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Three new *Cynoglossum* species (Boraginaceae) in the Mediterranean part of the Middle East

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SUTORÝ K. 2025: Three new *Cynoglossum* species (Boraginaceae) in the Mediterranean part of the Middle East. *Acta Musei Moraviae, Scientie biologicae* **110(1–2):** 11–28. – In the Middle East, the genus *Cynoglossum* has traditionally been represented in the literature and in herbaria by only two taxa: the relatively common Mediterranean *C. creticum* and, as the second species, either *C. nebrodense* or *C. montanum* – neither of which actually occurs in the studied region. However, based on the revised plant material available, three new endemic species, *C. levanticum* sp. nov., *C. cedrorum* sp. nov. and *C. abietinum* sp. nov. are described here.

Keywords. Boraginaceae, distribution, endemic, Israel, determination key, Lebanon, new species, Syria

Introduction

The subcosmopolitan genus *Cynoglossum* L., comprising approximately 80-100 species, has an unclear delimitation and is considered as para- or polyphyletic (CHACÓN & *et al.* 2013, WEIGEND *et al.* 2016, POURGHORBAN *et al.* 2020). However, a recent work by POURGHORBAN *et al.* (2025) sheds new light on the evolutionary history of this genus, introducing new genus-level synonyms. In the Mediterranean part of the Middle East, the Euro-West Asiatic species of *Cynoglossum* occur at the southern limit of their distribution range. There is no biogeographical connection between the Mediterranean species and those in West or South Africa. The discussed species belong – along with other Mediterranean taxa – to an independent Miocene dispersal event from East Asia, as opposed to the African and South Asian species (POURGHORBAN *et al.* 2025). The genus *Cynoglossum* is absent from Egypt, including the Sinai Peninsula (EL-GAZZAR 2015). In northern Jordan, the genus is represented solely by *C. creticum* Mill. (TAIFOUR & EL-OQLAH 2019), and in Israel (Palestine), it is likewise represented only by this species. *C. creticum* has been reported as occurring as far south as Jerusalem. Further southwards, only scattered records exist (BRAND 1921, DANIN & FRAGMAN-SAPIR 2025).

For Syria, Lebanon and Israel, only *Cynoglossum creticum* is reported by FEINBRUN-DOTHAN (1978). However, some sources list additional taxa, either as *C. nebrodense* Guss. (BOISSIER 1879, POST 1896, 1933, MOUTERDE 1984, AL HAKIM 1986) or *C. montanum* L. (GREUTER *et al.* 1984, DANIN & ORSHAN 1999, TAIFOUR 2014, TAIFOUR & EL-OQLAH 2019). Plants assigned to these taxa were examined in detail within this study.

Resolving the taxonomic identity of these plants in the Middle East is challenging. Field visits are currently impossible, and recent gatherings are extremely rare. Nevertheless, a study based exclusively on the herbarium material led to the discovery of three new *Cynoglosum* species confided to a narrow section of the mountain ridges in the eastern Mediterranean. Their ranges are determined by temperature and precipitation. All

three species described here as new occur within a narrow belt of suitable temperate climatic conditions that extends from the Anatolian Peninsula (Fig. 1), where the genus is represented by 13 species (Korüklü 2012, Sutorý 2016, 2024).

Materials and methods

The material was studied in the herbarium collections of B, E, G, HUJ, JE, K, LE, P, W, and Z; herbarium acronyms follow Thiers (2025). As expected, the largest numbers of specimens were found in the Jerusalem collection, while the most historically important specimens relating to the localities used by Boissier (1879) and Mouterde (1984), were located in Geneva.

A total of 324 nutlets were studied and measured on herbarium specimens, with the majority belonging to *Cynoglossum nebrodense* and *C. montanum*. Data previously collected and published by the author has also been used e.g. for *C. nebrodense* subsp. *lucanum*; Sutorý & Selvi (2012). Kruskall-Wallis test was used to determine differences in nutlets length and length-width ratio among the studied taxa. In case of statistically significant results, Dunn's test (Dinno 2024) was used for post-hoc comparison among taxa. All statistical analyses were performed in R 4.4.1 (R Core Team 2024). The graphic comparison of nutlet size and size ratios between studied species were generated with Statistica CZ (StatSoft 2002).

Only 51 nutlets represented the three newly described species. The material for *C. abietinum* was the most limited, as only four localities are known for this species, and just a single fruiting plant found in herbaria yielded only 10 measurable nutlets. Herbarium specimens with mature fruits are very rare: most plants were collected in spring, during the flowering period, and those gathered later in the season are often seriously damaged. Additionally, contemporary or recent material is scarce. All specimens cited below were physically examined by the author. In addition, records published by Mouterde (1984), supported by herbarium specimens, have also been accepted.

The distribution map was created using Google Earth Pro, and the climatic zones were classified according to Kottek *et al*. (2006) and Peel *et al.* (2007). Internet resources such as the Flora of Israel Online (Danin & Fragman-Sapir 2025) of the Jerusalem Botanical Gardens were also consulted.

Results and discussion

The presence of *Cynoglossum creticum,* common in the Mediterranean region, has been confirmed in the Middle East (cf. POWO 2025), though it occurs here at the southernmost limit of its distribution range. This species can be easily distinguished even in flower by corolla (light blue when mature, violet when young), which exhibit conspicuous reticulation of deep blue or purple veins. Identification is also straightforward when the plants are in fruit: the nutlets are rounded in outline, disc (abaxial side of nutlets) convex, and densely and evenly covered with glochidia. Therefore, it was not compared with any new species in this paper.

