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THE TAXONOMIC STATUS OF CYNOGLOSSUM LATIFOLIUM (BORAGINACEAE)

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ABSTRACT. The Australian species *Cynoglossum latifolium* R. Br. is considered sufficiently distinct to warrant recognition at generic rank. The name *Austrocynoglossum,* proposed for the species by Popov but never published, is here validated for the first time. Morphological, palynological and chemical evidence for the segregation of this species from *Cynoglossum* L. and its allies is presented, together with a discussion of the relationships of the new genus with others in the tribe *Cynoglosseae.*

Cynoglossum latifolium R. Br. (Boraginaceae) is a distinctive plant inhabiting forests in Australia and Tasmania. Most recently it was awarded sectional rank as *C.* sect. *Axillaria* by Riedl (1962), the section being defined by the flowers solitary in the leaf axils.

In his account of *Cynoglossum* L. for *Flora URSS,* Popov (op. cit. 19: 658, 1953; translation 1974) observed '. . . the Australian *C. latifolium* R. Br. is unquestionably a separate genus, *Austrocynoglossum* M. Pop.'. He did not provide a description of his 'new genus', however, nor did he present any argument to support the statement quoted above, and the name *Austrocynoglossum* has remained a *nomen nudum.* As the morphological, palynological and chemical evidence strongly supports Popov's opinion, I take this opportunity of providing a formal account of the genus here.

Austrocynoglossum M. Popov ex R. Mill, **gen. nov.** (Boraginaceae, tribe *Cynoglosseae*).

Syn.: *Cynoglossum* L. subgen. *Paracynoglossum* (M. Popov) H. Riedl sect. *Axillaria* H. Riedl in Öst. Bot. Zeitschr. 109: 393 (1962).

Ab omnibus generibus in tribu inclusis caulibus setulis aculeiformibus ferentibus, floribus infra insertionem foliorum superiorum exorientibus calyce in parte receptaculari densissime piloso valde differt.

Herba perennis effusa. *Caules* debiles tenues ramosi, tuberculis remotis magnis praediti, tuberculi setulos aculeiformes robustos plerumque ferentes. *Folia basalia* nulla. *Internodia caulina* longa, folia alterna, unumquidque saepe folio multo minore in axillo ferens, omnia (suprema excepta) petiolata. *Petiola* alata. *Flores* solitares, juxta vel paulo infra insertionem petiolorum foliorum superiorum dispositi, sic racemam foliosam formantes. *Pedicelli* longissimi filiformes in caulem decurrentes. *Calyx* ad 4/5 divisus, lobi ovati integri acuti, pars inferior indivisa receptacularis densissime pilosa, alibi multo minus pilosus. *Corolla* caerulea, interdum alba, breviter campanulata; tubus limbus subaequans, limbus ad faucem leviter expansus, ad basem divisus. *Fornices* humiles, late triangulares ad semilunares. *Filamenta* brevissima. *Antherae* oblongo-ovoideae, in medio tubi insertae. *Annulus* nullus. *Stylus* brevis; stigma capitatum. *Nuculae* 4, ad gynobasem areola prismatico-triangulare parva super funiculum breve affixae, obovatae, facies ventralis glabra, dorsalis convexa ± compressa immarginata, dense glochidiato-aculeata.

Type species: *A. latifolium* (R.Br.) R. Mill (*vide infra*).

Austrocynoglossum latifolium (R. Br.) R. Mill, **comb. nov.**
Syn.: *Cynoglossum latifolium* R. Br., Prodr. Fl. Nov. Holl. 496 (1810).

