

# The genus *Buglossoides* (Boraginaceae) in southern Africa

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## ABSTRACT

The genus *Buglossoides* Moench, a member of the family Boraginaceae, subfamily Boraginoideae, tribe Lithospermeae, is revised for the *Flora of southern Africa* (FSA) region. *Buglossoides* comprises about seven species of annual, biennial or perennial herbs and subshrubs native to Asia, southern Europe and northern Africa. *B. arvensis* (L.) I.M. Johnst., a naturalized weed in many parts of the world, is the only member of the genus represented in the flora of southern Africa, presumably introduced with imported cereal seed. Although the similar polyaperturate pollen grains of *Buglossoides* and *Lithospermum* support the view that they are congeneric, they are retained as separate entities here. Diagnostic characters, a full description, various illustrations and a distribution map of *B. arvensis* in southern Africa are given.

## INTRODUCTION

In 1794 Moench established the genus *Buglossoides* (Boraginaceae/Boraginoideae/Lithospermeae), separating it from the closely related genus *Lithospermum* L. Ever since, the generic status of *Buglossoides* has been a matter of controversy. De Candolle (1846), Boissier (1879), Gürke (1897), Wright (1904), Riedl (1967) and Mabberley (1997) regarded the genus as congeneric with *Lithospermum*, not accepting or unaware of Moench's view. In 1954 Johnston published a taxonomic revision of *Buglossoides*. He used the corolla throat, decorated inside with five well-developed vertical lines of hairs, to distinguish *Buglossoides* from *Lithospermum*, which is characterized by a corolla throat lacking these hairs but bearing localized faucal appendages or groups of stipitate glands. *Buglossoides* was accepted by various authors like Ingram (1958), Fernandes (1972), Edmondson (1978), Qaiser (1979), Brummitt (1992), Al-Shehbaz (1991), Verdcourt (1991), Herman (1993), Retief & Herman (1997), Lebrun & Stork (1997) and Retief (2000), and this view is also taken here.

*Buglossoides* is a genus of about seven species, distributed primarily in the European portion of the Mediterranean region and in adjacent southeastern Asia, with a single species indigenous to China, Korea and Japan (Al-Shehbaz 1991). *B. arvensis* (L.) I.M. Johnst. is the only member of the genus represented in the flora of southern Africa, scattered across the region. *B. arvensis* most probably reached southern Africa with imported cereal seed. It is widespread as a naturalized weed in many parts of the world. As yet it is not known from the *Flora zambesiaca* region, but is recorded in Tanzania and North Africa. Fernandes (1971, 1972) reduced three *Buglossoides* species to subspecies of *B. arvensis*. How-

ever, typically *B. arvensis* differs from these taxa in its infundibuliform corolla (not hypocrateriform), a calyx that usually equals or exceeds the corolla tube in flower (not with calyx distinctly shorter) and in its distribution (not confined to the Mediterranean region). It is here recognized as a separate species. One of the three species concerned, *B. sibthorpiatum* Griseb., is regarded as conspecific with *B. arvensis* by Edmondson (1978) and Qaiser (1979).

De Candolle (1846) already cited Burchell 1686 under *Lithospermum arvense* L. Burchell collected his specimen at Kloof village in the Asbestos Mountains, Northern Cape in 1811. Wright (1904) in his revision of *Lithospermum* in *Flora capensis* cited several localities in South Africa where '*L. arvense*' had been collected. Bolus & Wolley-Dod (1904) also mentioned the occurrence of *Buglossoides arvensis* because Wolley-Dod had collected it at a few places on the Cape Peninsula. Although Wright (1904) and Ross (1972) cited Gerrard 230 for KwaZulu-Natal, *B. arvensis* is not recently recorded from the region.

In this paper, diagnostic characters, a full description, various illustrations and a distribution map of *Buglossoides arvensis* in southern Africa are given. The description is based exclusively on local collections. This paper forms part of a revision of the Boraginaceae for the *Flora of southern Africa* (FSA) which is currently in progress.

## MATERIALS AND METHODS

Herbarium specimens of *Buglossoides arvensis* housed in BM, BOL, E, GRA, K, NBG, NH, NMB, NU, PRE, PRU and SAM were studied to assess morphological variation as well as phenological and distributional attributes. Acetolysis of pollen followed the standard method of Erdtman (1960). For scanning electron microscope studies, samples were coated with gold and studied with an ISI-SX-25 SEM. Measurements of pollen grains were taken with the light microscope from acetolysed grains mounted in glycerine jelly.

