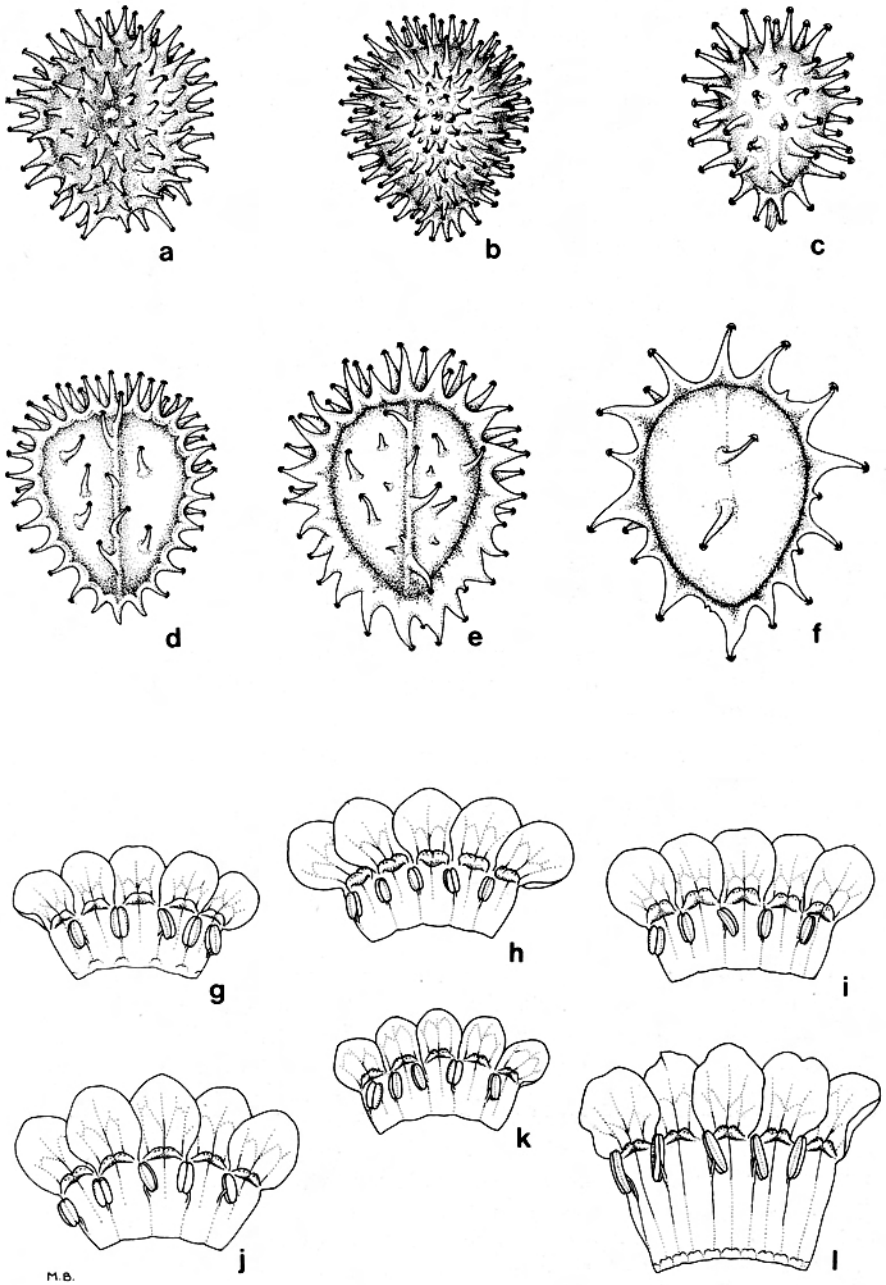



FIG. 1. Nutlets: a, *Paracynoglossum yemenense* × 8; b, *P. afrocaeruleum* × 8; c, *P. lanceolatum* × 12; d, *P. geometricum* × 8; e, *P. bottae* × 8; f, *P. sabirense* × 8. Corollas: g, *P. yemenense* × 5; h, *P. afrocaeruleum* × 4; i, *P. bottae* × 4; j, *P. geometricum* × 5; k, *P. lanceolatum* × 5; l, *P. sabirense* × 4.

