

A taxonomic revision of *Campanula* L. subgenus *Sicyocodon* (Feer) Damboldt and subgenus *Megalocalyx* Damboldt (Campanulaceae)

LLORENÇ SÁEZ^{1*} and JUAN JOSÉ ALDASORO²

¹Unitat de Botànica, Facultat de Ciències, Universitat Autònoma de Barcelona. E-08193, Bellaterra, Barcelona, Spain

²Real Jardín Botánico de Madrid-CSIC. Plaza de Murillo, 2, E-28014, Madrid. Spain

Received May 2002; accepted for publication October 2002

A taxonomic study of *Campanula* L. subgenera *Megalocalyx* Damboldt and *Sicyocodon* (Feer) Damboldt is presented here. Taxonomical, nomenclatural, morphological, chromosomal, geographic and ecological data are recorded for each taxon. Based on these data, one species is included in *C.* subgenus *Sicyocodon* and 12 in *C.* subgenus *Megalocalyx*. In addition, 11 lectotypifications of specific and infraspecific names are made, and a taxonomic key and descriptions of subgeneric and specific taxa are given. © 2003 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2003, 141, 215–241.

ADDITIONAL KEYWORDS: endemism – Mediterranean basin – phylogeography – pollination – taxonomy.

INTRODUCTION

The genus *Campanula* comprises c. 300 species, largely distributed in temperate areas of the northern hemisphere. *Campanula* includes annual and perennial plants. Annuals were included in sect. *Annuae* by Boissier (1875), but later were separated by Damboldt (1976) into four subgenera: *Megalocalyx*, *Sicyocodon*, *Roucela* (Dumort.) Damboldt and *Brachycodonia* (Fedorov) Damboldt. The subgenus *Roucela* includes plants lacking appendages between lobes of the calyx (Damboldt, 1978), and the monotypic subgenus *Brachycodonia* holds an intermediate position between *Campanula* and *Legousia* (Fedorov, 1957). Subgenus *Sicyocodon* and *Megalocalyx* are closely related and form a natural group. They have two synapomorphies in common: (i) the dichasial or subdichasial inflorescence, and (ii) the reflexed appendages present between the calyx lobes (Damboldt, 1976). These subgenera have been recognized by different authors as several other taxonomic ranks: as a subsection

(Fedorov, 1957; Rechinger & Schimann-Czeika, 1965), or as a section (Post & Kuntze, 1904; Charadze, 1949). The monotypic subgenus *Sicyocodon* can be easily differentiated from taxa belonging to subgenus *Megalocalyx* on the basis of the conspicuous, broadly campanulate corolla and very long exerted style (35–50 mm long). Unfortunately, the reported taxonomic affinities of subgen. *Sicyocodon* are speculative. On the other hand, plants included in subgenus *Megalocalyx* show tubular-campanulate or nearly rotate corollas, the style is smaller (4–15 mm long) and always included in the corolla. Some authors (Contandriopoulos, 1972, 1976, 1984; Gadella, 1966; Damboldt, 1978) suggested that *Sicyocodon* with its long exerted style probably holds a very isolated position in the genus, which is attributed to a different pollination syndrome related to flies, unique in the Campanulaceae (Damboldt, 1978). Plants included in the genus *Campanula*, and particularly those in subgen. *Megalocalyx*, are mainly pollinated by bees that become coated with pollen when they take the nectar. When the bee visits a flower in female-phase, the pollen is deposited on the stigma while the bee searches for nectar. Other non-specialized pollen-feeding insects were observed, such as small flies and beetles. Nevertheless, they are less

*Corresponding author. E-mail: llorens.saez@uab.es

important as pollination agents. In the absence of insects, autopolination is common, being probably more frequent in annual plants with small flowers (Nyman, 1993; Proctor, Yeo & Lack, 1996).

On morphological grounds, subgen. *Sicyocodon* is related to subgen. *Megalocalyx* with which it shares most of the vegetative characters and the basic flower features. However, this could be simply due to a convergence. In the absence of more conclusive evidence (molecular or anatomical) for subgeneric delimitation in the genus, we prefer to accept subgenus *Sicyocodon* as independent of *Megalocalyx*.

Subgenera *Sicyocodon* and *Megalocalyx* are distributed throughout the Mediterranean basin, but the number of species is higher in the east Mediterranean. The limits are the Canary Islands in the west and the Caucasus in the east. The annual habit and the irregular reproductive patterns could be responsible for the observed morphological variation of some species. These species can have autogamous and allogamous flowers during different phases of their life cycle. Taxonomic difficulties sometimes led to different and somewhat confusing treatments in Floras and other local studies (Battandier & Trabut, 1904; Fomin, 1907; Maire, 1932; Rechinger & Schimann-Czeika, 1965; Damboldt, 1978; Greuter, Burdet & Long, 1984). Thus a comprehensive study throughout the distribution area is necessary to understand the group. The object of this work is to obtain comprehensive information about these species, to discover useful characters to define them taxonomically, and to define their geographical distribution.

MATERIAL AND METHODS

This revision is based on 423 herbarium specimens, including type specimens, from the following herbaria (abbreviations according to Holmgren, Holmgren & Barnett, 1990): BC, BCC, BCF, COI, G, LD, LE, MA, MAF, MPU, P, RAB, UPS, VAB, W and the herbarium of the Universitat de les Illes Balears (Balearic Islands, Spain). Features of gross morphology were studied under a binocular stereoscopic microscope. Samples for scanning electron microscopy (SEM), were glued to aluminium stubs, coated with 40–50 nm gold and examined with a JEOL-TSM T330A at 20 kV. The density of spinules in the pollen surface was recorded by counting the number of spinules in a known area of surface of a SEM photograph.

Twelve quantitative characters were recorded and measured using a Brown and Acutee 599-571-3 digital caliper. Each character was analysed for its mean and median values, range, standard deviation and significance, using the STATISTICA package. To represent the variability of each descriptor within species, box-plots containing medians and percentiles were pre-

pared. All taxa were then differentiated using qualitative characters. This separation was tested by means of Discriminant Analysis (DA) for the most difficult species. This method (Sneath & Sokal, 1973), which requires the a priori assignment of OTUs to groups, indicates whether the recognized groups are statistically definable entities or whether there is a too much variation within groups to allow classification. For DA, a raw matrix was obtained, the results sorted into discrete groups, and calculations carried out using the STATISTICA package. The parameters used as descriptors and the results are summarized in Tables 1 and 2. Both quantitative and qualitative

Table 1. Correct classifications and values of *P* obtained in DA

	Number of OTUs	Correct classifications (%)	<i>P</i>
<i>C. dichotoma</i>	25	100	0.271
<i>C. hierosolymitana</i>	9	100	0.097
<i>C. strigosa</i>	17	100	0.184
<i>C. saxonorum</i>	7	100	0.076
<i>C. propinqua</i>	16	100	0.173
<i>C. reuteriana</i>	8	100	0.086
<i>C. camptoclada</i>	10	100	0.108

Table 2. Standardized coefficients obtained in DA for canonical variables

	Root 1	Root 2
Ratio leaf width/leaf length	-0.2191581	0.14559311
Calyx length during fructification	-0.10640835	-0.26435199
Calyx appendage length during fructification	0.16281492	0.28133583
Corolla length	0.23898034	0.02054952
Ratio lobe length/total corolla length	0.11932179	0.45656919
Length of the basal part of the stamen filament	0.43252316	-0.20315267
Length of the narrow part of the stamen filament	-1.14482856	0.54066497
Anther length	0.23132282	0.42487493
Style length	-0.10097335	-0.04147021
Stigma width	0.68195915	-0.18845785
ratio seed width/seed length	0.50054479	0.5991323
Eigen values	41.5903473	5.16856527
Total Cumulative Proportion	0.79949468	0.89885038

characters were used in the key, the most discriminant quantitative characters being inferred from box-plots.

RESULTS

TAXONOMIC CHARACTERS

Habit and leaves: Annuals, showing generally erect stems (the exception is *C. rimarum* which is flexuous and filiform). Stem simple, often dichotomously branched. Leaves sessile or subsessile, obtuse. The shape varies between lanceolate, elliptical, ovate and oblong-lanceolate, with a reticulate venation. The leaf margin is entire, crenate or finely denticulate. The indumentum is hispid in leaves and stems of both subgenera, showing rigid unicellular eglandular hairs (0.5)1–2.2(2.8) mm long. Hair density varies considerably among species included in subgen. *Megalocalyx*: it is dense in *C. hierosolymitana*, and usually sparse in *C. dichotoma*. A few species possess two types of hairs in pedicels, calyx, capsule and higher parts of stems: longer patent hairs and shorter more retrorse ones. This feature is useful in distinguishing some species. Lower parts of stems and leaves show only one type of hair. The hair surface is generally granulate (Fig. 1).

Inflorescences, flowers and pedicels: Inflorescences can vary between dichasia and monochasia, with many intermediate forms, but the commonest form is a dichasium. In some cases, the monochasial or dichasial development seems to depend on actual growth conditions. The exceptions are *C. camptoclada*, which always has monochasia, and *C. rimarum*, with solitary flowers. Flowers are usually erect but in the case of *C. rimarum*, they are pendulous. However, all the species have reflexed pedicels during the fruiting period. The indumentum of pedicels is useful to discriminate species because, as previously noted, they can show one or two types of hairs (Figs 1,2).

Calyx: The calyx is five-lobed, deeply divided, with reflexed appendages located between the adjacent lobes. The lobes are ovate, ovate-lanceolate or narrowly lanceolate, but in *C. strigosa* the lobe apex is subulate. The length of lobes is a useful discriminating character: they are longer in *C. ceciliai*, *C. reuteriana* and *C. macrostyla* and shorter in the remaining species. In many cases, the calyx is accrescent and the appendages are connivent during fruiting, especially in *C. strigosa* and *C. reuteriana*. One species shows a different type of calyx development: *C. stellaris* has fruit with a stellate calyx.