Straggling, scrambling perennial herb. *Stems* weak, slender, sometimes extending to several metres, branched, somewhat flattened ± striate, with rather remote large tubercles which usually develop into strong retrorse prickle-like setae; tubercles becoming calcified; setae 0.5–1mm, rapidly tapering from a broad base. *Basal leaves* absent. *Cauline internodes* to 3cm, at least near flowering region; *leaves* alternate, all ± petiolate (uppermost with petiole reduced to a winged leaf base), each leaf often with a much smaller one in its axil. *Petioles* of median leaves 10–15(–18)mm, of upper (floral) leaves (0–)5–10mm, all winged, with retrorse prickles along the wing margins. *Lamina* ovate to broadly lanceolate, entire, mucronate, abruptly changing into winged petiole; venation camptodromous, longitudinal veins 5(–7), prominently raised beneath and bearing short stout prickles; upper surface of leaves sparingly covered with large multi-cellular tubercles, the cells oblong-hexagonal, in (1–)2(–3) concentric rings, hyaline at first but quickly becoming white and calcified; lower surface completely glabrous except on veins. *Flowers* solitary, arising at or usually slightly below each upper leaf. *Pedicels* long (10–25mm), filiform, decurrent on to stem, greatly elongating in fruit, clad with ± dense antrorsely adpressed setules and few retrorse prickles. *Calyx* c.2.5mm, slightly accrescent in fruit, lobed to 4/5, lobes ovate or broadly ovate, acute, densely hairy on undivided receptacular portion, much more sparsely so on outside of lobes, glabrous inside. *Corolla* pale blue, pale mauve or white, c.2–3.5mm; tube c.1–1.5mm, subequal to limb; limb slightly expanded at throat, divided to base into 5 broadly elliptic-oblong subtruncate or very obtuse lobes slightly broader than long. *Faucal scales* small, c.0.1–0.3 × 0.3–0.7mm, triangular or semilunar, slightly emarginate, as broad as lobes, papillate all over. *Anthers* oblong-ovoid, c.0.2–0.3 × 0.15–0.2mm, inserted in middle of corolla tube, their apices not reaching bases of scales. *Nutlets* attached to gynobase by small scar atop a short funicle c.1mm diam., obovate, c.2.5–3.5 × 1.5–2mm; ventral surface strongly flattened, immarginate, evenly and densely glochidiate-aculeate, glochids 0.5–0.7mm.

Flowering sporadically throughout most of year, mainly October-April. By creeks and streams in rainforest, and by roadsides and occasionally on cultivated land, to c.1000m.

Type: [AUSTRALIA] Port Jackson [Sydney Harbour], *Robert Brown* s.n. (holo. K, iso. E).

AUSTRALIA. Queensland. Burnett District, Kingaroy, 17 iv 1947, *L. S. Smith* 3096 (K). Near (chiefly N of) Moreton Bay, from Glasshouse Mountain to Mt Flinders and Stradbroke Island, *Strange* 1850–1 (K). Moreton District, State Forest adjoining Mt Glorious National Park, rainforest, 27°01'S,152°04'E, 28 xi 1977, *R. A. Lebler & L. Durrington* s.n. (K). Moreton District, Mistake Mountains, in rainforest, common near soakage patches along roadside, fruits pinkish or white, *L. S. Smith & L. J. Webb* 3646 (K). Mt. Ballow, MacPherson Range, soak in rainforest, 3 iv 1953, *R. Melville & T. Hunt, Melville* 3600 (K). New South Wales: Clarence River, *F. Mueller* (K); Tambara Road, 25 mi E of Tenterfield, rainforest, creeping, flowers pale china blue, 2700ft, 14 iv 1963, *E. C. Macdonald* 282 (K). Banks of Paterson River, x 1804, *R. Brown* 2936 (BM, K). Macquarie Rivulet, foot of Macquarie Pass, 3 iv 1966, *E. J. McBarron* 12320 (K). Upper Williams River, 11 xi 1936, *L. Fraser & J. Vickery* 7694 (K). Mount Tomah (Blue Mts.), 26 iii 1952, trailing herb, growing on edge of rainforest creek, basalt, 930m, 26 iii 1952, *M. Tindale & E. F. Constable* 1937 (K). Jenolan Caves Road, 975 m, 10 iii 1950, *E. F. Constable* 11844 (BM, K). Kanangra Deep, Kanangra, 10 mi SE of Jenolan Caves, scrambling herb, occasional near rocky falls in deep gorge,

fls. pale mauve, 650 m, 23 v 1965, *E. F. Constable* 5869 (NSW 78746, K). 'Green Scrub', Bilpin via Mountain Lagoon, 33°28'S, 150°38'E, scrambling herb to 20cm, common in wet sclerophyll forest, 7 v 1978, *R. Coveny* 10131 & *P. Hind* (K). Summit of Cambewara Range, S Coast NSW, on cultivated ground, 15 vi 1929, *F. A. Rodway* s.n. (K). Tallagonda Shire, Reedy and Moodon Creek, Marble Arch, 2000ft, 9 ii 1975, *P. van Royen* 10690 (K). Tallagonda Shire, Neringla Creek Caves, 9 mi SSW of Major's Creek, S Tablelands, 2300ft, limestone outcrop, frequent in sheltered places amongst shrubs and grasses, straggly bright green perennial with white to pale blue flowers, 19 iii 1968, *L. G. Adams* 2061 (K). Bellmore Falls, Robertson, 22 viii 1966, *E. J. McBarron* 12922 (K). c.2 mi E of Robertson, Southern Highlands, c.2540ft, lush roadside growth, in shade of *Acacia melanoxylon*, gregarious massed low herb, fls. mauve to almost white, yellow at edge of throat, 14 iv 1964, *R. Pullen* 4044 (K). On bank of Kangaroo River, 5 mi from the junction with Shoalhaven River, 1 v 1938, *F. A. Rodway* 2714 (K). Bendethera Caves 20 mi W of Moruya, limestone in caves, 450m, 10 v 1966, *E. F. Constable* 6871 (NSW 100956, K). Victoria. Latrobe River, *F. Mueller* (K). Ferntree Gully, 25 i 1896, *A. Morrison* s.n. (E)*. Fernshaw, *C. Walter* (BM). Waterloo, Gippsland, iv 1884, *P. Walter* (E)*. Dandenong Hills, 7 iii 1871, *A. Morrison* (E). Port Phillips, *R. Gunn* (K).
TASMANIA. Circular Head, *R. Gunn* (K),