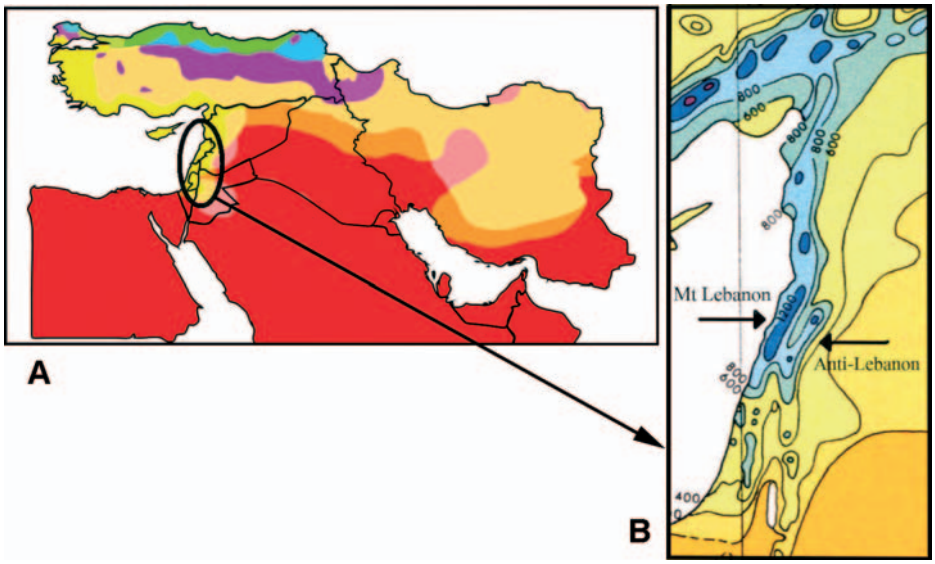

Fig. 1. (A) Climatic conditions of the Middle East with marked area of interest. Köppen-Geiger climate type after Peel (2007). Yellow – temperate, dry and hot summers; red and light violet – arid climate. (B) Precipitation in the Levant (according Zohary 1974).

In contrast, neither of the two other species reported from the study area, i.e. *Cynoglossum montanum* and *C. nebrodense*, have been confirmed here. Instead, three new endemic species have been recognized and newly described. The possibility of their confusion with *C. montanum* and *C. nebrodense*, along with their diagnostic features, is discussed below.

The range of *C. montanum* extends from Spain to northwestern Turkey (Sutorý 2007). The main differences between C. *montanum* and the three newly described species lie in the flowers and nutlets. The nutlet length of *C. montanum* varies considerably (5–7.5 mm) (Fig. 2A). A key distinction is the absence of small protuberances on the disc in *C. montanum,* as well as its larger corolla limb (up to 6.5 mm), compared to the smaller limbs in all of the newly described species.

Some authors (e.g. Boissier 1879, Post 1933, Mouterde 1984, Al Hakim 1986) have also reported *Cynoglossum nebrodense* in the study area. This species was originally described from Sicily, and its occurrence is scattered from southern Italy through Greece (Euboea) to southern Turkey (Cilician Taurus). In southern Italy, an endemic subspecies, *C. nebrodense* subsp. *lucanum* Selvi & Sutorý (2012) occurs. The name *C. nebrodense* has traditionally been applied to plants in the Middle East. But distinguishing it from local taxa may be tricky. The nutlets of *C. nebrodense* are similar in size to those of *C. cedrorum*. They also share surface sculpturing. However, *C. nebrodense* differs in having longer glochidia, glabrous inside part of the calyx, glabrous upper side of the basal leaves, and it also has denser inflorescence. *Cynoglossum abietinum* differs more