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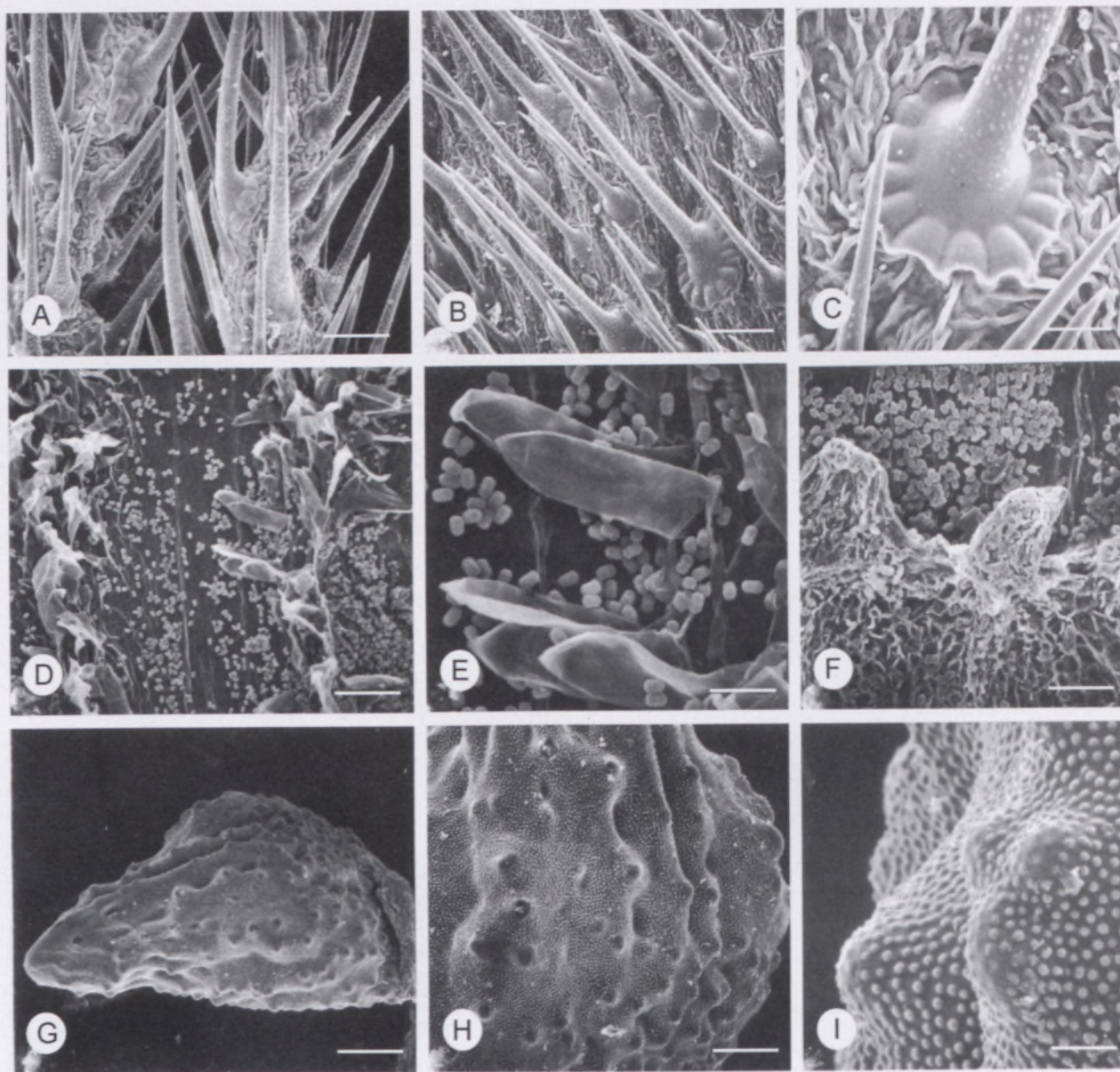


