definitely more senecioid than cacalioid, despite its chromosome number ( $x=30$ , cf. Afzelius 1949) and non-yellow flower colour (white, pink, mauve or purple). Thus, the disc styles are truncate with a small brush of sweeping-hairs and with distinctly discrete stigmatic areas, the anthers have a 'radial' endothelial tissue (Fig. 2 G), and the filament collars are distinctly 'senecioid' (Fig. 7 E).

Characteristic features of *Pericallis* are petiole and palmately-veined leaves, absence of calyculus, non-yellow florets, papillate ligule epidermis, keeled and usually convex-concave

anther appendage, a caducous pappus or (in ray-florets) none at all, and somewhat compressed, ten-ribbed achenes, which are distinctly heteromorphic, those of disc-florets being generally smaller and more hirsute. This achene heteromorphism is most obvious in the herbaceous species, the ray achenes of which are often twice as large as those of the disc, distinctly compressed, different in colour and without a pappus. The marginal achenes also tend to persist longer in the involucre of the fruiting flower-head.

Although relict in character, the 'pericalloid' stock has been capable of considerable evolution within Macaronesia. The ancestral type was probably a shrubby plant with a many-headed corymbose synflorescence and more or less homomorphic achenes, all provided with a pappus. Near descendants of this type are now to be found on the Azores (*P. malvifolia*), Madeira (*P. aurita*) and on all of the western Canary Islands (*P. appendiculata*).

Further speciation has taken place in the Canary Islands, including evolutionary trends such as the development of a herbaceous habit, increase in size and decrease in number of capitula, loss of pappus, and increasing achene heteromorphism. *P. cruenta*, which occurs on four of the western islands, exhibits several of these trends. Further differentiation, as seen in northern Tenerife, has involved an ecological shift from high forest regions (800–1500 m, *P. cruenta*) to the lower forest zone as well as to scrub and moist sites below the forest zone (200–800 m, *P. tussilaginis*) and to *Cistus* scrub and rocky habitats at low altitudes (50–400 m, *P. echinata*). Equivalent vicarious taxa on other islands are *P. murrayi* on Hierro, *P. steetzii* on Gomera and *P. papyracea* on La Palma. The Gran Canarian counterpart, *P. webbii*, is more eurytopic and shows no obvious signs of adaptive radiation into different ecological niches.

On a separate evolutionary line, *P. lanata* has retained the suffruticose habit, but has developed a strongly reduced synflorescence with usually solitary flowerheads. This species inhabits rocky places between 200 and 650 m above s.l. on southern Tenerife.

Fig. 12. *Sinacalia tanguitica*. – A: Portion of plant,  $\times 0.5$ . – B: Ray-floret,  $\times 2.8$ . – C: Disc-floret,  $\times 2.8$ . – D: Corolla of disc-floret, laid out,  $\times 2.8$ . – E: Style of disc-floret,  $\times 5.6$ . – F: Style branches from disc-floret,  $\times 12$ . – G: Stamens,  $\times 5.6$ . – Smith 7033 from Shansi Prov., BM.

In short, the evolution of *Pericallis* in Macaronesia is mainly due to vicarious evolution from an ancient stock, but there are also obvious signs that adaptive radiation has occurred in the Canary Islands, notably in Tenerife. A modern biosystematic study is called for, to clarify the interrelationships, degree of infraspecific variation, and extent of natural hybridization. The status of *P. multiflora* also needs further investigation, and it is even possible that one or two more taxa remain to be described.

The nomenclature of *Pericallis* and its species, including the cultivated 'cineraria', is in a confused state. The generic name is usually (e.g. in Index Kewensis, Willis's 'Dictionary', Holub 1973 p. 163), but erroneously, ascribed to Webb & Berthelot. Instead, David Don should be cited as author of the genus. In 1834 Don published the genus in the text to a plate of *P. tussilaginis* in Sweet's 'British Flower Garden', giving a perfectly valid generic diagnosis and combination for the one species mentioned and making reference to several others, although without making the actual combinations in the sense of the Code.