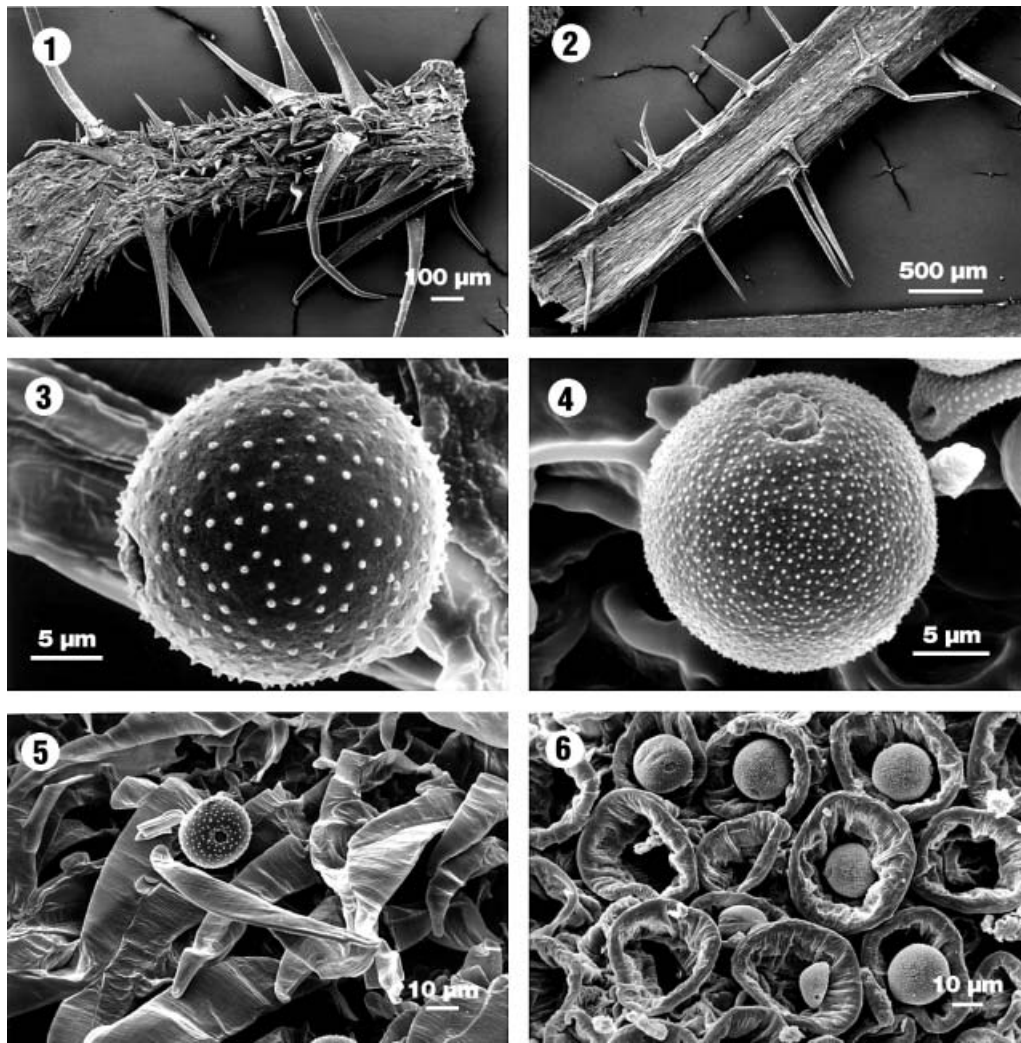
Corolla: The corolla is considerably variable in shape, varying from tubular-campanulate, campanulate, broadly campanulate, to nearly rotate. The length is

also variable, from 4 to 5.5 mm long in *C. rimarum* to c. 30(40) mm long in *C. dichotoma* and *C. macrostyla*. Most species have lobes dissected from only a third to a half of the corolla length, but *C. semisecta* and *C. stellaris* have lobes longer than one half of the corolla length and in *C. rimarum* they are shorter than a quarter of the total corolla length. The corolla colour is violet or violet-blue in subgen. *Megalocalyx*, with two exceptions: yellow in *C. sulphurea*, and reddish to violet in *C. strigosa*. The colour in subgen. *Sicyocodon* (*C. macrostyla*) is purple-whitish outside, and inside it is purple with darker veins.

Androecium: The filaments show two parts: a triangular-ovate (rarely obovate, elliptical or subpentagonal) base and a filiform apex. The base is ciliate in most species, showing 0.1–0.2 mm long hairs, but in *C. rimarum* the base margin is papillate. *Campanula macrostyla* has long hairs (c. 1 mm) in the margin. The abaxial surface can also bear hairs, as occurs in *C. camptoclada*, *C. ceciliai* and *C. macrostyla*. The filiform part of the filament varies in length, from 0–0.5 mm in most species, to 0.5–2 mm in *C. dichotoma*, *C. macrostyla*, *C. saxonorum* and *C. ceciliai*. The anthers are also considerably variable in size, from 3–4.5 mm long in *C. stellaris*, to 7–7.5 mm in *C. macrostyla*. Pollen is spherical, triporate (rarely tetraporate), 18–30 µm in diameter, and has a surface ornament of more or less crowded spinules, which are more or less prominent (Figs 3,4). The density of spinules in the pollen surface was recorded, and varies from 0.24 spinules µm⁻² to 2.68 spinules µm⁻². As occurs in other *Campanula* species, anthers dehisce while flowers are still in bud, depositing the pollen on pollen-collecting hairs of the upper style (Fig. 5).

Gynoecium: The style is included in all species of subgen. *Megalocalyx* (rarely subexserted in *C. propinqua*) and prominently exserted in subgen. *Sicyocodon*. The stigma is trilobate in all species of both subgenera. *Campanula macrostyla* is characterized by its larger stigma (12–16 × 3.5–5 mm) with patent lobes at maturity. The pollen-collecting hairs of the style accumulate pollen (Nyman, 1992a,b, 1993). Later, pollen is retrieved by pollinators and the hairs usually retract into their expanded bases (Fig. 6). However, there are two species (*C. macrostyla* and *C. ceciliai*) which show a weak or very late invagination of these hairs (Fig. 5).

Capsules and seeds: The fruit of both subgenera is a 3-locular, pendulous capsule, dehiscing by three basal valves. The capsules are usually hispid, with indumentum distributed on the keels or on the valves. The indumentum is often deciduous, the mature fruit being glabrous or glabrescent. The seeds are ±broadly elliptical, with the surface smooth and shining, the



Figures 1–6. Scanning electron micrographs of different parts of *Campanula* subgen. *Megalocalyx*. Fig. 1. Indumentum of pedicels of *C. saxonorum* showing two hair types (*Hausknecht* 2600, MA 628444). Fig. 2. Indumentum of pedicels of *C. strigosa* showing only one hair type (*Dinsmore* 6014, MA 120925). Fig. 3. Pollen of *C. macrostyla* (unknown origin, MA628444). Fig. 4. Pollen of *C. propinqua* (*Magmanesian s.n.*, MA 560705). Fig. 5. Pollen-collecting hairs of the upper style in *C. macrostyla* (unknown origin, MA628444). Fig. 6. Retracted pollen-collecting hairs in the upper style in *C. saxonorum* (*Hausknecht* 2600, MA 628444).

colour yellowish to brown. The seeds are rather similar in length (0.7–1.1 mm long), only *C. ceciliae* having longer seeds (1.2–1.5 mm long).

Chromosome number: Subgenus *Megalocalyx* shows several basic numbers: $x = 8, 10, 11, 12$ (Contandriopoulos, 1972), while subgen. *Sicyocodon* has $x = 10$ (Marchal, 1920; Contandriopoulos, 1972; Damboldt, 1978). Processes of dysploidy could explain these numbers (Contandriopoulos, 1972), considering that $x = 17$ occurs frequently in *Campanula* (Gadella, 1966). B chromosomes have been reported in two species, *C. reuteriana* and *C. rimarum* (Contandriopoulos, 1972).

MORPHOMETRIC ANALYSIS

As previously mentioned (see Material and methods), DA was used to test the differentiation made using qualitative characters. The group of more similar species (*C. dichotoma*, *C. hierosolymitana*, *C. strigosa*, *C. saxonorum*, *C. propinqua*, *C. reuteriana* and *C. camptoclada*) was analysed and the results are presented in Figure 7 and Tables 1 and 2. The descriptors used are: width/length ratio of leaves, calyx length during fructification (Fig. 8), calyx appendage length during fructification, corolla length (Fig. 9), ratio lobe length/total corolla length (Fig. 10), length of the basal part of the stamen filament (Fig. 11), length of the

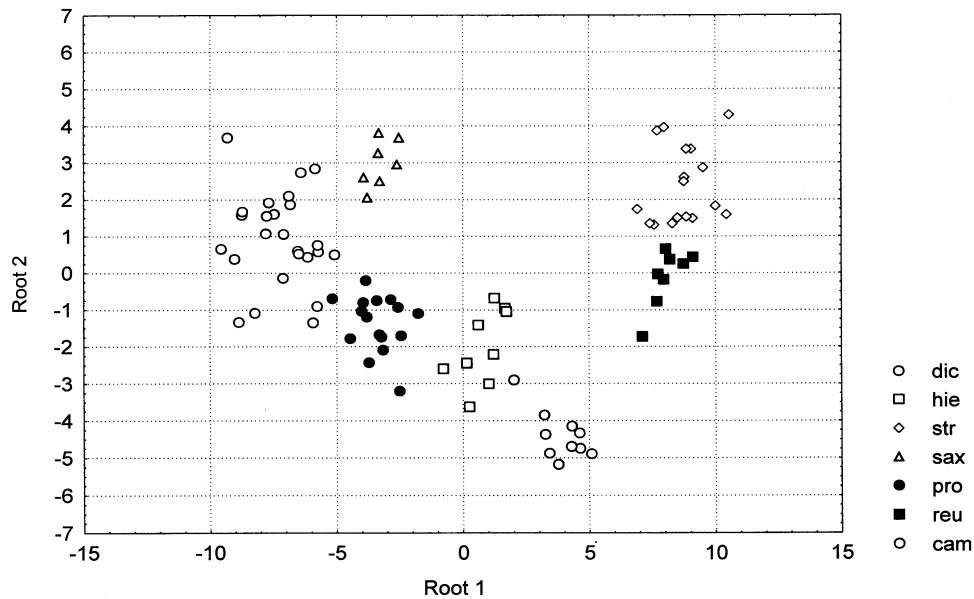


Figure 7. Plot of Discriminant Analysis of the group of *C. dichotoma*, *C. hierosolymitana*, *C. strigosa*, *C. saxonorum*, *C. propinqua*, *C. reuteriana* and *C. camptoclada*. The descriptors used are: width/length ratio of leaves, calyx length during fructification, appendage length during fructification, corolla length, ratio lobe length/total corolla length, length of the basal part of the stamen filament, length of the narrow part of the stamen filament, anther length, style length, stigma width and ratio seed width/seed length.

narrow part of the stamen filament (Fig. 12), anther length (Fig. 13), style length, stigma width and ratio seed width/seed length (Fig. 14). The least discriminating among them were: width/length ratio of leaves, calyx length during fructification, appendage length during fructification, and style length. The rest of characters were sufficiently discriminant (Tables 1,2).