Austrocynoglossum latifolium is widely distributed in forests throughout the coastal regions of the states of Queensland (Bailey, 1901), New South Wales (Beadle et al., 1982), and Victoria (Ewart, 1930; Willis, 1972). It also occurs in Tasmania (Curtis, 1967). Eichler (1965) comments that an old record of this species from the extreme SE of South Australia by Eckert needs confirmation, there being no supporting specimen. The Australian vernacular name is 'Forest Hounds-tongue'.

The typical habitat of *A. latifolium* is rainforest, on damp soil beside creeks and streams, often within reach of the spray from waterfalls, and frequently near or even in caves. It seems to prefer well-drained, limestone or basaltic soils.

A. latifolium is very distinct morphologically and in general habit is quite unlike any species of *Cynoglossum* L. Several aspects of its morphology are clearly adaptations to its forest habitat, e.g. the large dark green leaves with only thinly scattered tubercles (cf. *C. germanicum* Jacq. of C European woodlands), the long straggling stems which cling to neighbouring vegetation by means of the prickle-like setules, and the indeterminate inflorescence of solitary flowers borne near or usually below leaf-like bracts. This type of inflorescence is unknown in *Cynoglossum* (even taken in its broadest sense), which has terminal, determinate normally paniculate or geminate, inflorescences composed of one or more scorpioid cymes which are usually ebracteate except rarely in the lowest flowers.

Austrocynoglossum differs from *Cynoglossum* s.l. in nutlet attachment. The development of a short obconical funicle is a most unusual feature, unknown in the European and N African members and very rare in the Asiatic and S American ones, some of which have sometimes been separated as the genus *Paracynoglossum* M. Popov (as earlier by myself: Mill & Miller, 1984). The reduced attachment scar near the apex of the funicle also differs from the typical situation in *Cynoglossum* s.l., in which the attachment scar usually occupies a large part of the ventral surface. The nutlets are free from the style, indicating a greater affinity with *C.* subgen. *Paracynoglossum* (M. Popov) H. Riedl, but there is no basal extension of the style to form an elevated gynobase. The minute style is in fact hidden by the nutlets, creating a condition reminiscent of *Omphalodes* Miller and quite unlike any species of *Cynoglossum* s.l.

Austrocynoglossum appears to be taxonomically isolated within the

Cynoglosseae. There is no affinity with the Australian species of *Cynoglossum* s.l., nor with the Malesian ones. The Mexican genus *Mimophytum* Greenman has a somewhat similar inflorescence type but very different ecological preferences, being adapted to a desert, not rainforest, environment. The lack of obvious close relationships with other genera in the tribe, together with its many distinctive features, are sufficient to warrant its separation as an independent, monotypic genus. The argument based on its morphological differences is further strengthened by the palynological and chemotaxonomical differences from *Cynoglossum* detailed below; no cytological information has been traced and it would be interesting to know whether the chromosome number is different to the 2n = 24 so prevalent in the rest of the *Cynoglosseae*. The limits between the European members of *Cynoglossum* and the rest of this large genus are more blurred and beyond the scope of the present paper.

Palynology

Pollen was prepared from herbarium material (indicated by an asterisk in the specimen citations above) following a technique similar to that employed by Barbier & Mathez (1973), and was examined and measured under the light microscope. Characters measured were P (length of polar axis), E (equatorial diameter), B (maximum breadth), and D (polar diameter); from these P/E and P/B ratios and an index of equatorial constriction, C (= E/B × 100) were calculated. Sample size was 10 grains in polar and equatorial views.