FIGURE 1.—*Buglossoides arvensis*. A–C, rigid setae: A, on calyx lobes; B, on upper leaf surface; C, basal part. D, E: inner corolla; D, lines of hairs; E, close up of hairs and pollen grains. F, part of annulus and pollen grains; G, nutlet; H, I, rugose, tuberculate nutlet surface. A–E, H, I, *Acocks 17740*; F, *Acocks 19035*; G, *Acocks 17805*. Scale bars: 10 mm. A, 122  $\mu$ m; B, 190  $\mu$ m; C, 492  $\mu$ m; D, 130  $\mu$ m; E, 36  $\mu$ m; F, 71  $\mu$ m; G, 528  $\mu$ m; H, 269  $\mu$ m; I, 59  $\mu$ m.

#### MORPHOLOGICAL CHARACTERS OF TAXONOMIC SIGNIFICANCE

##### Macromorphology

Species of *Buglossoides* are divided into two groups: perennials with corollas 12–20 mm long, nutlets smooth or punctate-reticulate, white or yellowish and shiny, and annuals with corollas up to 10 mm long, nutlets tuberculate, brownish or greyish and not shiny. *B. arvensis* belongs to the latter group. The species is distinguished from others in the genus by its calyx with a whitish indumentum and by the calyx lobes which are strongly accrescent in fruit, narrow, acute and covered with long, rigid setae (Figure 1A) and hairs (Leistner 2000: 759). The indumentum of the leaves is appressed-setulose with rigid setae, and the multicellular bases of the setae are 1-layered (Figure 1B, C). *B. arvensis* is distinguished from all species of *Lithospermum*, and from all other southern African representatives of Boraginaceae, by a

combination of the following characters: five longitudinal bands of hairs extending from the base of the corolla lobe downwards to the tips of the anthers, as is typical for the genus (Figure 1D, E); an annulus of scale-like lobes present near the base of the corolla tube (Figure 1F); and nutlets that are rugose and tuberculate (Figure 1G–I).

##### Pollen

Pollen of *Buglossoides arvensis* is isopolar and prolate, with  $P = 12.5\text{--}18.8\text{ }\mu\text{m}$  and  $E = 8.3\text{--}12.6\text{ }\mu\text{m}$ . In equatorial view, the grains are rectangular to elliptic, with the long sides more or less straight and the poles convex, but frequently collapsing inwards (Figure 2A, B). Ectoapertures are positioned at the equator, rhombic in outline, regularly granular and the margins are not thickened. Endoapertures are situated on or near the equator and are  $\pm$  oval and lalongate. The tectum is psilate. Orbicules are present.



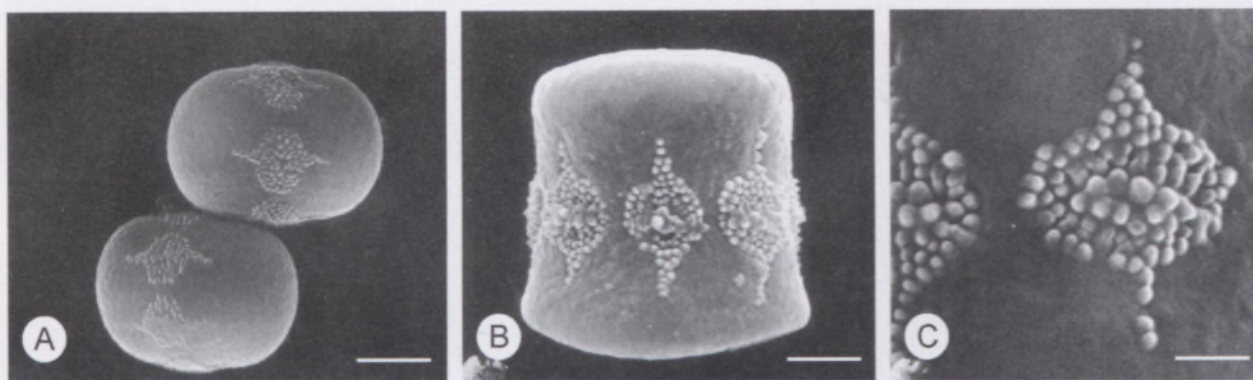


FIGURE 2.—*Buglossoides arvensis*. A, pollen grains; B, pollen grain with collapsed poles; C, granular aperture and psilate tectum. All grains acetolysed. A, Acocks 17805; B, C, Acocks 17740. Scale bars: 10 mm. A, 4  $\mu$ m; B, 2  $\mu$ m; C, 1  $\mu$ m.