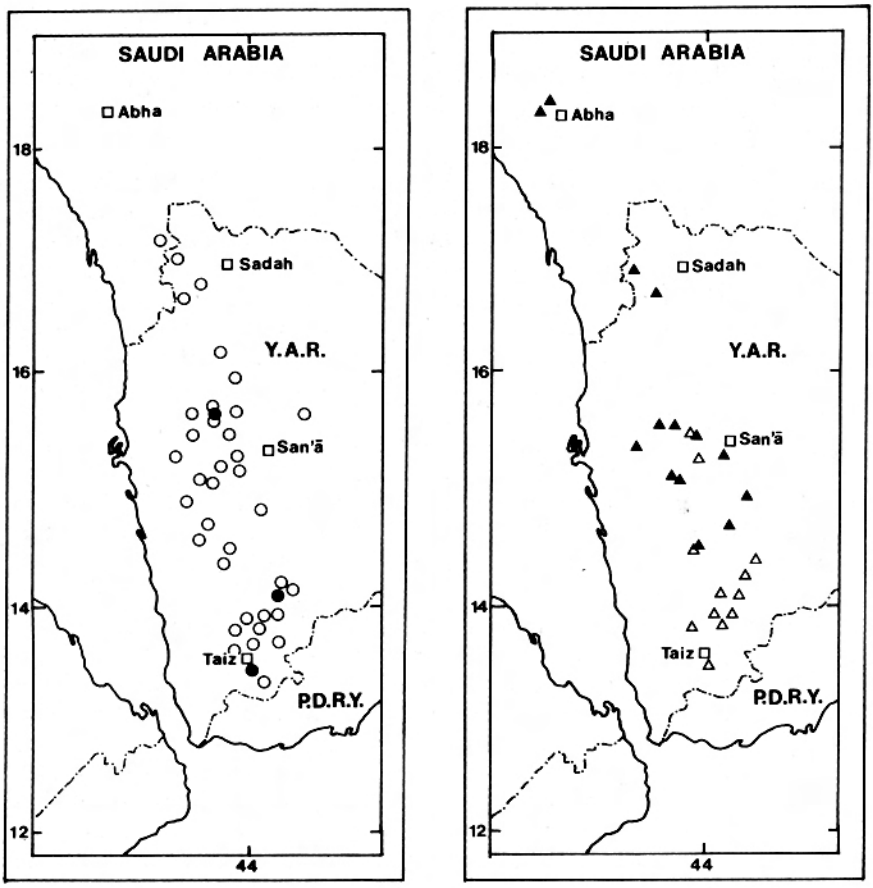



FIG. 2. Distribution of *Paracynoglossum sabirense* ●; *P. lanceolatum* ○; *P. bottae* ▲; *P. yemenense* △. (*P. bottae* also 20°31′ N 41°05′ E).

Type: [Yemen Arab Republic] Hadîe, *Forsskål* s.n. (n.v.).

SAUDI ARABIA. Jabal Fayfa, 100 km NE of Jizan, among shrubs on rocky hillside, 1615 m, 18 ii 1982, *S. Collenette* 3262 (E).

YEMEN ARAB REPUBLIC. Nr Al Qa'ala, J. Razih, Khawlan As Shan, 2000 m, 27 ix 1979, *J. Wood* 2936 (E); Shaharah, field margins, 2200 m, 22 ix 1978, *Miller* 179 (E); ibid., N slope to village, field margin, 2300 m, 22 ix 1978, *Miller* 192 (E); J. Nabi Schwaib, S ridge to summit, rocky slopes and terrace walls, 3000 m, 20 ix 1979, *Miller* 151 (E); Menacha, Hajarah to Attarah, S facing rocky slopes, 2000 m, 12 x 1978, *Miller* 485a (E); J. Masar in the Haraz, 2600 m, 8 vi 1979, *J. Wood* 2834 (E, K); J. Schibam, Menacha, 2400–2600 m, 28 ii 1889, *Schweinfurth* 1752 (K); Sumara Pass, W facing gulley, 2600 m, 9 x 1978, *Miller* 425 (E); Wasab region, J. Hisn Madnan, rocky slopes, 2200 m, 16 ix 1978, *Miller* 113 (E); N side of J. Kuburu nr Gerger above Hadia in J. Raymah, 2000 m, *J. Wood* 2805 (E, K); above Suddah in Wadi Banna, 2500 m, 29 v 1979, *J. Wood* 2768 (E); Mashwara, on the Ibb–Udayn pass, 2500 m, *J. Wood* 75/465 (BM);