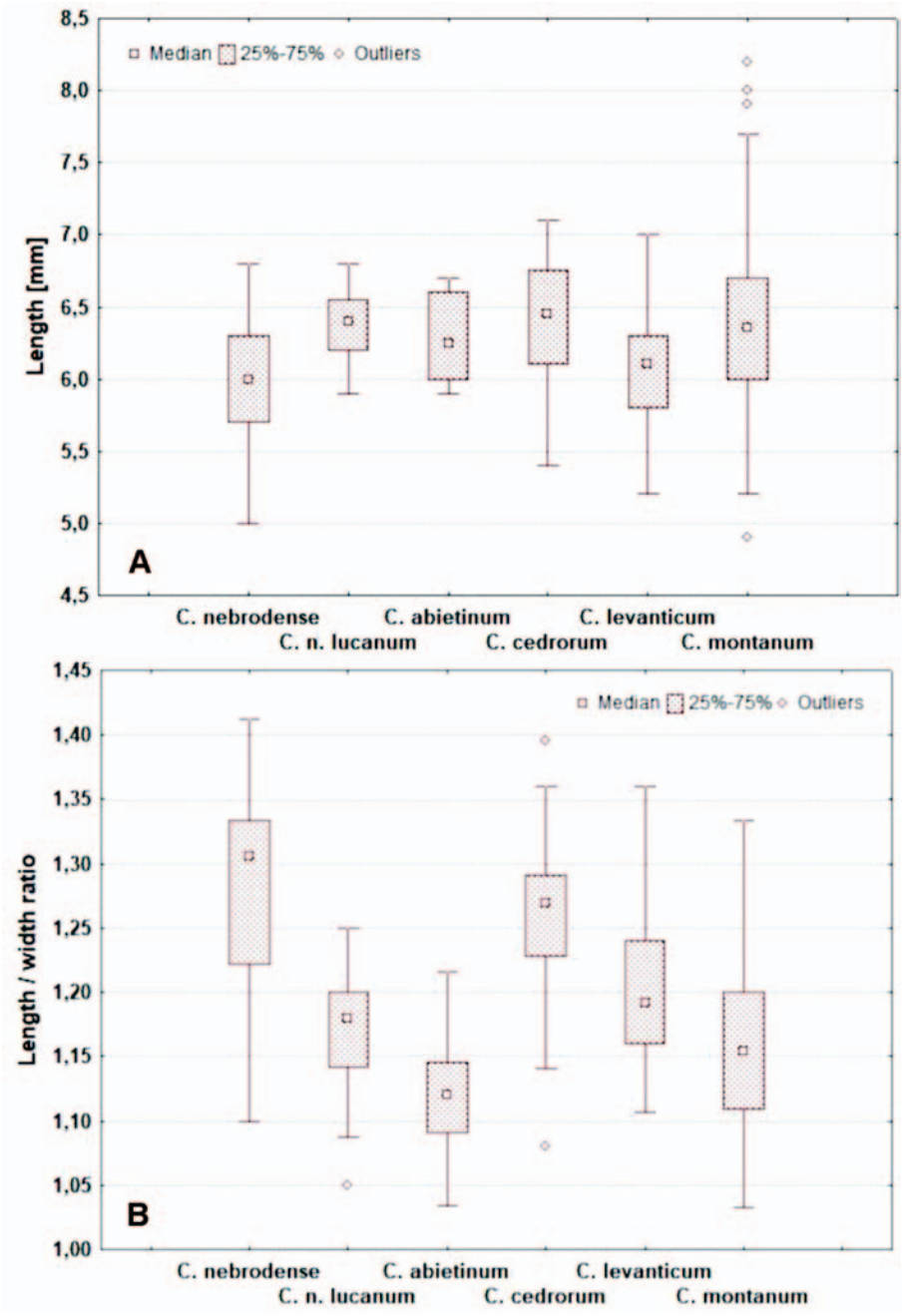

Fig. 2. Comparison of length (A) and length/width ratio (B) of nutlets in *C. nebrodense* (incl. both subspecies), *C. abietinum*, *C. cedrorum*, *C. levanticum*, and *C. montanum*.

distinctly: it differs in nutlet shape and size, as well as in the corolla tube/limb ratio, and in the presence of trichomes on the corolla (see below). Due to their similar features, the identification of the newly described species is primarily based on morphological and micromorphological characters, particularly the shape and size of the nutlets, the types of glochidia, (Fig. 3A), and the type of trichomes, their presence and density on the leaves (Fig. 4) and calyx.

Significant differences among studied taxa were found in both nutlet length (H_5 = 32.83, $p < 0.001$; Fig. 2A) and length-width ratio (H_5 = 103.94, $p < 0.001$; Fig. 2B). As revealed by the pairwise comparison, most taxa differed particularly in the length-width ratio (Tab. 1), while the nutlets´ length appeared to be significant in only a few cases (results not shown).

According to Zohary (1973), "moisture is the most decisive ecological factor" in this area, whereas "temperature is in general less decisive in conditioning plant life". Despite all three new species occurring in a region with the same climate type, they are not completely sympatric, which is consistent with Zohary's observation, based on precipitation patterns (Fig. 1B). *Cynoglossum abietinum* and C. *cedrorum* are found in the more humid Lebanon mountain range near the coast, where there are *Cedrus* and *Abies* forests. In contrast, *C. levanticum* is restricted to the drier conditions of the Anti-Lebanon range, where there is a lack of forest vegetation. The genus *Cedrus* is associated with the southernmost montane extension of coniferous forest in the Old World (Beals 1965). Notably, all three species exhibit a positive relationship to the warm temperate zone, which is characterized by warm (not hot) summers (see Kottek *et al*. 2006).

Hewett *et al.* (2022) published five maps illustrating the key moments of high and low rainfall in the Levant during the Holocene. Throughout most of the Holocene, precipitation in this region was more or less continuous and closely linked to Anatolia,

Table 1. Results of Dunn's tests for nutlet length/width ratios. Each cell contains Z-value (upper part) and p-value (lower part) for comparison of the respective pair of taxa. Statistically significant results are denoted by asterisk (*) and highlighted in bold.

	C. abietinum	***C. cedrorum***	***C. levanticum***	***C. montanum***	***C. nebrodense* subsp. *lucanum***
C. cedrorum	-4.673639 **<0.0001***				
C. levanticum	-3.200328 **0.0015***	1.857913 0.0431			
C. montanum	-1.644841 0.0577	5.426414 **<0.0001***	3.024154 **0.0023***		
C. nebrodense* subsp. *lucanum	-2.119752 0.0255	3.872935 **<0.0001***	1.781806 0.0467	-1.238467 0.1155	
C. nebrodense	5.626293 **<0.0001***	-0.583741 0.2797	-2.790136 **0.0044***	-8.635845 **<0.0001***	-5.602785 **<0.0001***