The polyaperturate pollen grains of *Buglossoides*, similar to those of *Lithospermum*, support the merging of these genera. In their studies on pollen, Clarke (1977) and Diéz *et al.* (1986) accepted *Buglossoides* as a separate genus. Ahn & Lee (1986), in a palynotaxonomical study of the Korean Boraginaceae, did not accept *Buglossoides*. Johnston (1954) divided the genus into two sections and concluded that the pollen of section *Eubuglossoides* (e.g. *B. arvensis*) is isopolar, whereas pollen of section *Margarospermum* (e.g. *B. purpureo-caerulea* (L.) I.M.Johnst.) is heteropolar and shows similarity to pollen of *Lithospermum*. Pollen morphology thus suggests that whereas the section *Margarospermum* can perhaps be included in *Lithospermum*, members of the section *Eubuglossoides* are from *Lithospermum* and best retained in *Buglossoides*. The white, smooth, shiny nutlets of *Buglossoides purpureo-caerulea* similar to those of *Lithospermum afromontanum* Weim., for example, as opposed to the rugose, tuberculate ones of *B. arvensis*, support Ahn & Lee's (1986) view. Heterostyly is absent in *B. arvensis* and a vast amount of pollen is released on to the corolla and between the lines of hairs (Figure 1D–F).

Pollen of southern African Boraginaceae is classified into seven pollen types (Retief & Van Wyk 1999). Two genera *Lobostemon* and *Echiostachys*, mainly confined to Western Cape of South Africa, and the two species of *Echium* introduced into southern Africa, are often regarded as belonging to the tribe Lithospermeae in the subfamily Boraginoideae (Johnston 1954). The triaperturate, heterocolpate pollen grains with a reticulate tectum found in these genera are very different from those of *Buglossoides* and *Lithospermum*, which are polyaperturate with a psilate tectum. Palynology supports the recognition of a separate tribe, Echieae, for *Lobostemon*, *Echiostachys* and *Echium*.

***Buglossoides* Moench**, Methodus plantas horti botanici et agri marburgensis: 418 (1794); R.Fern.: 87 (1972); Al-Shehbaz: 129 (1991); Verdc.: 79 (1991); Retief: 180 (2000). Type: *B. tenuiflora* (L.f.) I.M.Johnst.

*Lithospermum* L.: 132 (1753), pro parte.

The genus name is derived from *Buglossum* Miller, the name of a genus now reduced to a section of *Anchusa*

L., and *eidos* = appearance, alluding to the superficial resemblance of the two genera; the name *Buglossum* is derived from the Greek *bous*, an ox and *glossa*, a tongue, in reference to the broad, rough leaves (Al-Shehbaz 1991).

***Buglossoides arvensis* (L.) I.M.Johnst.** in Journal of the Arnold Arboretum 35: 42 (1954); Edmondson: 316 (1978); Qaiser: 82 (1979); Meikle: 1148 (1985); Tölken: 1152 (1986); Verdc.: 79 (1991); Gibbons & Brough: 204 (1992); Retief & Herman: 350 (1997). *B. arvensis* (L.) I.M.Johnst. subsp. *arvensis* sensu R.Fern.: 87 (1972). Type: Europe, *Herb. Linn.* 181/4 (LINN, syn.-PRE, microfiche!).

*Lithospermum arvense* L.: 132 (1753); A.DC: 74 (1846); Boiss.: 216 (1879); C.H.Wright: 24 (1904); I.M.Johnst.: 7 (1927); Levyns: 688 (1950); Levyns: 234 (1966); Jacot Guill.: 235 (1971); J.H.Ross: 298 (1972).

Illustrations: Qaiser: 83 (1979); Tölken: 1153 (1986); Verdcourt: 80 (1991); Gibbons & Brough: 205 (1992).