Ibb region, c. 35 km N of Taiz, around Dhisufal, 1800–2100 m, 20 x 1975, *Hepper & J. Wood* 5903 (K); J. Sabir, 1837, *Botta* s.n. (K); J. al Amal, Otomah, 2500 m, 18 x 1979, *J. Wood* 2989 (E); below Ban-an, 2900 m, 19 ix 1979, *J. Wood* 2915 (E); nr the hospital, Turba, 1900 m, 26 x 1974, *J. Wood* 74/162 (BM).

*P. lanceolatum* is the most widespread of the Arabian species of *Paracynoglossum,* extending from Arabia to South Africa and eastwards to India. Previously, a very broad view was taken of this species in Arabia, but we have restricted the name to plants with small immarginate nutlets readily separating from each other at maturity and with the ultimate pairs of inflorescence branches divaricate (i.e. not narrowly divergent as in the other Arabian species). *Miller* 151 is atypical in having larger nutlets, and branches less widely divaricate; it was growing near typical *P. bottae* (*Miller* 154–see below).

In N Yemen *P. lanceolatum* has a distribution typical of an 'escarpment plant', being very rare (only one record) east of the inner escarpment. It grows at lower altitudes than the other species, down to 1100 m, but reaches 3000 m. It is not closely allied to the other Arabian species, being nearer to certain Indian and Far Eastern species of the genus.

**2. P. bottae** (Deflers) R. Mill & A. G. Miller, **comb. nov.** Figs 1e, 1i, 2.
Syn.: *Cynoglossum bottae* Deflers, Voyage au Yemen 173 (1889).

Scabrid biennial herb. *Stems* 20–45 cm, simple or branched from below, scabrid, hairs antrorse in region of inflorescence, retrorse or patent below. *Leaves* lanceolate or oblanceolate, apex acute; lower 70–105 × 14–18 (–20) mm, base long-attenuate, ±petiolate; upper 15–40 × 5–16(–24) mm, ±sessile, base more rounded; indumentum spreading or patent, scabrid; venation of only one main vein, with no obvious lateral veins. *Inflorescence* a lax ebracteate panicle with acutely divergent branches. *Pedicels* lengthening and becoming recurved in fruit, 8–10 mm. *Calyx lobes* oblong-ovate, c. 2 × 1 mm, with short antrorse hairs. *Corolla* subrotate, white with blue centre, 3–5 mm long, lobes 1·25–1·5 mm × c. 2 mm, oblong-ovate. *Faucal scales* semilunar, emarginate. *Nutlets* 3·5–5 × 3–4 mm excl. glochids, 4·5–5 × 5 mm incl. glochids, marginate, separating with difficulty from gynobase at maturity; glochids blackish-tinged, on dorsal surface (disc) usually restricted to median keel; style obscure in fruit.

Syntypes: [Yemen Arab Republic] Hab. ad fauces montis Schibâm (Haraz), 2400–2800 m, *Deflers* 300, 363 (P).

SAUDI ARABIA. Between Abha and J. Sudah, 2600 m, 10 iii 1980, *S. Collenette* 2041 (E): Al Sudah, 15 km N of Abha, 2600 m, 14 iv 1979, *S. Collenette* 1380 (E); Asir Province, Al-Sawdah, 13 v 1977, *A. K. Nasher* H53 (E); Zabna nr Al-Sawdah, 31 i 1980, *A. K. Nasher* H30 (E); Shabwa village, J. Ibrahim, 15 iii 1982, *J. Grainger* 433 (E).