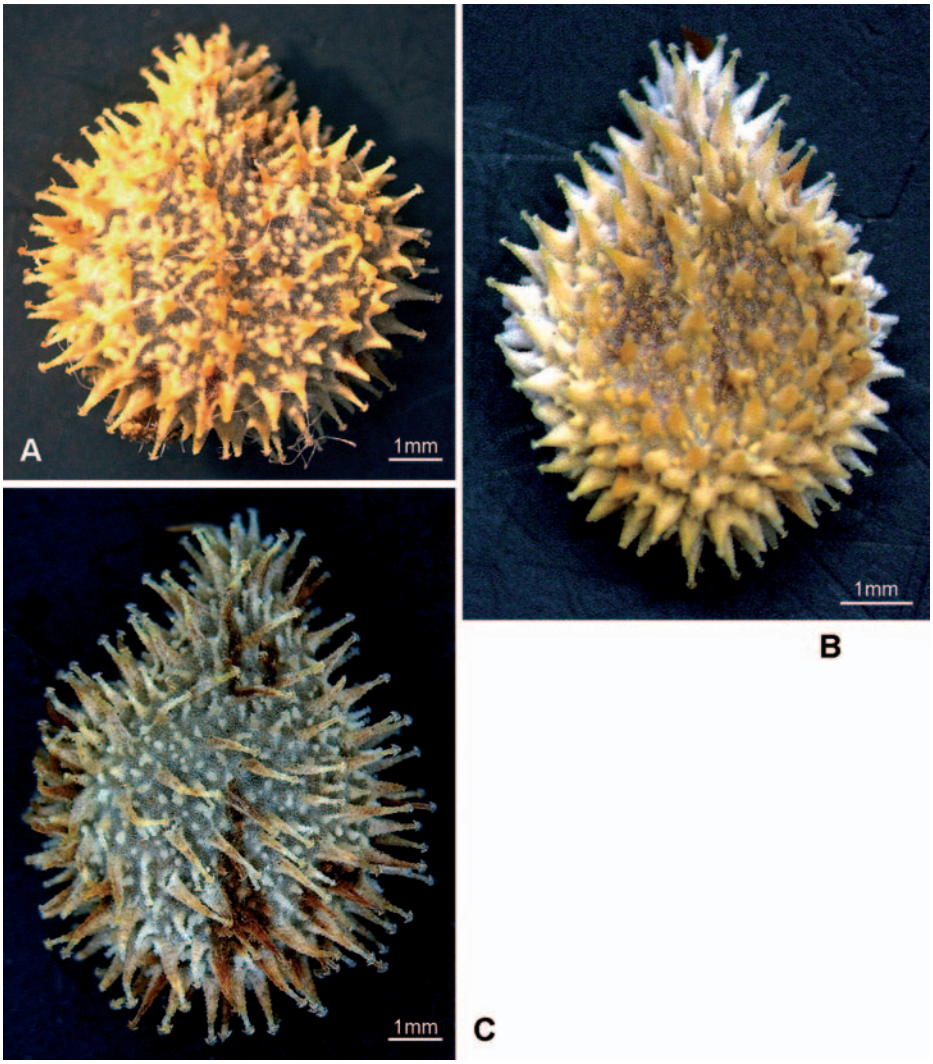

Fig. 3. Nutlets of here described species. (A) *Cynoglossum abietinum*. Nutlets very widely ovate, (5.9–)6.1–6.6(–6.7) mm long. Glochidia slim, 0.8–1 mm long, evenly dispersed on the surface. (B) *Cynoglossum cedrorum*. Nutlets widely ovate, (5.4–)6.1–6.8(–7.1) mm long. Glochidia conical, 0.5–0.6 mm long, unevenly dispersed on the surface. (C) *Cynoglossum levanticum*. Nutlets widely ovate, (5.2–)5.8–6.3(–7.0) mm long. Glochidia slim, 0.5–0.9 mm long, evenly dispersed on the surface.

which lies to the north. The only significant interruption, occurred around 5.19 ka BP, leading to the isolation of the Levant. It remains unclear whether this event has influenced the current distribution of these three endemic species.

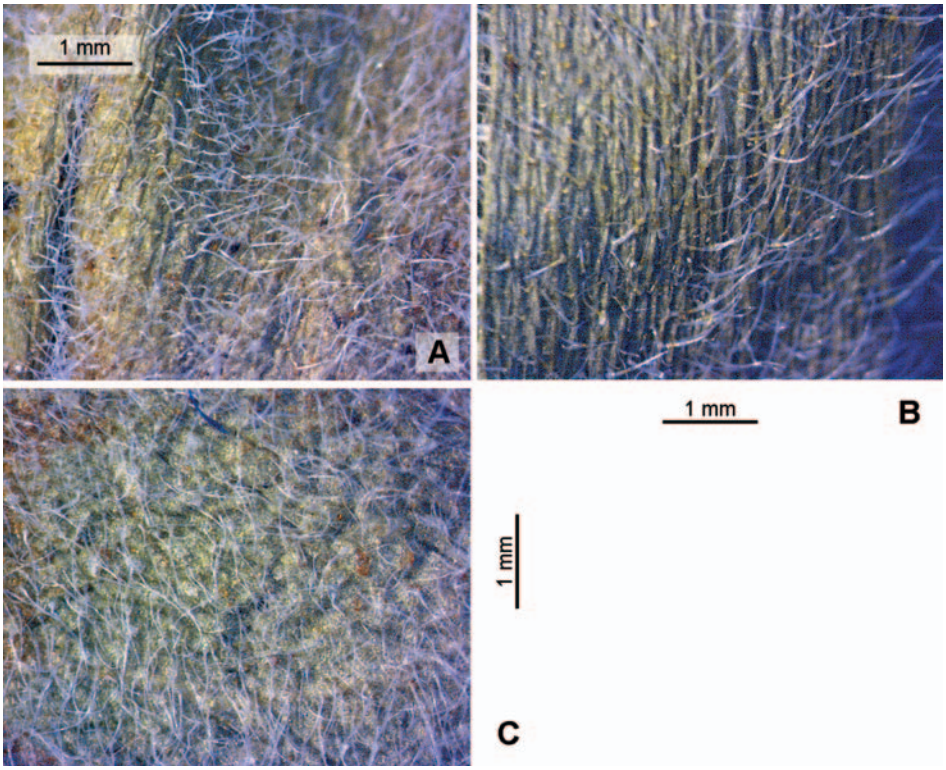

Fig. 4. Indumentum on leaves. (A) *Cynoglossum abietinum*, (trichomes patent, soft, slender, dense); (B) *Cynoglossum cedrorum*, (trichomes patent, stout); (C) *Cynoglossum levanticum*, (trichomes rather stiff, patent).

Taxonomic treatment

Cynoglossum levanticum Sutorý, sp. nov.

Holotype: ANTI-LEBANON. [Jabal ash-Shaykh, Har Hermon] S. Hermon: 4 km NNW of Majdel Chams, hard Jurassic limestone, 1650 m, leg. *A. Shmida*, 10 June 1976, det. A. Liston 1985, herb. HUJ ut *C. montanum*. VP-0001000023 HUJ (Fig. 5); 6 isotypes. (HUJ).

Description. Biennials?, up to 70 cm tall, often branched into multiple stems from the base (Fig. 6 C), stem with hard, lignified base, pilose, with up to 2 mm long trichomes, in the upper part only with shorter (0.5 mm long), stiff, appressed trichomes, sometimes many small branches presented in the lower part of the stems.

Leaves narrowly oblong, 8–10 cm long, 1–1.5 cm wide, acute, lower ones petiolate (–13 cm long). Trichomes, on upper side rather stiff, patent, up to 1 mm long, on lower side shorter, only 0.5 mm long (Fig. 4). On older plants, trichomes grow from a sclerotized group of cells.

Fig. 5. *Cynoglossum levanticum* Sutorý, sp. nov. Holotype (herb. HUJ 0001000023).

Inflorescence with up to 7–8 stiff branches of helicoid cymes (up to 25 cm long), sometimes bracteolate in the lower part, with up to 20 flowers, angle between the branches and stems acute.

Pedicels appressed or erect, 2–3 (–9) mm long.

Calyx segments oblong or narrowly lanceolate, 4 mm long in flower, 6 mm long in fruit, obtuse, inside with sparse, *ca* 0.5 mm long trichomes evenly on the entire surface.