For the 'Phytographia canariensis' (Webb & Berthelot 1842–50) Webb evidently had the adoption of the genus *Pericallis* in mind and he first published several plates using that generic name. These are not valid combinations, however, although they have been frequently cited as such. When the text to the Compositae was finally written up by Schultz (Bipontinus), he made many changes to Webb's nomenclature. All 'pericalloid' taxa with pappose ray-florets were included in *Senecio*, and those without a pappus in the ray-florets were treated as section *Pericallis* of *Doronicum*. Webb's names under *Pericallis* were cited in synonymy and thus once again not validly published. Now that the genus is reinstated, a number of new combinations are required (see below).

The nomenclatural and taxonomic status of the cultivated 'cineraria' is another intricate matter. Its ancestry has been the subject of some dispute (see Barkley 1966 for a thorough review), but it seems clear that it is of hybrid origin and that *P. cruenta* must be one of the progenitors. However, the modern 'cineraria' is composed of true-breeding strains and is now so divergent from anything growing in nature, that it seems advisable to designate it with a binomial. As no

legitimate epithet is available (cf. below), a new name, *P. hybrida* B. Nord., is proposed in the spirit of Art. 72 of the Code.

1. ***Pericallis malvifolia*** (L'Hérit.) B. Nord.,  
comb. nov.

Basionym: *Cineraria malvaefolia* L'Hérit., Sert. Angl. 26 (1789). – *Senecio malvaefolius* (L'Hérit.) DC., Prodr. 6: 410 (1838). – Type: Azores, Masson (BM holo, S iso).

2. ***Pericallis aurita*** (L'Hérit.) B. Nord.,  
comb. nov.

Basionym: *Cineraria aurita* L'Hérit., Sert. Angl. 26 (1789). – *Senecio maderensis* DC., Prodr. 6: 409 (1838). – Type: Madeira, Masson (BM holo, S iso).

3. ***Pericallis appendiculata*** (L. fil.) B. Nord.,  
comb. nov.

Basionym: *Cacalia appendiculata* L. fil., Suppl. 352 (1781). – *Cineraria appendiculata* (L. fil.) Poirét, in Lam., Encycl. Méth. Bot. Suppl. 2: 263 (1811). – *Senecio appendiculatus* (L. fil.) Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 327 (1845), nom. illeg. (non Poirét, in Lam., Encycl. Méth. Bot. 7: 102 (1806), nec non (Lam.) DC., Prodr. 6: 376 (1838)). – *Cineraria populifolia* L'Hérit., Sert. Angl. 25 (1789), nom. illeg. – *Senecio populifolius* DC., Prodr. 6: 409 (1838), nom. illeg. (non L., Sp. Pl. ed. 2, 1224 (1763)).

4. ***Pericallis multiflora*** (L'Hérit.) B. Nord.,  
comb. nov.

Basionym: *Cineraria multiflora* L'Hérit., Sert. Angl. 26 (1789). – *Senecio multiflorus* (L'Hérit.) DC., Prodr. 6: 410 (1838) (excl. descr. et specim. cit. = *P. webbii*). – Type: Canary Islands, Masson (BM).

5. ***Pericallis lanata*** (L'Hérit.) B. Nord.,  
comb. nov.

Basionym: *Cineraria lanata* L'Hérit., Sert. Angl. 25 (1789). – *Senecio heritieri* DC., Prodr. 6: 409 (1838). – Type: Tenerife, Masson (BM).

6. ***Pericallis echinata*** (L. fil.) B. Nord.,  
comb. nov.

Basionym: *Cacalia echinata* L. fil., Suppl. 353 (1781). – *Senecio echinatus* (L. fil.) DC., Prodr. 6: 411 (1838). – *Doronicum echinatum* (L. fil.) Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 335 (1845). – *Cineraria ramentosa* L'Hérit., Sert. Angl. 26 (1789), nom. illeg. – Type: Tenerife, Masson (S iso).

7. *Pericallis papyracea* (DC.) B. Nord.,  
comb. nov.

Basionym: *Senecio papyraceus* DC., Prodr. 6: 410 (1838). – *Doronicum papyraceum* (DC.) Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 339 (1845).

8. *Pericallis murrayi* (Bornm.) B. Nord.,  
comb. nov.

Basionym: *Senecio murrayi* Bornm., Bot. Jahrb. 33 Beibl. 72: 1 (1903).

9. *Pericallis steetzii* (Bolle) B. Nord., comb. nov.

Basionym: *Senecio steetzii* Bolle, Bonplandia 7: 296 (1859).

