A NEW *ANCHUSA* FROM ISRAEL

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A new *Anchusa* (*A. negevensis*) (Boraginaceae) from the Negev of Israel is described. It is referred to subgen. *Hormuzakia* (Guşul.) D. F. Chamb. on account of its helmet-shaped nutlets with a hollow base and with a basal dentate ring around the ventral side. Although the only other species in this subgenus (*A. aggregata* Lehm.) is annual, nutlet morphology is strikingly similar between these two taxa. The new species is a perennial, herbaceous plant with succulent roots and reproduces vegetatively by adventitious shoots from its roots. It is known only from a 0.2 hectare area of weathered, Neogene sandstone outcrop, situated with a sloping aspect and subject to high wind erosion, located 10km SE of Dimona, Israel.

Anchusa negevensis Danin, **sp. nov. Fig. 1.**

Affinis annuae *A. aggregatae* Lehm. sed perennis. Differt ab hac radicibus succulentis gemmas adventitias procreantibus, inflorescentia cincinnis laxis (non aggregatis) composita, pilis axis inflorescentiae appressis brevioribus (0.3–1.5mm longis), haud patentibus.

Perennis, 10–50cm alta, strigosa, setis crebris e basi tuberculata obtecta; radices succulentae; caules erecti et diffusi, ramosi; folia linearia, angusta, inferiora in petiolum attenuata, superiora sessilia; rami floriferi erecti, laxi, plerumque bifidi bracteati; bracteae lineares floribus longores, patentes sed saepe ad apicem sursum curvati; pedicelli floriferi 3–4mm, post anthesin 5–8mm longi, fructiferi reflexi; calyx pedicellis aequilongus vel brevior, indumento foliis simili praeditus, laciniis lanceolatis; corolla cyanea, parva, fornicibus exsertis oblongis papillatis; nuculae horizontales, transversim latiores, breviter rostratae, lateribus inaequalibus, alterum costa circulari, alterum laeviter vel parce verticaliter striatum, annulo basilari inflato, dentato.

Type: Israel, Negev Highlands, Yamin Plain, 10km SE of Dimona, sandy soil on a SW-facing slope subject to constant wind erosion, mostly in local small rills or heads of wadis, 21 iii 1994, *A. Danin* (holo. HUJ; iso. E, K).

Perennial herb, 10–50cm high, up to 70cm in diameter, densely hispid with upturned, white, short, subappressed bristles and (in the lower half) also longer patent bristles; all bristles tubercle-based. *Roots* succulent, giving rise to adventitious shoots. *Stems* many, erect, branched at base and above. *Leaves* rigid, linear, sessile, undulate margined, lower ones 20–110 × 1–5mm, some of them long attenuate, thus appearing petiolate; upper leaves shorter (20–50mm long). *Inflorescence* a lax, branched raceme, slightly elongated in fruit; bracts linear, similar to cauline leaves, shorter and narrower (5–30 × 1mm) but much longer than the pedicels; pedicels 3–4mm in flower, 5–8mm in fruit. *Calyx* 3–4mm long, divided to base; lobes lanceolate,