Corolla small (tube 2 mm, limb 2.5–3 mm long), with distinct papillose faucal scales 0.7 × 0.5–0.6 mm (when dry) (Fig. 6 A, B).

Style on mature fruits 4 mm long.

Nutlets very widely ovate in outline, (5.2–)5.8–6.3(–7) mm long, L/W ratio (1.09–)1.12–1.22(–1.27), covered with over 0.5 mm long, on the abaxial side up to 0.9 mm long, slender, evenly dispersed glochidia, with many intermixed small protuberances (Fig. 3C). Cicatrix trullate, 2.5 mm long and 2 mm wide.

Flowering April to August (Danin & Fragman-Sapir 2025).

Eponymy. The name was chosen after the historical geographical *Levant region,* encompassing the territories of present-day Syria, Lebanon, Israel, Jordan and Cyprus.

Distribution. Mainly in the Anti-Lebanon mountain range and sparsely also in Mt. Lebanon at *ca* (1000–) 1500–1900 metres above sea level. (Fig. 7).

Specimens examined. ANTI-LEBANON: Faraya, 12 July 1946, *Frére Luis* (P); Lebanon: Mt Leben, above the hotel at Faraya, May 1970, *Hunt s.n.* (K); Syria /al Jabal ash-Sharqi/ June 1846, *E. Boissier* (G, K, LE, P); Syria-Antilibanus, *E. Boissier s.n*., June 1846, (K, LE, P); Env. Merj el Tawil (near Merj Hine) E of Hermel, 1800 m, 14 July 1934, "*Bot. Dep.*? (HUJ); Mont Hermon, May 1881, *Daibes-Fadouh* (G); Mt Hermon, Wadi Shibah, 21 July 1924, *N. Naftolsky s.n.* (HUJ); Mt Hermon, [wadi Shiba] Shib'ah to [wadi] Jinnah, dry wadi, shadow, 1200–1500 m, 27 July 1924, *A. Eig s.n*. (HUJ); Mt Hermon, Wadi Jinnah, 21 July 1924, *Smoly s.n.* (HUJ); Mt Hermon, above Ain Jinnah, 22 July 1924, *A. Eig s.n.* (HUJ); Mt Hermon, Wadi, 22 June 1924, *A. Eig s.n.* (HUJ); Mt Hermon, Ain Jinnah, to spring, 1500–1700 m, 21 July 1924, *A. Eig s.n.* (HUJ); Mt Hermon, env. of "lower cable Train Station?, 1550 m, stony ground, 30 April 1979, *M. Zohary s.n.* (K, Z); S. Hermon, lower cable car, 1600 m, 25 May 1985, *A. Liston, Y. Lev-Ari 7-85-372/3* (HUJ); S. Hermon Upper Nahal Arar, betw. the lower cable car to Mann Valley, 1500–1600 m, 24 May 1985, *A. Liston, Y. Lev-Ari 7-85-366/1* (HUJ); Mt Hermon: nr. lower teleferique (rakeval), 1700 m, 1 June 1987, *A. Danin s.n*. (HUJ); Mt Hermon, Neue Atir, 800 m, 26 April 1974, *D. Furth 313* (HUJ); Hermon: 6.5 km N of Majdal Shams, tragacanthic vegetation, 1950 m, 4 June 1986, *A. Liston, A. Shmida 496/1* (HUJ); Quala'at Jendel [*Qalaat* al-Jandal] (Mouterde 1984); Mt Hermon, Har Habushit [1955 m], 1700–1850 m, 21 May 2009, *A. Shmida s.n.* (HUJ); MONT LEBANON: Liban: Afka [Afqa, Apheca, Afeca] 1882, *E. Peyron s.n.* (G); Libanus Afka, 14 May 1882, *E. Peyron s.n.* (G, Mouterde 1984); Wadi Missiad, ca 1200 m, 11 June 1934, *J. Olami s.n.* (HUJ); Chahtoul, 15 April 1941, *P.F. Mouterde s.n.* (G). Ad oppidum Saihle [Zahlé], Arishan, Bairut, *C.G. Ehrenberg 1820–26* (G); Prope Bicfaya [*Bikfaya],* July 1894, *S. Ranzevolle* (W); Mt LEBANON: Betw. Bakafra [Bqaa Kafra] and Cedrus forest, above Bscherra [Bécharré], 1500–1800 m, 21 July1931, *A. Eig, M. Zohary s.n*. (HUJ).

Note. The assessment of the life cycle of *Cynoglossum levanticum* is disputable. The populations referred to as *C. montanum* are treated as annuals in the web portal Flora of Israel and adjacent areas (Danin & Fragman-Sapir 2025), even though biennial life cycle is common in the genus *Cynoglossum*. However, no herbarium specimen of this species contains sterile first-year rosettes. It is possible, though, that the rosettes appear late in autumn and have not been noticed. The hard, lignified bases of plants, together with the lack of sterile rosettes in herbaria, may indicate the perennial life cycle.

Fig. 6. *Cynoglossum levanticum* (A) Flowers (Photo Eli Livneh). (B) Dry corolla. (C) Plants found on the slopes of Mt. Hermon. (Photo Ori Fragman-Sapir).

Cynoglossum cedrorum Sutorý, sp. nov.

Holotype: LEBANON. In Libani borealis regionis alpine in cedreto supra Bscherre [Bsharri], 1925 m, Iter syriacum II (1910) No. 12186, leg. *J. & F. Bornmüller*, 3–5 July 1910, herb. B ut *C. nebrodense* Guss., *C. montanum* var. *asiaticum* Brand; isotypes: E, G, W (Fig. 8). http://herbarium.bgbm.org/object/B101258975.

Description. Biennials, sterile rosettes with oval, acute leaves 15 × 2.5 cm; Plants branched, stem 60 cm tall, often with more (up to 5) stems, with abundant, relatively stiff, up to 2 mm long trichomes.

Lower leaves 10 × 1.5 cm long, petiolate, oblong, upper leaves sessile, lanceolate, acute. Trichomes patent, stiff, up to 1.5 mm long, shorter (1 mm) on lower side (Fig. 4).