The calyx is longer in several species. The longest are *C. cecilia*, *C. strigosa*, *C. saxonorum*, *C. sulphurea*, *C. reuteriana* and *C. macrostyla* (Fig. 8), but they are more acrescent in *C. strigosa* and *C. reuteriana*. In *C. cecilia* and *C. macrostyla* they suffer a proportionally weaker upgrowth during fructification. The longest corollas occur in *C. cecilia*, *C. strigosa*, *C. reuteriana* and *C. macrostyla* (Fig. 9). However, only two species have the lobes deeply dissected, *C. stellata* and *C. semisecta* (Fig. 10). As shown in the box-plot (Fig. 12), the filiform part of the filament is very useful in differentiating *C. dichotoma*, *C. cecilia*, *C. saxonorum* and *C. propinqua* from all other species of subgen. *Megalocalyx*. The length of the basal part of the stamen filament differentiates *C. propinqua*, with lower values from all others (Fig. 11). The anthers are longer in *C. semisecta*, *C. strigosa*, *C. sulphurea* and *C. saxonorum*, and shorter in the others (Fig. 13). All these values are considerably higher in *C. macrostyla*

due to the fact that this species possesses broad fly-attracting flowers (Damboldt, 1978). The seeds are wider in *C. strigosa* and *C. reuteriana*, producing a nearly rounded shape and higher width/length ratios (Fig. 14).

GEOGRAPHIC DISTRIBUTION

The species of *Campanula* subgen. *Megalocalyx* are native to western Asia, north Africa, south and west Europe and Macaronesia (Canary Islands). Many species are endemic to relatively small areas, with the exception of *C. dichotoma* and *C. propinqua* (Figs 15–19). The centre of diversity lies in western Asia, mainly the area formed by Anatolia, Caucasus, Syria and Palestine (Fig. 15). The coast of Syria, Lebanon and Palestine and many zones of the interior of Anatolia are extraordinarily rich in species of *C.* subgen. *Megalocalyx* (Figs 15–19). The monotypic subgenus *Sicyocodon* is endemic to south-western Anatolia (Fig. 15). Conversely, only two species grow in the western Mediterranean, *C. semisecta* and *C. dichotoma*. *Campanula semisecta* is endemic to the south-east of Iberian Peninsula, while *C. dichotoma* is widespread in Macaronesia, north Africa, Italy, Sicily and several other Mediterranean islands (Figs 16,17).

Fig. 8

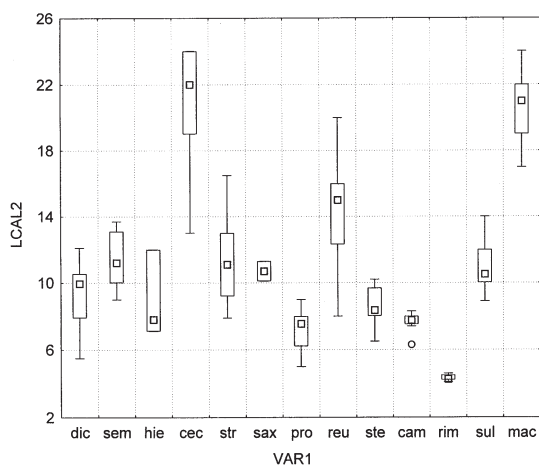


Fig. 9

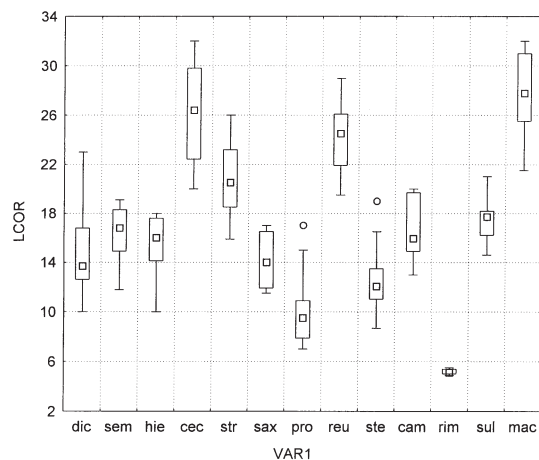


Fig. 10

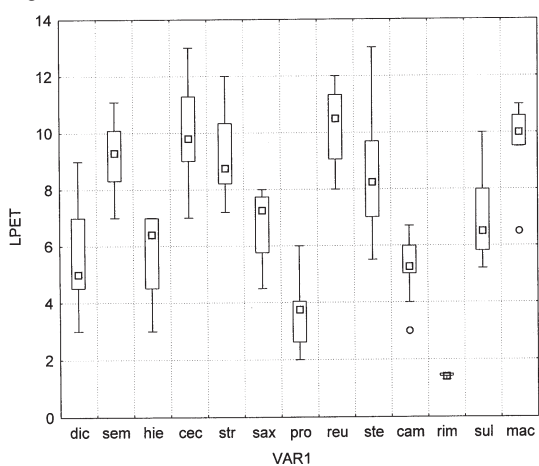


Fig. 11

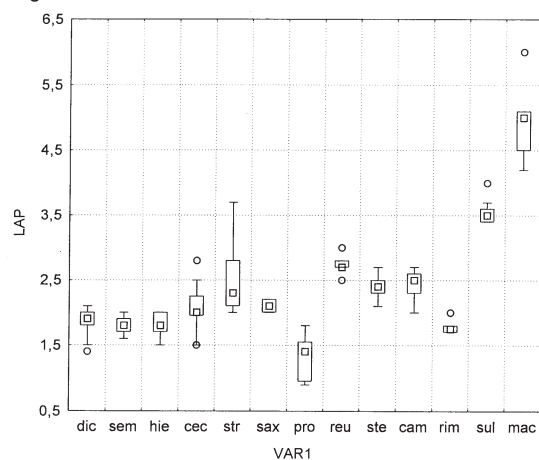


Fig. 12

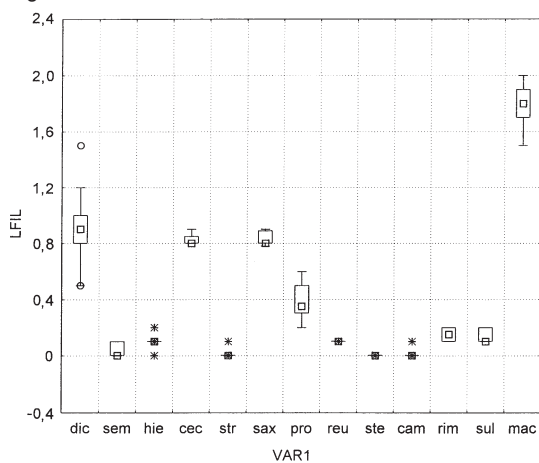
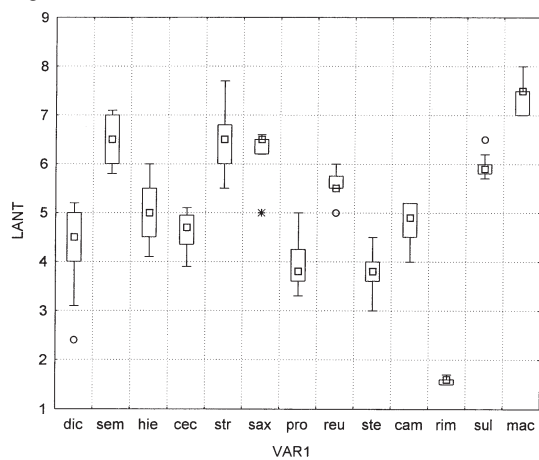
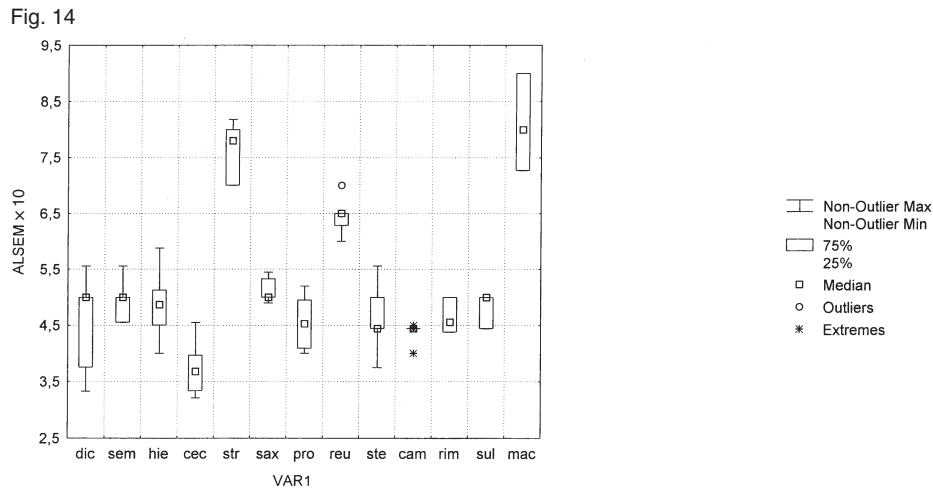


Fig. 13



Figures 8–14. Box-plots representing the variability of descriptors in all *Campanula* species studied. Fig. 8. Calyx length in fruit. Fig. 9. Corolla length. Fig. 10. Ratio of lobe length/total corolla length. Fig. 11. Length of the basal part of the stamen filament. Fig. 12. Length of the narrow part of the stamen filament. Fig. 13. Anther length. Fig. 14. Ratio of seed width/seed length. All measurements are in mm.