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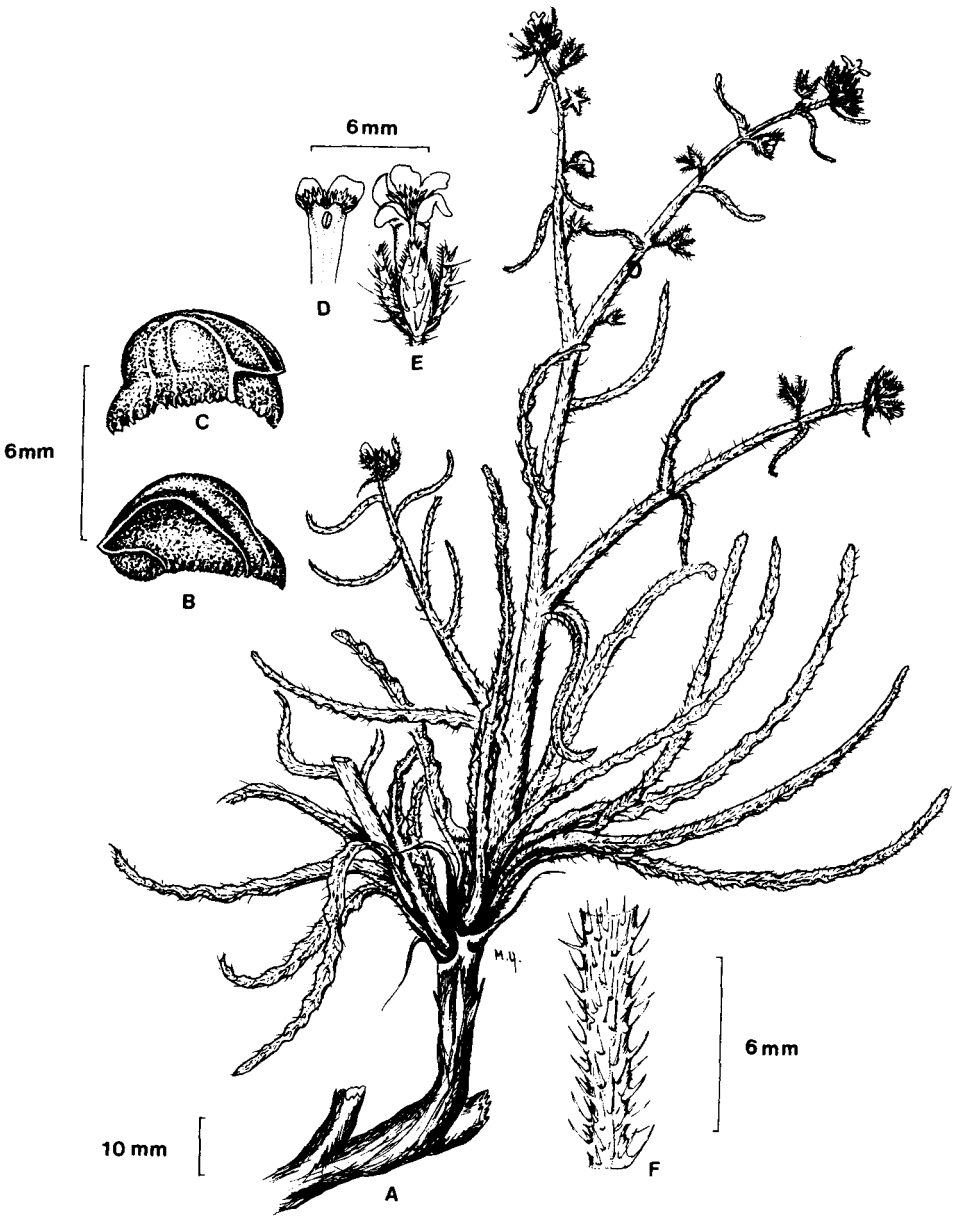

FIG. 1. *Anchusa negevensis* Danin. A, general view; B, nutlet, lateral view; C, nutlet, lateral view; D, corolla, longitudinal section; E, flower; F, leaf surface.

hispid, with bristles resembling those on leaves and stems. *Corolla* blue when young, becoming red after anthesis or after drying, hypocrateriform with 5 ovate papillate exerted scales; limb 5–6mm diam., tube straight, total length 6–8mm. *Nutlets* 1–4, (3–)5–6mm long, 2–3mm wide, 3–4mm high, horizontal, helmet-shaped and hollow

below the beak, with a prominent rib encircling a depression on one side and smooth or with a few straight vertical ribs on the other side, glabrous, glossy and somewhat granulate, hollow at base, with basal dentate ring around its ventral side. Fruiting pedicels reflexed. Fl. February–May.

Nutlet morphology is one of the most important diagnostic characters in the Boraginaceae. The helmet-shaped nutlets of *A. aggregata* have been regarded as the most important diagnostic character of *Hormuzakia* Guşul. as a genus separate from *Anchusa* L. (Guşuleac, 1928). Chamberlain (1977) reduced *Hormuzakia* to subgeneric level. The nutlet of *A. negevensis* closely resembles that of *A. aggregata,* especially in its helmet shape with a hollow part below the beak. However, it differs in being straight to only somewhat curved and not strongly curved as in *A. aggregata.* The deep horizontal cleft above the basal ring around the ventral side of the nutlet, typifying *A. aggregata* (Feinbrun-Dothan, 1978), does not occur in *A. negevensis.* The prominent rib encircling a depression on one side of most nutlets is not found in *A. aggregata.*

The inflorescence of *A. negevensis* is long, lax, and extends much above the cauline leaves; the flower pedicel is as long as the calyx, elongating after anthesis. However, the inflorescence of *A. aggregata* is overtopped by its upper cauline leaves and the flowers are sessile and aggregated into a compact congested inflorescence. The bracts of *A. negevensis* are much more prominent than those of *A. aggregata.* The leaves of *A. negevensis* are all linear. By this property it differs from the other species of *Anchusa* in Israel and the surrounding countries, all of which have lanceolate or even wider leaves.