Inflorescence with 3–5(–10) branches of helicoid cymes (up to 25 cm long), lower ones with single bracteoles, angle of upper branches to the axis *ca* 70–90°.

Pedicels patent, later slightly incurved, up to 10 mm long.

Calyx segments narrowly oblong, obtuse, in fruit 5 × 1.5 mm**,** inside with sparse trichomes 0.2 mm long in the upper part and 0.4 mm long in the lower part.

Corolla 5 mm long.

Nutlets widely ovate in outline**,** (5.4–)6.1–6.8(– 7.1) mm long, L/W ratio (1.1–)1.2–1.3(–1.4), with unevenly dispersed conical glochidia on the abaxial side of nutlets, with thick base, 0.5–0.6 mm long, with intermixed small protuberances (Fig. 3B). Style 4 mm long in fruit.

Eponymy. The name was derived from the expected association with the distribution of the Lebanon cedar (*Cedrus libani* A. Rich.) in this region.

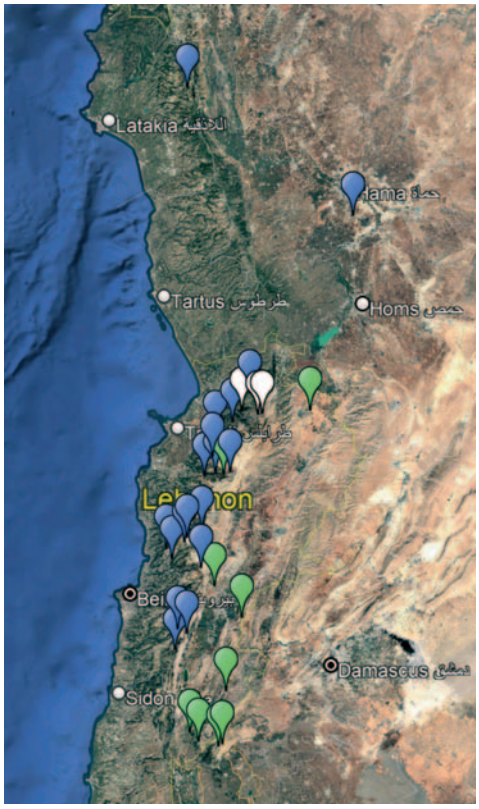

Fig. 7. Distribution of *Cynoglossum abietinum* (white dots), *C. cedrorum* (blue dots) and *C. levanticum* (green dots).

Distribution. The species occurs in the mountain range of Syria and Lebanon along the western coast of West Asia at elevations of 1000–1850 m a.s.l. Localities well coincide with the distribution of *Cedrus libani* (Beals 1965: 681) at an altitude of around (1200–)1500–1900(–2200) m a.s.l. (Zohary 1973) (Fig. 7).

Specimens examined. LEBANON: Arz Er-Rab, in glareosis ruderalibus prope cedretum, ca 1925 m, 12 June 1932, *G. Samuelsson 2317* (K); Mar Sarkis a Bcharré (Mouterde 1984). Aux lieux du Hadat[h el Jebbeh], 12 May 1866, *Anonymus 497* (JE); Neb el Hadid, *E. Peyron s.n.* (G); Liban, ou chemin des Cédres, May–June 1846, *E. Boissier s.n.* (G-Bois); Cédres du Bchari, 6 June 1954, *H. Pabot*, (G); Cèdre, *Daibes-Fadouh s.n.* (G); Giss el Haggiar [distr**.** Batroun] May 1879, *E. Peyron 565*, (G); Libani, in reg. alpina jugi Sanin, 1700 m, [Sannine, 33°56′5.12”N, 35°50′29.76”E] 15 June 1897, *F. Bornmüller Iter Syriacum 1167* (B, JE); Nebi Shirah (above Baynu), 4000–4500 ft, 1219–1372 m [Beino-Qboula], 14 June 1943, *P. Davis 6328*, (E, G, HUJ, K, W); Ain Zhalta, 31 August 1956, *H. Pabot s.n.* (G; Mouterde 1984); Jabal Barouk [Jabal el Barouk]: in declivibus lapidosis supra Ain Zhalta, versus cedretum, 1200–1300 m, 5 May 1965, *H. Roessler*; Maasser el Chouf (Jebel Barouk) 28 May 1923, *R. Gombault* (P); Jebel Baruk gride: 7497/7297, Dahar Mashab el Baqra top [Dahr Machraa el Baqara], W exposure, limestone and terra rossa, inside and around old Ceder grove. 1850 m, 25 June 1982 *A. Shmida*, (HUJ); Sir [Sir el Danniyeh], 1000 m, 4 June 1933, *R. Gombault* (P, Mouterde 1984) P.F. Mouterde 2362 (G); Environs d Eden [Ehden]. Juni 1896, *Blanche s.n.* (G); dominens Edenis 23 Juni 1894, *R.*

Fig. 8. *Cynoglossum cedrorum* Sutorý, sp. nov. Holotype (herb. B).

P. Reg… 1342 (G, Mouterde 1984). Libanus ad Eden. 1846*, E. Boissier s.n.* (G); Chahtoul 15 April 1941 Mouterde (G); Liban: Afka [Afqa, Apheca, Afeca, Afka] 1882, *E. Peyron s.n.* (G); Libanus Afka, s.d., *E. Peyron s.n.* (G, Mouterde 1984). SYRIA: Dj. Arbain [Jabal al-Arba'in]. Env. of Eriha [Arihah]. Field borders and rocks in a cut Quercetum. 27 June 1932, *A. Eig, M. Zohary s.n*. (HUJ); Slenfi [Slanfah], 6 May 1954*, H. Pabot s.n*. (G).

Cynoglossum abietinum Sutorý, sp. nov.

Holotype: LEBANON. Northern Lebanon, western slopes of Mount Lebanon, ENE of Tripoli ca 8 km SE of the village Fnaideg [Fnaydeg]; 1710 m, 34°25′13.2″N, 36°13′51.7″E, leg. *Y. Ch. Atallah*, 11 June 2003, herb. B ut *C. nebrodense* Guss. (Fig. 9). http://herbarium.bgbm.org/object/B101269560

Description. Biennials, stem up to 60 cm tall, with trichomes 1(–1.5) mm long, soft.