Figures 8–14. *Continued*

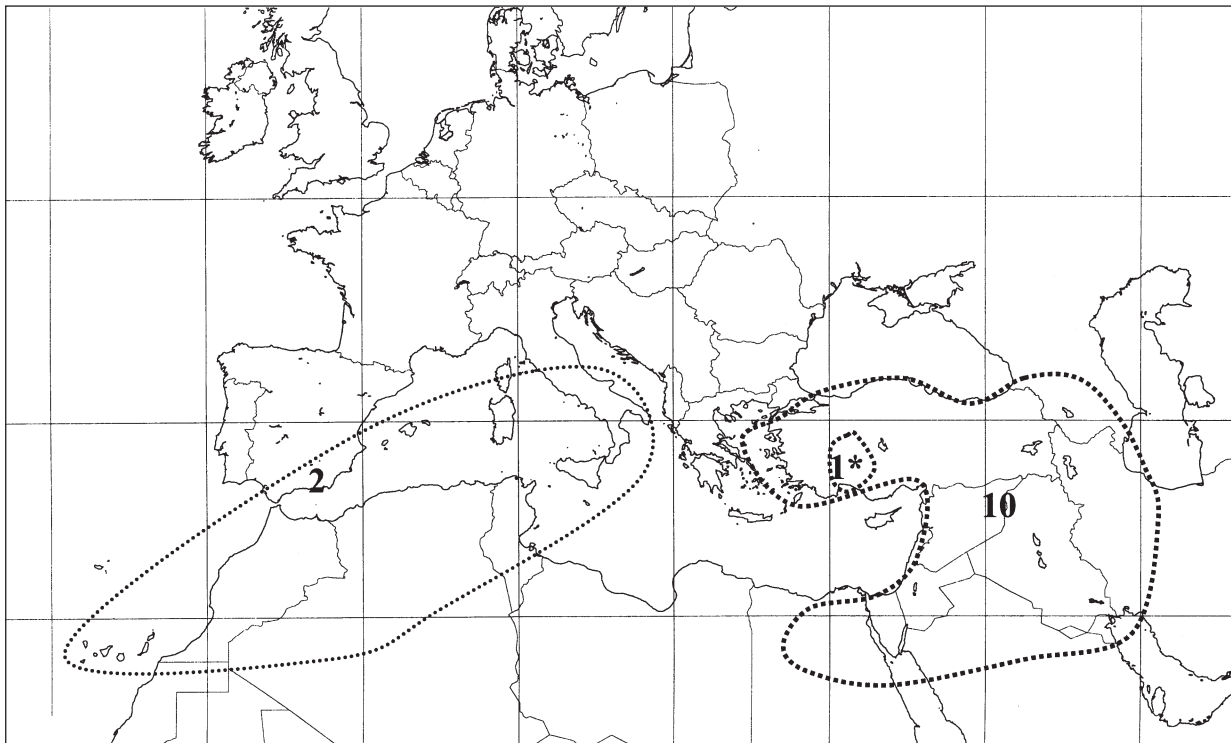


Figure 15. Number of species of *Campanula* L. subgenera *Sicyocodon* (*) and *Megalocalyx* in the east and west of the Mediterranean Basin.

TAXONOMIC TREATMENT

Campanula subgen. *Sicyocodon* (Feer) Damboldt, in Notes Roy. Bot. Gard. Edinburgh 35:43 (1976).
 ≡ *Sicyocodon* Feer in Bot. Jahrb. Syst. 12: 614 (1890).

≡ *Campanula* sect. *Sicyocodon* (Feer) Kuntze in T. Post & Kuntze, Lex. General Phan. 95 (1904).

Description: Annual, subdichotomously branched, rarely simple. Leaves ovate-lanceolate, entire or nearly so, alternate. Flowers usually terminal. Calyx

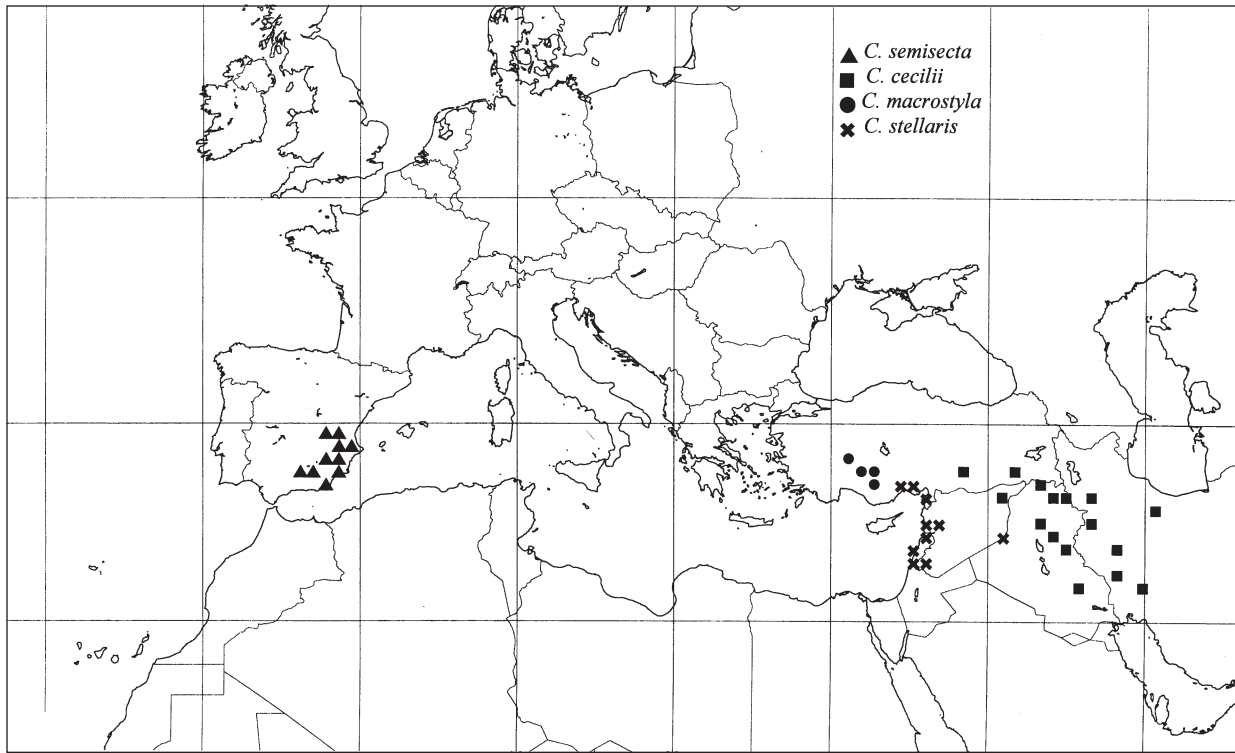


Figure 16. Area of distribution of *C. cecilia*, *C. semisecta*, *C. macrostyla* and *C. stellaris* in the Mediterranean Basin.