10. *Pericallis webbii* (Sch. Bip.) Bolle

Bolle, Bonplandia 8:133 (1860). – *Doronicum webbii* Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 333 (1845). – *Senecio webbii* (Sch. Bip.) Christ, Bot. Jahrb. 9: 148 (1888).

*Senecio multiflorus* auct. non (L'Hérit.) DC.; DC., Prodr. 6: 410 (1838) (quoad descr. et specim. cit., excl. syn.).

11. *Pericallis tussilaginis* (L'Hérit.)

D. Don in Sweet

D. Don in Sweet, Brit. Flow. Gard. Ser. 2, text to Plate 228 (1834). – *Cineraria tussilaginis* L'Hérit., Sert. Angl. 26 (1789). – *Senecio tussilaginis* (L'Hérit.) Lindley, Bot. Reg. t. 1550 (1833). (This combination is usually ascribed to Lessing, Syn. Gen. Comp. 392 (1832), but was not validly published there.) – *Doronicum tussilaginis* (L'Hérit.) Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 331 (1845). – Type: Tenerife, Masson (BM holo, S iso).

12. *Pericallis hadrosoma* (Svent.) B. Nord.,  
comb. nov., e descr.

Basionym: *Senecio hadrosomus* Svent., Bol. Inst. Nac. Invest. Agron. Madrid 10, 22: 1 (1950).

13. *Pericallis cruenta* (L'Hérit.) Bolle

Bolle, Bonplandia 8: 133 (1860). – *Cineraria cruenta* L'Hérit., Sert. Angl. 26 (1789). – *Senecio cruentus* (L'Hérit.) DC., Prodr. 6: 410 (1838), nom. illeg. (non Roth, Arch. Bot. (Roemer) 1, 3: 44 (1798)). – *Doronicum cruentum* (L'Hérit.) Sch. Bip., in Webb & Berth., Phyt. Canar. 2: 336 (1845). – Type: Tenerife, Masson (BM holo, S iso).

14. *Pericallis hybrida* B. Nord., nom. nov.

Syn.: *Cineraria hybrida* Willd., Enum. Pl. Hort. Berol. 893 (1809), nom. illeg. (non Bernh., Syst. Verz. Erf. 146 (1800)). – *Senecio hybridus* Regel, Gartenfl. 8: 310 (1859) et 12: 113 (1863), nom. nud. – *S. hybridus* Hyl., Våra Prydnadsv. Namn ed. 2, 87 (1960), non rite publ.

*Cineraria lactea* Jacq., Eclog. t. 105 (1844), nom. illeg. (non Willd., Enum. Pl. Hort. Berol. Suppl. 59 (1814)).

This species is only known in cultivation (the florist's 'cineraria'). The binomial *Senecio hybridus* is often applied to it, with various author citations, such as "Regel", "Hort. ex Regel", "(Willd.) Regel", or "Hyl.". Regel's publication is nomenclaturally dubious, since he did not refer to Willdenow, and he did not provide a description of the species; only of a subordinate variety (var. *Höltzeri* Regel). Hylander's *S. hybridus* is also not validly published, lacking a full reference to Willdenow's illegitimate name (Art. 33 of the Code). Under the circumstances it seems most appropriate to adopt the familiar epithet *hybrida* as a new name under *Pericallis* (Art. 72).

**Cacaliopsis** A. Gray and Luina Benth.

*Cacaliopsis* A. Gray, Proc. Am. Acad. 19: 50 (1883). *Luina* Benth., Hook. Ic. Pl. 12: 36, t. 1139 (Apr. 1873) et in Bentham & Hooker, Gen. Pl. 2(1): 438 (Apr. 1873).

The monotypic genus *Cacaliopsis* is nowadays (e.g. Cronquist 1955) usually included in *Luina*, despite its strikingly different habit. The two genera are certainly closely related, but the separation of *Cacaliopsis* seems justified on a number of characters, some of which are illustrated in Fig. 13.

The disc styles of *Luina* have very obtuse to almost truncate tips, and the stigmatic areas are widely discrete almost all the way to the tip, where they become confluent. The outsides of the style branches are finely papillate. In *Cacaliopsis* the style has longer and more tapering branches, more distinctly papillate outside. The stigmatic areas are separated over the greater part of their length, but do become confluent some distance below the tip.

The stamens of both genera are typical of cacalioid genera, i.e. they have a 'polarized' endothelial tissue (Fig. 1 C) and uniform fila-