Description

Pollen oblong, dumb-bell shaped, equatorial constriction moderate (C = 84); heterocolpate, tricolporate, tripseudocolpate, with little distinction between colpi and pseudocolpi *Amb* hexagonal, with straight sides and acute angles, appearing ± peritreme. P = 13.5 (13.2–14.0) μm, E = 6.0 (5.5–7.0) μm, B = 7.1 (6.7–7.4) μm, D = 7.2 (7.0–7.4) μm. P/E = 2.25; P/B = 1.90 (pollen prolate). *Colpi* linear, bordered by furrow. *Pseudocolpi* also bordered by furrow. *Endoapertures* endopori, not linked equatorially. NPC = 345. *Sexine* smooth.

The pollen is similar to that of *Cynoglossum* subgen. *Paracynoglossum* in its general morphology but is appreciably larger than is usual in that taxon. The ratios of P/E and P/B are among the highest known in the tribe *Cynoglosseae* and the combination of relatively large size and high P/E and P/B ratios is only found in *A. latifolium*. This supports the morphological evidence for its separation at generic rank.

Chemotaxonomy

Three distinctive pyrrolizidine alkaloids have been reported from *A. latifolium* by Crowley & Culvenor (1962): latifoline ($C_{20}H_{27}NO_7$), latifoline N-oxide ($C_{20}H_{27}NO_8$) and 7-angelyl-retronecine ($C_{13}H_{19}NO_3$). All these alkaloids are unique to *A. latifolium* and are structurally unlike the alkaloids of *Cynoglossum* s.l. (cf. Culvenor, 1978). Thus, alkaloid chemistry furnishes additional evidence in support of the generic separation of *Austrocynoglossum*. The alkaloid 7-angelyl-retronecine has the same formula but a different structure to the *Heliotropium* alkaloid 7-angelyl-heliotridine, which has not been recorded from the tribe *Cynoglosseae*. The $C_{20}H_{27}NO_7$ formula and structure of latifoline is also apparently unknown elsewhere in the *Cynoglosseae*.

References

BAILEY, F. M. (1901). *The Queensland Flora.* Part IV. Hygrophyllaceae to Eleagnaceae. Brisbane. (Cynoglossum: pp. 1048–1049).

BARBIER, E. & MATHEZ, J. (1973). Contribution à l'étude des Cynoglossées (Boraginaceae): Pardoglossum, genre nouveau du bassin méditerranéen occidental. *Candollea* 28: 281–323.

BEADLE, N. C. W., EVANS, O. D. & CAROLIN, R. C. (1982) *Flora of the Sydney region.* Third edition. Franchs Forest, N.S.W. (Cynoglossum, p. 485).

BENTHAM, G. (1869). *Flora Australiensis.* Vol. 4: Stylidieae-Pedalineae. London. (Cynoglossum: pp. 408–410).

CROWLEY, H. C. & CULVENOR, C. C. J. (1962). Alkaloids of Cynoglossum latifolium R.Br. Latifoline and 7-angelylretronecine. *Austr. J. Chem.* 15: 139–144.

CULVENOR, C. C. J. (1978). Pyrrolizidine alkaloids:—occurrence and systematic importance in angiosperms. *Bot. Not.* 131: 473–486.

CURTIS, W. M. (1967). *The student's flora of Tasmania.* Part 3. Government Printer, [Hobart], Tasmania.

EWART, A. J. (1930). *Flora of Victoria.* Melbourne. (Cynoglossum: pp. 967–969.)

EICHLER, H. (1965). Supplement to J. M. Black's *Flora of South Australia* (second edition, 1943–1957). Adelaide.

MILL, R. R. & MILLER, A. G. (1984). Studies in the flora of Arabia IX: A synopsis of Paracynoglossum (Boraginaceae). *Notes RBG Edinb.* 41: 473–472.

POPOV, M. G. (1953). BORAGINACEAE. In B. K. SHISHKIN (Ed.), *Flora URSS* 19: 97–681. (*Flora of the USSR,* English translation: Jerusalem, Israel Program for Scientific Translations, 1974.) (Cynoglossum: pp. 657–673).

RIEDL, H. (1962). Bemerkungen über Cynoglossum coelestinum Lindl. und C. glochidiatum Wall. sowie Versuch einer Neugliederung der Gattung Cynoglossum L. *Öst. Bot. Zeitschr.* 109: 385–394.

WILLIS, J. H. (1972). *A handbook to plants in Victoria.* Volume II. Dicotyledons. Melbourne. (Cynoglossum, pp. 533–534).