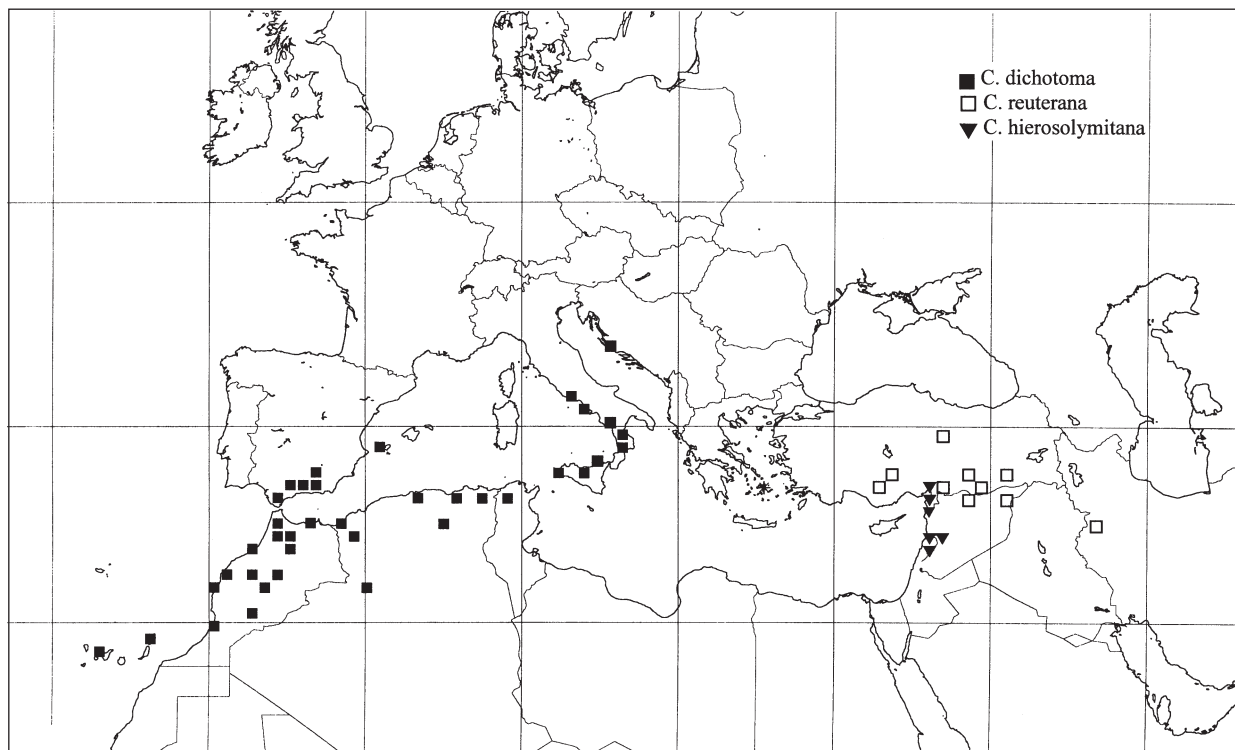
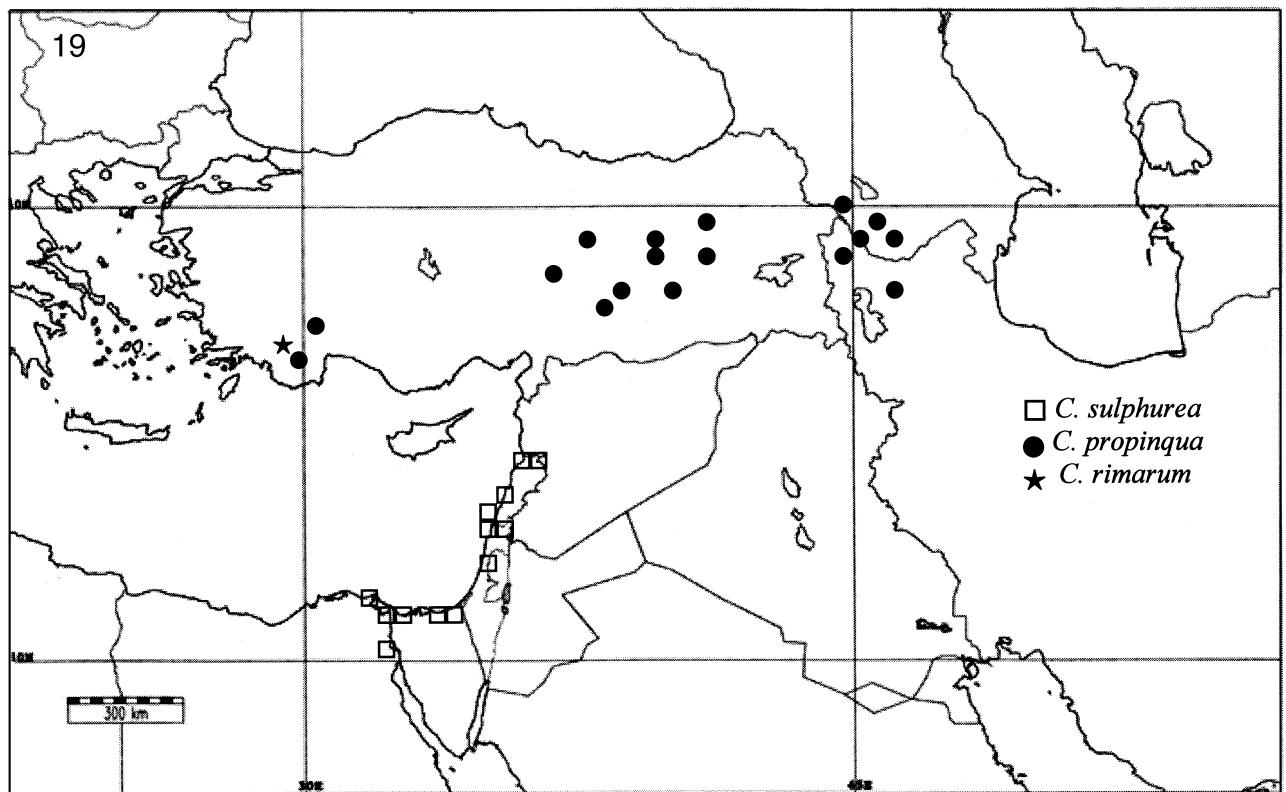
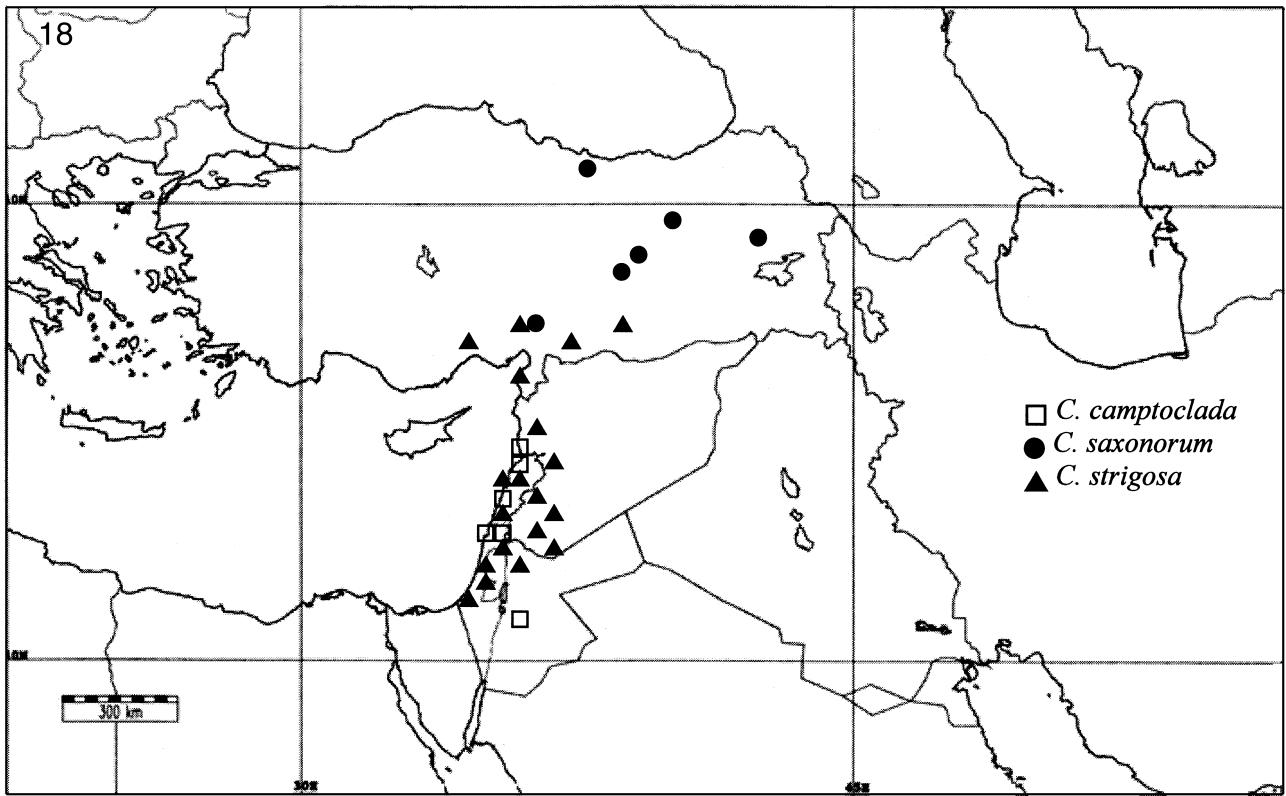


Figure 17. Area of distribution of *C. dichotoma*, *C. reuterana* and *C. hierosolymitana* in the Mediterranean Basin.



Figures 18, 19. Area of distribution of *Campanula* species in the east of the Mediterranean Basin. Fig. 18. *C. camptoclada*, *C. saxonorum* and *C. strigosa*. Fig. 19. *C. sulphurea*, *C. propinqua* and *C. rimarum*.

KEY TO THE SPECIES

1. Style 35–50 mm long 1. *C. macrostyla* (subgen. *Sicyocodon*)
 1'. Style 4–15 mm long 2. (subgen. *Megalocalyx*)
 2. Corolla divided more than half of its length 3
 2'. Corolla divided less than half of its length 4
 3. Calyx appendages spread during fructification, with a stellate aspect 2. *C. stellaris*
 3'. Calyx appendages not spread during fructification, not stellate 3. *C. semisecta*
 4. Anthers 1–2 mm long. Corolla usually 4–5.5 mm long 4. *C. rimarum*
 4'. Anthers longer than 3 mm. Corolla usually longer than 6 mm 5
 5. Corolla yellow 5. *C. sulphurea*
 5'. Corolla blue, violet or pink 6
 6. Lobes of calyx ending in a ±subulate apex 7
 6'. Lobes of calyx acute, not ending in a subulate apex 8
 7. Subulate apex on calyx lobes up to 2 mm long. Seed width/length 0.5–0.7 6. *C. saxonorum*
 7'. Subulate apex on calyx lobes up to (3)5–10 mm long. Seed width/length 0.8–0.9 7. *C. strigosa*
 8. Pedicels of flowers and base of calyx with two types of hairs: some shorter, retrorse and others longer, patent 9
 8'. Pedicels of flowers and base of calyx with only a kind of hairs, all similar and patent 11
 9. Appendages of calyx 5.5–7 mm long during fructification. Corolla 20–30 mm long 8. *C. reuteriana*
 9'. Appendages of calyx 2–4 mm long during fructification. Corolla 9–20(23) mm long 10
 10. Stamens with a very short (0.1 mm long) filiform part or without it. Stigma 2–3 mm long 9. *C. camptoclada*
 10'. Stamens with a filiform part 0.2–1 mm long. Stigma 1–1.5 mm long 10. *C. propinqua*
 11. Stamens with a filiform part 0–0.2 mm long 11. *C. hierosolymitana*
 11'. Stamens with a filiform part longer than 0.4 mm 12
 12. Lobes of fruiting calyx 5.5–15 mm long. Seeds 0.7–0.9 mm long 12. *C. dichotoma*
 12'. Lobes of fruiting calyx longer than 15 mm. Seeds 1.2–1.5 mm long 13. *C. cecillii*

divided nearly to base, accrescent after anthesis, with reflexed appendage at each sinus between adjacent lobes. Corolla large, very broadly campanulate. Style very long-exserted. Stigma spindle-like, spreading in 3 long linear-oblong segments. Capsule 3-locular, dehiscent by three basal valves.

Type: *C. macrostyla* Boiss. & Heldr. in Boiss.

1. *Campanula macrostyla* Boiss. & Heldr. in Boiss., *Diagn. Pl. Orient. Ser. 1*, 11: 65 (1849)
 ≡ *Sicyocodon macrostylus* (Boiss. & Heldr.) Feer in *Bot. Jahrb.* 12: 614 (1890)

Ind. loc.: 'Hab. in glareosis ad littora lacûs Egirdir Pisidiae et in saxosis ad Ermenek Isauriae. (Heldr.). Fl. Julio ineunte.'

Lectotype: (designated by Damboldt, 1978: 52): [Turkey, Isparta], in glareosis ad littora lacus Egirdir, 3 lieues d'Egirdir sur la route de Kovich, 4.vi.1845, *Heldreich s.n.* (G).

Description: Annual 15–35(70) cm, hispid. Stem erect to subflexuous, simple or branched from base. Leaves 30–65 × 10–20 mm, scattered, sessile, entire or nearly so, ovate-lanceolate, acute or subacute; upper cordate and auricled at base, reflexed. Flowers solitary, terminal or axillary on stout pedicels. Pedicels hispid, hairs 2–3 mm long. Calyx 22–29 × 5–6 mm (25–28.2 × 7.2–8.7 mm in fruit), hispid, hairs 0.7–2 mm long; lobes 17–23 mm long (19–32 mm long in fruit), ovate-lanceolate, acute, hairy at margin and on the nerves;

appendages 4.7–6 mm long (5–9 mm long in fruit), rounded to ovate, obtuse, concealing ovary in fruit. Corolla 22–32(40) mm, divided to *c.* 1/5, broadly open-campanulate, glabrous or hairy towards base, outside whitish to purple, purple within with violet veins; lobes 6.5–11 × 8–15 mm, broadly triangular, acute; tube 15–17 mm long. Stamen 13–14.5 mm long; filiform part of filament 1.5–2 mm long; base 4.2–5 × 4–5 mm, triangular-ovate to broadly obovate, densely hairy on the abaxial surface and on the margin, hairs 0.7–0.9(1) mm long; anthers 7–7.5 mm long; pollen 19–25 µm diameter, with a low density of spinules (0.22–0.31 spinules µm⁻²). Style 35–50 mm long, long exerted, straight. Stigma 12–16(20) × 3.5–5 mm. Capsule (7.5)11–14 × (6)12–15 mm, concealed by the accrescent connivent calyx lobes and appendages, sparsely hairy on the keels (hairs 0.7–2 mm long). Seeds 1–1.2 × 0.7–0.9 mm, light brown.