Annual herb up to 0.6 m high, greyish green, hispidulous-strigillose. *Roots* purplish red. *Stems* erect or decumbent, densely covered with appressed setae, 0.7–1.0 mm long. *Leaves* sessile, narrowly ovate or narrowly obovate, 15–45  $\times$  3–8 mm, somewhat clasping at base, apex acute or slightly obtuse, margin entire, densely setulose; setae rigid, with multicellular, 1-layered bases. *Inflorescences* terminal; cymes scorpioid, bracteate. *Calyx* divided almost to base into 5 narrow lobes; lobes with apices acute, strongly strigose, accrescent, up to 12 mm long in fruit. *Corolla* white, infundibuliform; tube cylindric, 5–7 mm long, throat with 5 well-differentiated, longitudinal bands of hairs extending from bases of corolla lobes downwards to tips of anthers; lobes 5, rounded or truncate,  $\pm$  2  $\times$  1 mm; annulus near base of corolla tube of scale-like lobes. *Stamens* 5, included, arising from corolla below middle of tube; filaments equal, shorter than anthers; anthers oblong, with short apical appendage. *Ovary* 4-lobed, 4-locular, gynobase disc-like; stigmas 2, subterminal. *Fruit* of 4 nutlets; nutlets erect, ovoid, flattened on dorsal side, keeled on ventral side, with  $\pm$  straight beak, 2.5–3.0 mm long, rugose, tuberculate, attachment scar basal or nearly so; fruiting pedicel  $\pm$  2.5 mm long. *Flowering time*: August to December. Figure 3.