Basal leaves ovate, petiolate, *ca* 10 cm long, 1.5 cm wide; stem leaves oblong, sessile or with broad base, acute at the apex, on both sides with patent, soft, 1.5 mm long, dense trichomes (Fig. 4).

Inflorescence with over 30 cm long branches of helicoid cymes, with *ca* 20 flowers, without bracts or with a few small bracts in lower part of branches, angle between branches and stems acute.

Pedicels erect, 5 mm long.

Calycine segments narrowly oblong, obtuse, 2 mm long in flower, up to 5 mm long in fruit, and 1 mm wide, with trichomes on both sides.

Corolla small, tube 2 mm, equivalent or slightly longer than limb, limb segments erectopatent, 1.5–2 mm long (Fig. 10), outside in the upper part with sparse, caducous or fragile trichomes, faucal scales 0.5 × 0.8 mm.

Style in fruit *ca* 4 mm long.

Nutlets very widely ovate in outline, (5.9–) 6.1–6.6 (–6.7) mm long, L/W ratio (1.0–)1.1–1.1(–1.3), with trullate or widely trullate cicatrix, glochidia slim, 0.8–1.0 mm long, evenly dispersed with many intermixed small protuberances on the surface of abaxial part (Fig. 3A).

Eponymy. The name was derived from the expected association with the distribution of *Abies cilicica* (Antoine & Kotschy) Carrière (1855) in this region. Zohary (1973: 562) already mentioned the occurrence of this taxon in *Abietum cilicae* forests in a list of 20 species from the locality between Ein El Dib and Fnaideq, but under the name *C. nebrodense*. It was collected nearby under the same name by Atallach (2007). See the type specimen (Fig. 9).

Distribution. The species occurs in Lebanon in the northern part of Mount Lebanon, at elevations of 1200–1700 m a.s.l. in cedar forests with the southernmost occurrence of *Abies cilicica* (Beals 1965; Fig. 7).

Specimens examined. LEBANON: Northern Lebanon, Wadi Ain Dib [Ain el Dib] (near Dj. Qammouha [El Quamouaa]), W. of Fnédiq [Fnaydek], 1600–1550 m, Abietum, 15 July 1934, "*Bot. dep.*? ut *C. nebrodense* (HUJ); N. Prov., east of Fnaideq to Jaball Qammouaa. 1450 m alt. Limestone slope, shallow terra rosa soil, dominated by *Abies cilicica*. 16 May 1996, *F.N. Hepper 12031* (K); Wadi Hanuffa (W of Wadi Jehennam), near Talchima plain, 1200–1300 m. 11 July 1934, "*Bot. Dep*." (HUJ).

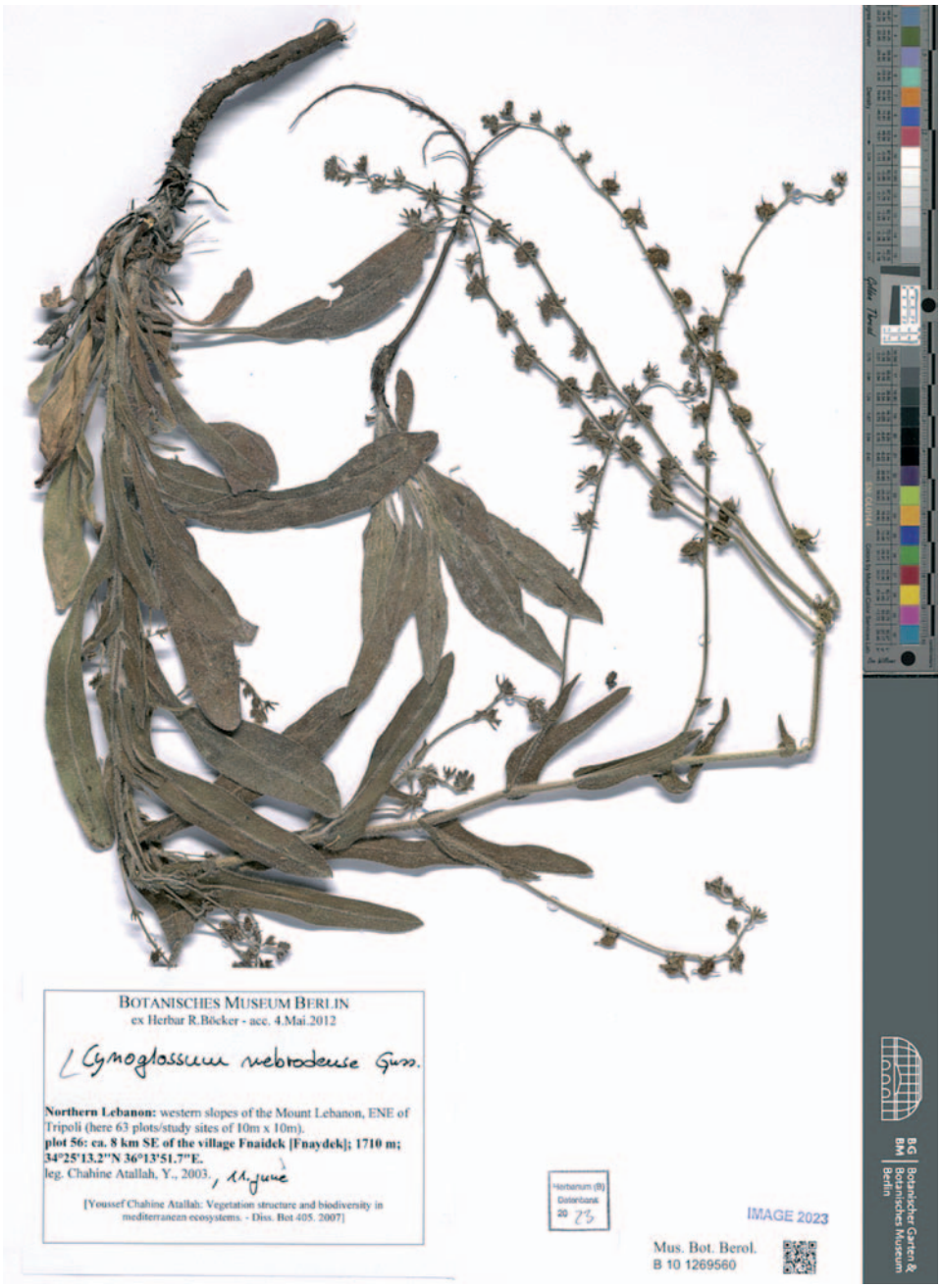

Fig. 9. *Cynoglossum abietinum* Sutorý, sp. nov. Holotype (herb. B).