Chromosome number: *n* = 10 (Marchal, 1920; Contandriopoulos, 1972).

Area: South Anatolia: Konya, Ermenek.

Habitat: Scrubs, stony places, 600–1400 m.

Phenology: Flowering June

Illustration: Hooker (1878; table 6394), Feer (1890; table VIII), Damboldt (1978: 51, fig. 3).

Representative specimens examined: TURKEY: In saxosis Ermenek, 2.vii.1845, *Heldreich* (G); Ad lacum Egirdir, 1854, *Tchiatchef s.n.* (G); Ermenek, vii.1872, *A. Peronin s.n.* (P); 50 km W Mirh, 1000 m, 7.vi.1966, *Damboldt 66-29-7* (W); oberhalb d. Apa Baraji, 1000 m, 11.vii.1978, *Sorger*, 78-25-6 (W); Konya: Konya-Seydisehir, 2 km SW Karacaören, 1300 m, 27.vii.1981, *Nyedgger 16997* (G); Ermenek, Cilicia, 1290 m (G); Cilicie, 1874 (MPU). Unknown origin: ex Hort. Paris. Herbarium Delacour s.d. (MA 628481).

Campanula subgen. *Megalocalyx* Damboldt in Notes Roy. Bot. Gard. Edinburgh 35: 43 (1976).

Description: Annual herbs, subdichotomously branched, rarely simple. Leaves ovate, elliptical or oblong-lanceolate, entire or nearly so, alternate. Flowers usually in shortly pedunculate dichasia. Calyx divided nearly to base, accrescent after anthesis, with a reflexed appendage at each sinus between adjacent lobes. Corolla tubular-campanulate, broadly campanulate or nearly rotate, usually blue or violet, rarely yellow or purple. Style included. Stigma-lobes 3. Ovary growing upward after anthesis. Capsule 3-locular, pendulous, dehiscent by three valves, rarely dehiscent irregularly. Seeds *c.* 1 mm, pale yellow, shining.

Type: *C. strigosa* Banks & Sol.

2. *Campanula stellaris* Boiss., Diagn. Pl. Orient. Ser. 1, 11: 63 (1849)

Ind. loc.: 'Hab. in lapidosis dumosis montis Carmeli paulò supra conventum. Legi fructif. Maio 1846.'

Lectotype: (designated by Damboldt, 1978: 50): Palestine, Mt. Carmel, vs. 1846, *Boissier s.n.* (G). Isolectotypes K, G, P, W.

Description: Annual 3.5–26 cm, hispid, greyish. Stem erect or flexuous, simple or dichotomously branched from base or in the upper part. Leaves 5–30 × 3–11 mm, usually sessile, lower sometimes petiolate, entire or nearly so, ovate to elliptical, obtuse. Flowers in shortly pedunculate dichasia. Pedicels hispid, hairs 0.4–0.9 mm long. Calyx 5–13.1 × 2–2.4 mm (9.6–14.3 × 2.5–4.2 mm in fruit), hispid, hairs 0.5–1 mm long; lobes 3.5–9.1 mm long (7.1–10.2 mm long in fruit), oblong-lanceolate, acute; appendages short, 1.1–3.5 mm long (2.5–4.1 mm long in fruit), narrowly triangular, acute, usually concealing ovary in fruit; fruiting calyx stellately spread, accrescent, reaching up to 25 mm diameter. Corolla 7–16.5 mm long, deeply lobed (to its middle or beyond), broadly campanulate, nearly rotate, glabrous, violet to violet-blue, tube white; lobes 5.5–11.5 mm long, elliptic-lanceolate, obtuse or subacute; tube 2.4–4.7 mm long. Stamen 5–7.1 mm long; filiform part of filament absent; base 2–3 × 1–2 mm,

obovate to subpentagonal, sparsely hairy in the upper margin, hairs 0.1–0.2 mm long; anthers 3–4.5 mm long; pollen 19–23 µm diameter, with a low density of spinules (40–47 spinules µm⁻²). Style 6–12 mm long, ±included. Stigma 1.9–2.7 × 0.9–1.5 mm. Capsule 5–6.5 × 4–6 mm, surrounded by the spreading calyx, hairy on the keels (hairs 0.8–1.5 mm long) and sometimes on the valves (hairs 0.5–0.8 mm long), irregularly dehiscent. Seeds 0.8–1 × 0.3–0.5 mm, yellowish.

Chromosome number: Unknown.

Area: South-eastern Turkey, Iraq, Syria, Palestine and Lebanon.

Habitat: Scrub, rocky and sandy places. 200–1675 m.

Phenology: Flowering February – May.

Illustration: Feinbrun-Dothan (1977: 476).

Representative specimens examined: IRAQ: Gadir, Siria, 23.iv.1880, *Peyron s.n.* (G). LEBANON: S Liban, Ras el Bayada, S de Tyr, 8.iv.1957, *Pabot s.n.* (G); S, Baabda, près Beyrouth, 200 m, 2.v.1957, *H. Pabot s.n.* (G); Devi el Kamar, SE Beyrouth, 28.iv.1957, *Pabot s.n.* (G); Ain Hesban, Palestine, 660 m, 27.iv.1911, *Meyers & Dinsmore 848* (G); Beyrouth, 8.iv.1889, *Vicent s.n.* (MPU). PALESTINE: Mt. Carmel, iv.1846, *Boissier s.n.* (G, W); Zerka to Jbel Atturus Transjordan, 26.iv.1945, *Davis 9381* (G); Tiberias-Migdal, dry slopes, 3.iv.1942, *Davis 4253* (W); Wadi Jhannam, Nahr Michmich, 14.vi.1946, *Mouterde 8572* (G); Jerusalem, 1894, *Makowski s.n.* (W); Nahr el Kelb, 18.iv.1948, *Mouterde 9237* (G); Kinnrot Valley, upper Jordan Valley, 2 km NE of Kibbutz Haen, 2.iv.1989, *Damin 39045* (G). SYRIA: cultures sablonneuses à Abarouch, près Saïda, 6.iv.1853, *Blanche s.n.* (MPU, P, W); champs au dessous de Bacamie à l'E de Saïda, 20.iv.1858, *Gaillardot s.n.* (MPU); Saïda, 21.iv.1880, *Barbey s.n.* (G); Beryti, 8.v.1890, *Vincent s.n.* (MPU); Collines du Liban à l'Est de Saïda, 18.iv.1818, *Gaillardot s.n.* (G); M. Libani prope Sidonem, s.d., *Gaillardot, s.n.* (W). TURKEY: Sehch Meram, monte Nur, iter Cilicico-Kurdico, 29.iv.1859, *Kotschy 21* (W); Syriae borealis, mont Carsuis, 4–5500', VI-1909, *Haradjan 3128* (G); prov. Hatay, dist. Iskenderum, 7 miles N of Iskenderum, 21.iv.1957, *Davis & Hedge 26945* (G); Camaine, Toprakkale, bassalt gulley below the castle, 20.iv.1957, *Davis & Hedge s.n.* (W); Antalya, 49 km W Anamur, 14.iv.1985, *Sorger 85-59-3* (W).

3. *Campanula semisecta* Murb. in Acta University Lund. 33(12): 115 (1897).

≡ *C. dichotoma* var. *semisecta* (Murb.) Pau in Mem. Soc. Esp. Hist. Nat. 12: 357 (1924).

Ind. loc.: 'Connu jusqu'ici seulement en Espagne. Albacete: Broussailles à Riopar (Bourg. 1850) Jaen: Cerro de San Vicente; Puerta (Blanco, 1849).'

Lectotype: (here designated) [Spain] Broussailles à Riopar, 4.vii.1850, *Bourgeau 779* (LD). Isotypes MA, P, G.

= *C. semisecta* var. *basiclada* Murb. in *Acta University Lund.* 33(12): 116 (1897).

Ind. loc.: 'Valentia: Moxente (Bourg. 1852); Sierra de la Cueva-Santa (Reverch. 1891). Albacete: Hellin, au pied de la sierra de las Caldas (Rouy, 1881). Murcia: Serra de Espuña (Guirao, 1850).'

Lectotype: (here designated) [Spain] Sierra de la Cueva-Santa, dans les maquis rocheaux, sur le calcaire jurassique, 700 m, vi.1891, Reverchon 588 (G).

Description: Annual up to 45 cm, hispid. Stem erect or flexuous, dichotomously branched from base or in the upper part. Leaves 6–21 × 2–14 mm, usually sessile, lower sometimes petiolate, entire or nearly so, ovate to elliptical-lanceolate, acute or obtuse. Flowers in shortly pedunculate dichasia. Pedicels hispid, with adpressed hairs 0.05–0.25 mm long and patent hairs 0.7–2 mm long. Calyx 5–16 × 1.3–1.5 mm (7–13.4 × 2–2.3 mm in fruit), hispid, hairs 0.8–1.9 mm long; lobes 4–11 mm long (9.3–15 mm long in fruit), oblong-lanceolate to lanceolate, acute; appendages 2.1–2.7 mm long (2.2–3 mm long in fruit), narrowly triangular, acute, usually concealing ovary in fruit. Corolla 5–25 mm long, deeply lobed (to its middle or beyond), broadly campanulate, glabrous or hairy in the abaxial side, violet to violet-blue; lobes 4–12 mm long, elliptical-lanceolate, obtuse or subacute; tube 7–8 mm long. Stamen 5–9 mm long; filiform part of filament 0–0.3 mm; base 1.5–2.5 × 2–3.1 mm, broadly ovate, sparsely hairy in the upper margin, hairs 0.2–0.3 mm long; anthers 3.5–7 mm long; pollen 20–25 µm diameter, with a high density of spinules (2.5–3.1 spinules µm⁻²). Style 4.5–15 mm long, included. Stigma 1.1–2.5 × 1.2–1.4 mm. Capsule 5.5–8 × 5.5–7 mm, with patent hairs on the keels (0.7–2 mm long) and adpressed hairs on the valves (hairs 0.05–0.25 mm long). Seeds 0.9–1.1 × 0.3–0.6 mm, yellowish.

Chromosome number: Unknown.

Area: South-eastern Iberian Peninsula.

Habitat: Scrub, rocky and sandy places. 80–1700 m.