YEMEN ARAB REPUBLIC. Sadah–Khawlan track, Al Mejasin, 16°48′ N 43°23′ E, 6 ii 1979, *D. Wood* Y 1051 (E); J. Razih nr Al Qa'ala, 2000 m, 27 ix 1979, *J. Wood* 2935 (E); below Kuhlan, 2200 m, 26 iii 1981, *Miller & Long* 3223 (E); Bait Udhaqa, 20 km W of Amran under J. Miswar, 1700 m, *Miller* 246 (E); Bait al Alama, J. al Mahdad, 20 km W of Amran,

rocky slopes, 3000 m, 26 ix 1978, *Miller* 237 (E); between Kaukaban and Shibam, 2900 m, *J. Wood* 2756 (E); Hadda, 4 km SW of Sanaa, on terraces around town, 2400 m, 15 x 1978, *Miller* 566 (E); J. Nabi Schwaib, S ridge to summit, terrace walls, 3000 m, 20 ix 1978, *Miller* 154 (E); nr summit of J. Melhan, Shahir, 2300 m, 14 vi 1979, *J. Wood* 2862 (E); frequent around the Hisn nr the summit of J. Masar, Haraz, 2800 m, 8 vi 1979, *J. Wood* 2831 (E, K); Menacha, J. Schibam, overgrown terraced fields, 2700 m, 5 x 1978, *Miller* 381 (E); Nachl al Hamra, Kumain, NE of Dhamar, edge of irrigated 'Qat' field, 2600 m, 25 v 1979, *J. Wood* 2783 (E, K).

The application of the name *Cynoglossum bottae* Deflers has presented a problem. In SW Arabia there are two taxa which are possible candidates for the name. The first has marginate nutlets and white flowers with blue centres; the second has immarginate nutlets and blue flowers. Only one of the two syntypes has a fruit and this is rather immature. *Miller* 381 from the type locality of J. Schibam is very similar in facies to the syntypes of *C. bottae* and is of the first taxon. The immature nutlet on *Deflers* 300 is apparently marginate and consequently we have linked this taxon with the name *C. bottae*. Defler's description of the flower colour as 'yellow' is very misleading and certainly refers to the colour when dry. The second taxon, with blue flowers and immarginate fruits, we have separated as the new species *P. yemenense*.

In N Yemen *P. bottae* is a mountain plant of 2500 m and higher. It has a strong northern tendency, i.e. it is absent from the Ibb region and further south. A number of plants have similar distribution patterns in N Yemen, including *Galium yemenense* Kotschy, *Pavonia patens* (Andr.) Chiov., and *Festuca obturbans* St.-Yves. One collection (not on Fig. 2), *Grainger* 433, has considerably extended the range of *P. bottae* north to J. Ibrahim, 20°31′ N 41°05′ E.

The relationship between *P. bottae* and the African species *P. geometricum* (Baker & C. H. Wright) R. Mill needs consideration. The latter is blue-flowered, with larger, more distinctly marginate nutlets. It was considered by Brand (1921) to be a subspecies of *Cynoglossum lanceolatum* but his concept of that species is now considered to be unacceptably broad and heterogeneous. Baker & Wright (1906) had separated *P. geometricum* from *P. lanceolatum* on the nutlets having glochids confined to the margin and central keel, rather than being evenly scattered over the surface. Most African floras, e.g. Agnew (1974) and Robyns (1948–55), follow them and treat the two as distinct species. There would seem to be ecological justification for this view; Robyns (op. cit.) states that in the Albert National Park *P. geometricum* is nitrophilous and prefers humid habitats, while *P. lanceolatum* is a pioneer ruderal species. The necessary new combination is made below.

**Paracynoglossum geometricum** (Baker & C. H. Wright) R. Mill, **comb. nov.**
Syn.: *Cynoglossum geometricum* Baker & C. H. Wright in Thiselton-Dyer, Fl. Trop. Africa 4 (2):52 (1906).

**3. P. yemenense** R. Mill & A. G. Miller, **sp. nov.** Figs 1a, 1g, 2, 3c.