Note. Turkish *Cynoglossum anatolicum* Sutorý, might be confused with *C. abietinum* due to their similar habit (only one main stem, not more as is usual in *C. levanticum* and *C. cedrorum*). However, *C. anatolicum* can be distinguished by its larger corollas, only widely ovate (not very widely ovate) nutlets, and a greater number of branches with more acute stem-branch angles. Its distribution is also more prevalent in northern Turkey, becoming less common towards the south (Sutorý 2024).

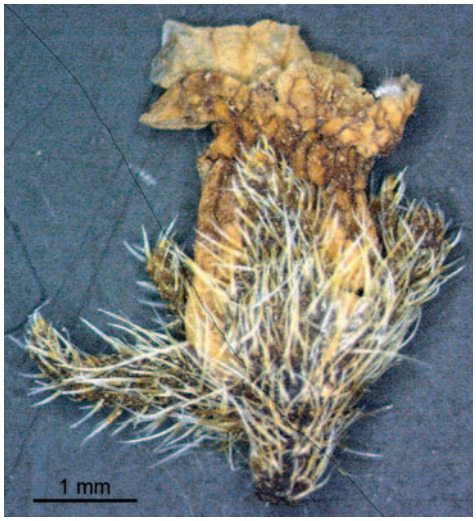

Fig. 10. Corolla of *Cynoglossum abietinum* (from the holotype), corolla limb is shorter than corolla tube.

Cynoglossum abietinum is characterised by two distinct characters. The first is the ratio of the corolla tube to the corolla limb lengths: the tube is either longer than or equal in length to the limb. Within the Cynoglossae tribe, this feature is only documented in *Cynoglossum clandestinum* Desf., a species found in North Africa (from Morocco to Tunisia), the Iberian Peninsula and southern Italy, as well as in the closely related genus *Solenanthus* (Brand 1921). *Cynoglossum magellense* Ten., a species endemic to the central and southern Apennines, also exhibits this characteristic, albeit less distinctly than *C. clandestinum*. A second typical feature of *C. abietinum* (and an even rarer character of this genus) that further reinforces the first is the presence of trichomes on the upper exterior surface of the corolla lobes. Trichomes on corolla are exceptional within the entire Cynoglossae tribe. Brand (1921: 6) noted them in only one case, again in *C. clandestinum,* whose corolla lobes are densely and prominently villous-barbate across their entire surface, with a corolla tube that is much longer proportionally than the limb. In specimens of *C. abietinum* from B and HUJ, the trichomes are inconspicuous, short, and sparse, and are restricted to the uppermost part of the small (1 mm long) corolla lobes. Similar trichomes occur in *C. magellense*, which also has a comparable corolla tube-to-limb ratio like *C. abietinum*, though it is larger in absolute sizes (4 mm tube vs. 4 mm limb). Thus, these two unique characteristics of the Cynoglossae tribe, (1) tube ≥ limb and (2) trichomes on the exterior of the corolla, are present in at least three species: the western Mediterranean *C. clandestinum*, the Italian *C. magellense*, and the eastern Mediterranean *C. abietinum*. This suggests their descent from a common ancestor with a broad distribution. Unfortunately, representatives of these taxa are missing in previously published phylogenetic studies (Chacon *et al*. 2017, Pourghorban *et al*. 2020).

Key to the *Cynoglossum* species in the Mediterranean part of the Middle East

1a Corolla light blue (when mature, violet when young), with distinctly dark-veined limb; nutlets widely ovate up to rounded, dorsally slightly convex, densely and evenly glochidiate, cicatrix (attachment scar) rhomboid, 2 × 2 mm, with thick border ..... ***Cynoglossum creticum***

1b Corolla red, without distinct veins; nutlets widely ovate or very widely ovate, dorsally flat, densely, evenly or unevenly glochidiate, cicatrix trullate or widely trullate, 2.5 × 2 mm, with thin border **2**

2a Plants with soft indumentum; corolla tube equal to slightly longer than limb, limb outside in the upper part with sparse trichomes (loop), nutlets very widely ovate, evenly glochidiate ..... ***Cynoglossum abietinum***
Biennial, pedicels adpressed or erect up to 9 mm long; inner side of the calyx with 0.5 mm long trichomes; corolla small, tube 2 mm long, equivalent or slightly longer than 1.5–2 mm long limb; nutlets very widely ovate in outline, (5.9–) 6.1–6.6 (–6.7) mm long, with trullate or widely trullate cicatrix, glochidia slim, 0.8–1 mm long.

2b Plants with more or less stiff indumentum; corolla tube shorter than limb, limb outside in the upper part without trichomes, nutlets widely ovate, evenly or unevenly glochidiate **3**

3a Pedicels appressed or erect, up to 9 mm long; glochidia slim, up to 0.9 mm long, evenly dispersed over the nutlets surface ..... ***Cynoglossum levanticum***
Biennials?, with trichomes of different lengths on the upper and lower sides of the leaves; corolla 5 mm long; nutlets widely ovate in outline, (5.2–)5.8–6.3(–7) mm long.

3b Pedicels revolved, 6 mm long; glochidia conical, 0.5 mm long, unevenly dispersed over the nutlets surface ..... ***Cynoglossum cedrorum***
Biennial, with more or less stiff indumentum; pedicels revolved, 6 mm long; corolla 5 mm long; nutlets widely ovate in outline, (6.1–) 6.2–6.8 (–7.1) mm long.

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