Phenology: Flowering May – July

Illustration: Sáez & Aldasoro (2001: 128)

Notes: There is some confusion about the distribution of this species. There are several herbarium specimens collected in north Africa and determined as

C. semisecta. However, we have studied most of them and they are not *C. semisecta* (some of them are misidentifications of *C. filicaulis* Durieu or *C. dichotoma*). Consequently, in our opinion, *C. semisecta* has not yet been collected in north Africa.

In our view, the lectotype of *C. semisecta* var. *basiclada* should be included within the variation of the species. There is no evidence of distinction from typical *C. semisecta*.

Representative specimens examined: SPAIN: Albacete, Sierra de Taibilla, near Nerpio, 1000 m, 26.vi.1988, Valdés et al. s.n. (G); Albacete, Santa Elena de Ruidera, 25.v.1934, *González Albo s.n.* (MAF 2780); Albacete, Broussailles à Riopar, 4.vii.1850, *Bourgeau 779* (G, P); Alicante, in monte Mongó vs. Denia, 1.vi.1885, *Pau s.n.* (MA 120999); Alicante, Montcabrer, 30SYH19, 1250 m, 19.vi.1988, *J.R. Nebot s.n.* (VAB 92/0809); Alicante, Vall de Gallinera, pic del Miserat, 30SYJ4402, 550 m, 8.vi.1997, *M. Signes & J.X. Soler JS7098* (MA 590245); Castellón, Mas de Moro, Amara, Segorbe, 1885, *Pau s.n.* (MA 120958); Ciudad Real, Lagunas la Tomilla y San Pedro, 29.v.1934, *González Albo s.n.* (MA 120950), 25.vi.1935, *González Albo s.n.* (BC 84827); Cuenca, Contretras, vi.1899, *Pau s.n.* (MA 120956); Jaén, cerro de San Vicente, 1849, *P. Blanco s.n.* (P); Jaén, El Serrate, vert. Oriental, 17.vii.1925, *Cuatrecasas s.n.* (BC 39099, MAF 2781); Jaén, Almadén, vert. SE, 19.vii.1925, *Cuatrecasas s.n.* (BC 39100); Jaén, Santiago de la Espada, La Fresnedilla, 17.vii.1975, *González Rebollar et al. s.n.* (MA 479937); Murcia, Sierra de Espuña in regno Murcico, 1850, *Guirido s.n.* (G); Murcia, Sierra Cantón, Abanilla, 19.v.1985 *Robledo s.n.* (ARAN). Teruel, Sierra de Javalambre, 11.vii.1895, *Pau s.n.* (MA 120957); Valencia, Bicorn, vi.1915, *Vicioso s.n.* (BC 39109); Valencia, Enguera, 10.vii.1919, *Font Quer s.n.* (BC 39105); Valencia, In saxosis Valldigna, 17.vi.1791, *Cavanilles s.n.* (MA 121516); Ricorp, 26.vi.1915, *C. Vicioso s.n.* (MA 120955, MA 120962); Valencia, Les Foies, Simat, vi.1976, *Mansanet & Mateo s.n.* (VAB); Valencia, 1815, *Léon Dufour s.n.* (MPU); Valencia, de Chiva à la sierra de Santa Maria, 14.vi.1881, *Barbey s.n.* (G); Valencia, Villagordo del Cabriel, 11.v.1984, *Mateo & Figuerola s.n.* (VAB); Valencia, Monte del Tejo, Requena, 20.vi.1984, *Sanchis & Alcover s.n.* (VAB); Valencia, Pico del Águila, Requena, 10.vi.1986, *García s.n.* (VAB); Valencia, Corbera d'Alcira, 1944, *Borja s.n.* (BC 100370); Valencia, Utiel, La Rampina, 30.iv.1988, *Navarro s.n.* (VAB); Valencia, Cerro Calderón, pr. Puebla de San Miguel, 3.vii.1988, *Mateo 940* (VAB); Valencia, Llaurí, 3.vi.1989, *Pascual s.n.* (VAB); Valencia, Ayora, la Muela de Carcelén, 12.vi.1990, *Mateo et al. s.n.* (VAB); Valencia, Sinarcas, umbría del Picarcho, 25.vi.1991, *Navarro s.n.* (MA 599090); Valencia, Sierra de la Murta, *Borja s.n.* (MAF 2777).

4. *Campanula rimarum* Boiss., Fl. Orient. 3: 931 (1875).

Ind. loc.: 'Hab. in fissuris rupium Lyciae ad Duden prope Elmalu (Bourg !). Fl. Mai.'

Lectotype: (designated by Damboldt, 1978: 50) [Turkey], in fissuris rupium ad Duden prope Elmalu, 1.vi.1860, *Bourgeau s.n.* (G). Isotypes (E, G, MPU, P, W).

Description: Small fragile spreading white-hispidulous annual 5–15 cm. Stem flexuous, filiform, branched from base. Leaves 2–15(20) × (2)4–6(8) mm, lower attenuate into petiole to 15 mm, upper sessile, entire, elliptical to oblong-spatulate, obtuse. Flowers solitary, terminal. Pedicels filiform, hispid, with long hairs 1.2–1.7 mm long. Calyx 5–6 × 2.5–3 mm (6.1–6.7 × 3.6–4 mm in fruit), densely hispid, hairs 0.7–1.7 mm long; lobes 3.6–4 mm long (4.1–4.5 mm long in fruit), ovate-triangular, acute; appendages 1.4–1.9 mm long (2–2.3 mm long in fruit), truncate to rounded, obtuse, concealing ovary in fruit. Corolla 4–5.5 mm long, shortly exceeding calyx lobes, divided to *c.* 1/3, narrowly cylindrical to narrowly tubular-campanulate, hairy outside, pale violet; lobes 1.3–1.5 mm long, broadly triangular to semielliptical, obtuse; tube 3.5–4 mm long. Stamen 3–4 mm long; filiform part of filament 0.1–0.2(0.3) mm long; base 1.7–2 × 0.8–1 mm, subelliptical to oblong-elliptical, papillose in the margin; anthers 1.5–1.7 mm long; pollen 20–23 µm diameter, with a high density of spinules (1.8–2.0 spinules µm⁻²). Style 4.3–4.5 mm long, ±included. Stigma 0.4–0.6 × 0.4 mm. Capsule 4.3–5.5 × 4–5.2 mm, concealed by the acrescent connivent calyx lobes and appendages, sparsely hairy on the keel and on the valves, hairs 0.7–1.7 mm long. Seeds 0.75–0.9 × 0.3–0.4 mm, yellowish to brownish.

Chromosome number: $2n = 20$, $2n = 20 + 1B$, $2n = 20 + 2B$ (Contandriopoulos, 1970, 1976).

Area: Antalya, south-eastern Turkey

Habitat: Limestone rocks. 1000–2800 m.

Phenology: Flowering June

Illustration: Fig. 20.

Representative specimens examined: We were able to see only the type specimens, although several others are known (Contandriopoulos, 1970; Damboldt, 1978).

5. *Campanula sulphurea* Boiss., Diagn. Pl. Orient. Ser. 1, 11: 64 (1849)

Ind. loc.: 'Hab. in arenà mobili purà collium littoralium Syriae circà Gaza (Boiss. Aucher n. 1856), circà Beyrout (Boiss. Pestalozza).'

Lectotype: (here designated) (Palestine) Gaza & Aucher-Eloy 1856 (G, isolectotype P).

Description: Annual 5–30 cm, hispid. Stem erect, simple or spreadingly branched from base. Leaves 7–20 × 4–6 mm, sessile, entire or nearly so, oblong to oblong-lanceolate, obtuse to acute. Flowers in shortly pedunculate dichasia. Pedicels hispid, hairs 1.1–1.4 mm long. Calyx 9–13.5 × 1.7–2.5 mm (11.3–13.8 × 2.6–3.7 mm in fruit), hispid, hairs 0.5–1.7 mm long; lobes 7–10 mm long (8.9–14 mm long in fruit), lanceolate, subacute; appendages 2–3.5 mm long (2.4–4.2 mm long in fruit), ovate, obtuse, concealing ovary in fruit. Corolla 18–21 mm long, divided to 1/3–1/2, campanulate, glabrous or hairy on nerves outside, sulphur-yellow; lobes 6.5–10.6 mm long, triangular-ovate, obtuse; tube 15–17 mm long. Stamen 9.4–10.9 mm long; filiform part of filament 0.1–0.4 mm long; base 3.5–4 × 2.3–2.5 mm, obovate, hairy in the upper margin, hairs *c.* 0.2 mm long; anthers 5.8–6.7 mm long; pollen 20–25 µm in diam., with a low density of spinules (0.60–0.68 spinules µm⁻²). Style 12.5–15 mm long, included. Stigma 2.5–5 × 1–1.3 mm. Capsule 6.1–7.2 × 5.7–6 mm, concealed by the acrescent connivent calyx lobes and appendages, sparsely hairy on the keels (hairs 0.5–1.5 mm long). Seeds 0.8–0.9 × 0.4 mm, yellowish.

Chromosome number: unknown.

Area: Egypt, Sinai, Palestine, Lebanon and Syria. 200–1200 m.

Habitat: Sandy soils.