The new species belongs to a well-defined ecomorphological type of plant found in sandy habitats of desert areas; it is adapted to habitats where constant sand removal by wind takes place (Danin, 1995). The morphological feature of this adaptation is the succulent roots with the ability to produce adventitious buds. In this character it resembles other Boraginaceae such as *Heliotropium digynum* (Forssk.) C. Chr., *H. arguzoides* Kar. et Kir., *Echiochilon fruticosum* Desf., and *Moltkiopsis ciliata* (Forssk.) I. M. Johnst. These taxa grow in areas of wind-eroded sandy deserts, and *E. fruticosum* and *M. ciliata* also occur in the Mediterranean coastal dunes of Israel.

The single known population of the new species is confined to a slope subject to constant wind erosion, which is part of a sandstone outcrop in the Yamin-Rotem plain. Such a habitat is rather rare in Israel because other sandy habitats are in either moister or drier parts of the country (Danin, 1992). In most of the Yamin-Rotem plain, sandstone outcrops are either covered with sand or exposed as flat rock outcrops, hardly forming any slope (Danin et al., 1964; Danin, 1983). It is possible that this species will also be found in Jordan, Egypt and Saudi Arabia in wind-eroded areas of sand sheets or dunes, where *Anabasis articulata, Hammada salicornica* or *Calligonum comosum* are the dominant species.

A low number of nutlets was found in the entire population; in a sample of

525 flowers from eight plants, only 51 fertile nutlets were counted. A preliminary estimate of pollen viability (with methylene blue in lactophenol, using 500 pollen grains derived from five flowers, each of a different individual) showed values of pollen stainability of 5%, 2.3%, 2.2%, 2.0% and 0.6%. This phenomenon deserves further investigation. Although low fertility may call for a search for a hybrid origin of *A. negevensis*, such an assumption should be rejected at present because of the lack of a parent that resembles this distinctive species. Although resembling *A. negevensis* in its nutlet morphology, *A. aggregata* is an annual, confined to sand sheets. The similarity in the shape of some trichomes to those of *A. strigosa* Banks & Sol. can hardly be regarded as a clue to the second parent in the case of a hybrid origin. There is no other candidate, among all *Anchusa* species of the region, which resembles *A. negevensis* in the other distinctive morphological features, for example its linear leaves, lax inflorescences, prominent long bracts, and adventitious shoots developing from succulent roots. No other species of *Anchusa* is adapted to the special habitat of *A. negevensis,* otherwise shared by several other Boraginaceae only in the Old World (Danin, 1995).

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REFERENCES

CHAMBERLAIN, D. F. (1977). *Anchusa.* In: DAVIS, P. H. (ed.) Materials for a Flora of Turkey XXXIV: Boraginaceae, Gentianaceae, Solanaceae. *Notes Roy. Bot. Gard. Edinburgh* 35: 298.

DANIN, A. (1983). *Desert Vegetation of Israel and Sinai.* Cana, Jerusalem.

DANIN, A. (1992). Flora and vegetation of Israel and adjacent areas. *Bocconea* 3: 18–42.

DANIN, A. (1995). Plants of desert dunes. In: CLOUDSLEY-THOMPSON, J. L. (ed.) *Adaptations of Desert Organisms.* Berlin: Springer-Verlag (in press).

DANIN, A., ORSHAN, G. & ZOHARY, M. (1964). Vegetation of the Neogene sandy areas of the Northern Negev. *Israel J. Bot.* 13: 208–233.

FEINBRUN-DOTHAN, N. (1978). *Flora Palaestina* 3: 90; fig. 147. Jerusalem: The Israel Academy of Sciences and Humanities.

GUŞULEAC, M. (1928). Die monotypischen und artenarmen Gattungen der Anchuseae. *Bull. Fac. Şti. Cernauţi* 2: 394–461.