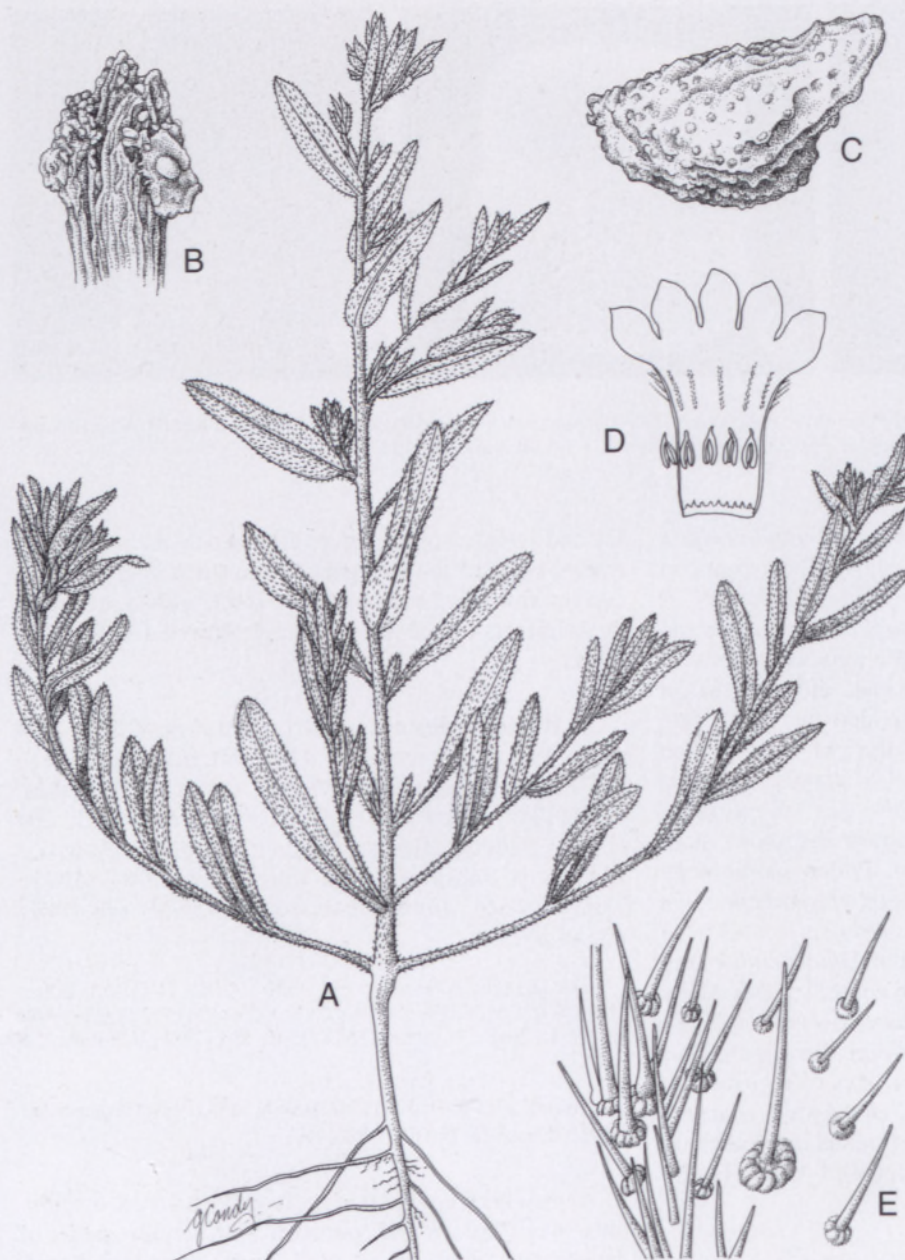


FIGURE 3.—*Buglossoides arvensis*. A, habit,  $\times 0.65$ ; B, stigma,  $\times 13.6$ ; C, tuberculate nutlet,  $\times 12$ ; D, corolla laid open,  $\times 3.3$ ; E, setae on upper leaf surface,  $\times 34.5$ . A, C–E, Acocks 19035; B, Acocks 17740. Illustrations by Gillian Condry.

**Distinguishing characters:** annual herb, branching from base, appressed hairy; corolla infundibuliform, white, hairy inside; stigmas 2, subterminal; nutlets rugose, tuberculate.

**Distribution:** North-West, Gauteng, Mpumalanga, Free State, Lesotho, Northern Cape, Western Cape, Eastern Cape (Figure 4); a native of Eurasia, naturalized as a weed in many parts of the world.

**Habitat:** weed of waste places; also in disturbed areas such as in and along edges of cultivated lands.

**Common names:** sheepweed, white ironweed, gromwell, corn gromwell, gromwell-corncockle, puccoon; naelbossie, naaldjiebossie, nagelbossie (Afrikaans) (Smith 1966; Wells *et al.* 1986).

#### SPECIMENS EXAMINED (southern Africa only)

Acocks 17740 K, PRE; 17805 PRE; 19035 K, PRE; 40897 PRE. Acocks & Roux 15948 K, PRE.

Bolus 101 BOL; 122 K; 274 GRA; 9201 BOL. Bradfield 200 PRE. Burchell 1686 K.

Dieterlen 1290 PRE.

Flanagan 1629 K, PRE. Fourcade 941 BOL, GRA.

Gerrard 230 K.

Holub s.n. K.

Jenkins TRV7232 PRE.

Leendertz TRV9748 PRE. Lovemore GRA-A1642 GRA.

MacOwan 1926 GRA. Marloth 7216, 9670, PRE40898 PRE. Mogg 15292 PRE. Muir 790 PRE.

Schlechter 3550 GRA. Sharpe 9145 PRE. Silk 52 PRE. Smith 884 PRE.

Tyson 378 GRA. Trollope GRA-A1640 GRA.

Wardle PRE40893 PRE. Wilman 19817, PRE59952 PRE. Wilms 1006 BM. Wolley-Dod 1551 K; 2794 BOL; 3611 BM, BOL, K.

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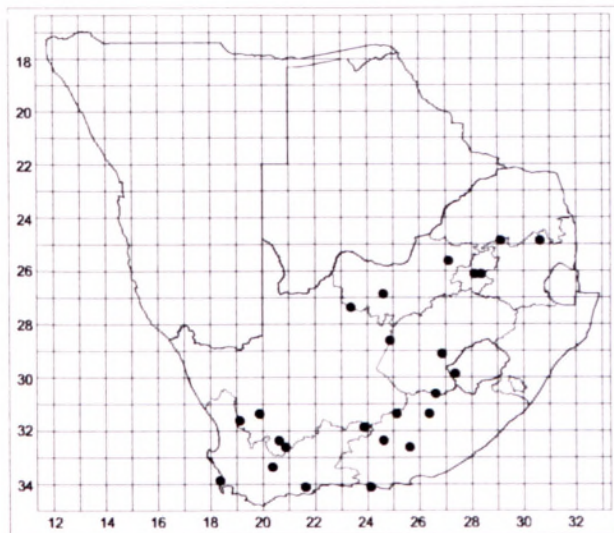


FIGURE 4.—Known distribution of *Buglossoides arvensis* in the Flora of southern Africa region.

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