Phenology: Flowering February – May

Illustration: Feinbrun-Dothan (1977: 478)

Representative specimens examined: EGYPT: Versant W de Gebel Ammon, entre le Caire et Suez, 2.v.1880, Sickenberger *s.n.* (G); 15 km in WSW von Cairo, iv.1885, *Schweifurth s.n.* (MPU); Cairo, 29.iv.1885, Volbens *s.n.* (G); Egypte, environs du Cairo, *Deflers s.n.* (MPU). LEBANON: route de Beyrouth a Saïda, 7.v.1853, *Blanche 691* (W); forets de pins au Sud de Beyrouth, 7.v.1858, *Gaillardot s.n.* (MPU); Bir Hassen, 12.v.1955, *Mouterde 11522* (G); Nebi l'Aousaye, 11.v.1933, *Mouterde 2218* (G); Beryti, 8.v.1890, *Vincent s.n.* (MPU); Beirut, 29.v.1901, *Post s.n.* (G). PALESTINE: Jaffa, prope Saron, 12.v.1897, *Bornmüller s.n.* (P); Gaffa, 25.iv.1912, 1–20 m, *Dinsmore 5059 et al.* (G); Herzlia, near Tel Aviv, sandy soil, 26.iv.1928, *Eig et al. s.n.* (MA 120984, W); Gaza, 13.v.1896, *Fonck s.n.* (W). SINAI: Isthmus Aegyptiaco-Palaestinus, Jebel Ekh-feynm 16.iv.1891, *Deflers s.n.* (MPU); Egypte, El Ary-

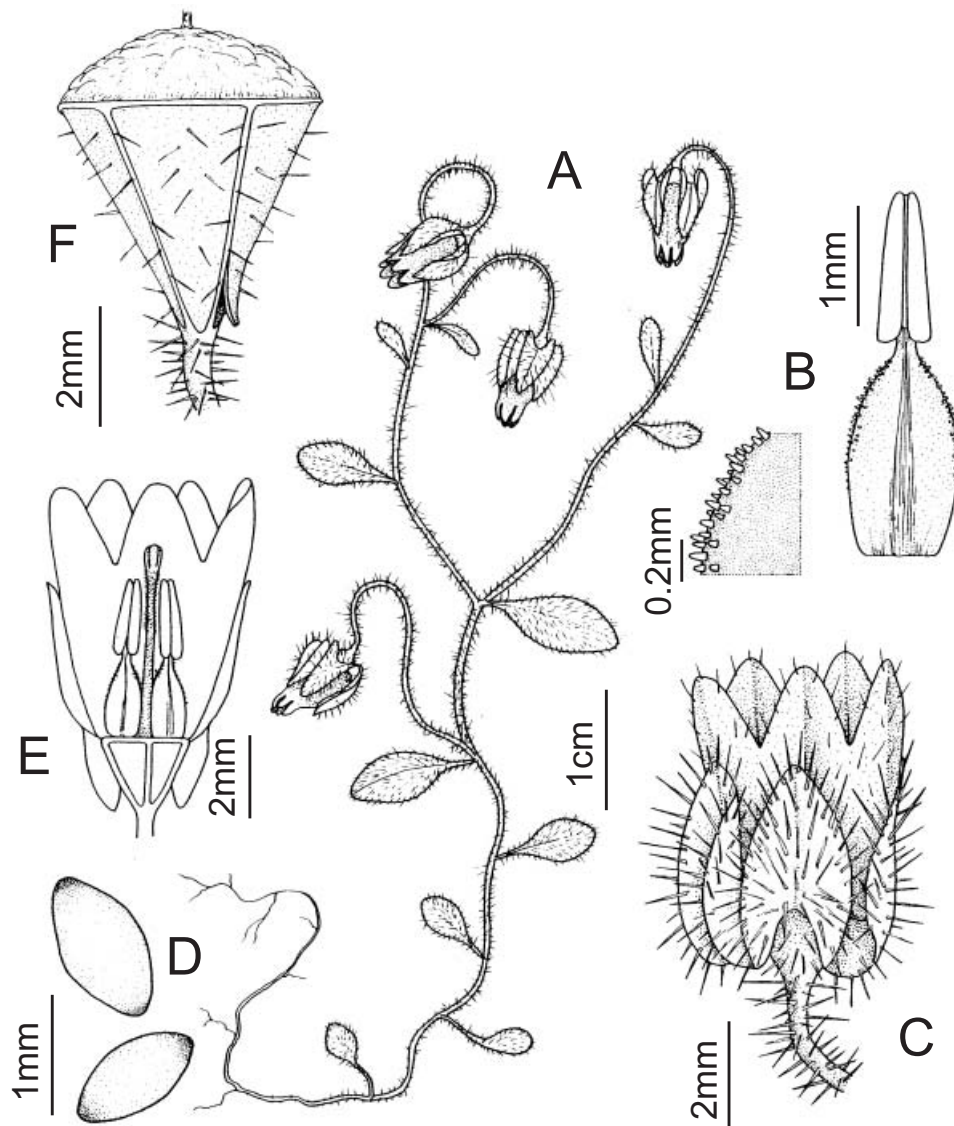


Figure 20. *Campanula rimarum*. Turkey: in fissuris rupium ad Duden prope Elmalu, 1.vi.1860, *Bourgeau s.n.* (P, isotype). A: habit; B: stamen and detail of the base of stamen (left); C: flower; D: seeds; E: dissection of a flower; F: capsule.

sch au S du Jebel Ekhfeyn, 14.iv.1891, *Deflers s.n.* (MPU); prope El Arys, iv.1855, *Kotschy 455* (P). SYRIA: Jebel Amqabya N, 25.v. 1945, *Davis 8539* (G 154513, W).

6. *Campanula saxonorum* Gand. in Bull. Soc. Bot. France 65: 54 (1918).

Ind. loc.: 'Anatolia, ad Amasia (*Bormüller* n. 581!); Armenia, in monte Dolidayh (*Bormüller* n. 3429!) et ad Gumuschkhane (*Sintenis* n. 6014!).'

Lectotype: (designated by *Damboldt*, 1978: 48) [Turkey, Gümüsane], Aghakoei, 20.vi. 1894, *Sintenis 6014* (B, isolectotypes B, E, G, GOET, LD, P, W, WU).

Description: Annual 3–15(27) cm, hispid, green. Stem usually erect, simple or dichotomously branched from base. Leaves 10–60 × 4–18 mm, entire or incised-dentate, lower subsessile, spatulate; cauline sessile, elliptical to oblong-lanceolate, obtuse. Flowers in dichasia. Pedicels hispid, with long hairs 1–2 mm long and small hairs 0.2–0.5 mm long. Calyx 9.6–14 × 1.5–3 mm (12.5–15.5 × 3.6–4.6 mm in fruit), hispid, hairs 0.8–1.4 mm long; lobes 5–10 mm long (7–11.5 mm long in fruit), linear-lanceolate, acute ending in a sub-acuminate or subulate awn up to 2 mm; appendages 5–10 mm long (7–11.5 mm long in fruit), rounded, acute or obtuse, concealing ovary in fruit. Corolla

10.5–16.5 mm long, divided to 1/4–1/3, narrowly tubular-campanulate, hairy outside at base and along the nerves, violet or blue-violet; lobes 4.5–8 mm long, triangular-ovate, obtuse; tube 6–8.5 mm long, hairy outside at base and on the nerves. Stamen 5.8–9.3 mm long; filiform part of filament 0.7–1 mm long; base 1.7–2.1 × 1.7–2 mm, oblong to ovate, sparsely hairy in the margin, hairs *c.* 0.1 mm long, and on the abaxial surface hairs 0.5–2 mm long; anthers 3.3–6.5 mm long; pollen 18–21 µm diameter, with a high density of spinules (1.5–1.56 spinules µm⁻²). Style 8–10 mm long, included or occasionally subexserted. Stigma 0.9–2.7 × 0.6–1 mm. Capsule 6.5–7.5 × 5.5–6 mm, concealed by the acrescent connivent calyx lobes and appendages, hairy on the keels (hairs 0.6–1.2 mm long) and occasionally on the valves (hairs 0.2–0.5 mm long). Seeds 1–1.1 × (0.4)0.5–0.6 mm, yellowish.

Chromosome number: Unknown.

Area: Turkey

Habitat: Stony places. 1300–1700 m.

Phenology: Flowering June – July

Illustration: Fig. 21.

Notes: The distinction of *C. saxonorum* and *C. strigosa* in most cases presents no difficulty. The lobes of calyx with a subulate apex (3)5–10 mm long in *C. strigosa* makes this species very easy to recognize.

Representative specimens examined: TURKEY: Armenia turcica, Kharput, S. Kuschnas, 8.vi.1889, *Sintenis 686* (G); Armenia Turcica, Egin, in campis prope Szanduk, 15.vi.1890, *Haussknecht 2600* (MA 628444); Armenia Turcica, Szanduk, 20.vi.1890, *Haussknecht 6014* (W); Aghakoci, Tunceli-Pülümür, 6 miles form Pülümür, 7.vi.1957, *Davis & Hedge 29205* (G); Prov. Tunceli, Nozat, 14.vii.1957, *Davis & Hedge 31124* (G, W); Bulandi, 16.vii.1965 (W); 2 km NE Mursal (N Yama Daglari), Sivas, 1.vii.1976, *Sorger 76.12.5* (W); 25 km NE Feke, Adana, 7.vii.1977, *Sorger 77.26.6* (W); Tunceli, Pülümür, 17.vi.1980, *Yıldırım & Eren 3317* (G); Armenia Minor, in monte Deli-dagh, vi.1983, *Bornmüller 3429* (W); Agri: Agri-Hamur, 2 km N Hamur, 9.vi.1988, *Nyedgger 43655* (G); Sivas, Divrigi-Sincan, 28 km W Divrigi, *Nyedgger 43843* (G).

7. *Campanula strigosa* Banks & Sol. in Russell, Nat. Hist. Aleppo ed. 2, 2: 246 (1794).

Ind. loc.: 'Aleppo.'

Lectotype: (designated by Rechinger & Schimann-Czeika, 1965: 12) [Syria], Aleppo, *Russell, s.n.* (BM).

≡ *C. russelliana* Schult. in Roem. & Schult, Syst. Veg. 5: 142 (1819) (as 'russeliana').

Description: Annual 5–35 cm, hispid. Stem erect to subflexuous, simple or dichotomously branched in the upper part, rarely from base. Leaves 4–30(60) × 6–10(30) mm, sessile, elliptical to oblong-lanceolate, obtuse or subacute. Flowers in shortly pedunculate dichasia. Pedicels hispid, hairs 1.4–2 mm long. Calyx 10.2–18.7 × 2.7–7 mm (14.2–21.8 × 4.5–7.1 mm in fruit), hispid, hairs 0.9–2 mm long; lobes 9–14.7 mm long (9–14.4 mm long in fruit), ovate-lanceolate, abruptly ending in a subulate (3)5–10 mm long awn-like tip; appendages (1.2)3–6 mm long (3–7.4 mm long in fruit), ovate, obtuse, concealing ovary in fruit. Corolla 16–23.5 mm, divided to *c.* 1/2, tubular-campanulate, glabrous or hairy on nerves outside, reddish purple to violet-blue; lobes 7.7–12 mm long, ovate to semi-elliptical, obtuse; tube 7.5–12 mm long. Stamen 6–11.5 mm long; filiform part of filament 0–0.1 mm long; base 2–3.7 × 1.5–2.5 mm, oblong-elliptical, emarginate, sparsely hairy, hairs 0.1–0.2 mm long; anthers 4–7.7 mm long; pollen 20–23 µm diameter, with a intermediate density of spinules (1.0–1.1 spinules µm⁻²). Style 10–15 mm long, included. Stigma 0.9–3.1 × 0.2–1.5 mm. Capsule 7.5–10 × 6–7.7 mm, concealed by the acrescent connivent calyx lobes and appendages, sparsely hairy on the keels (hairs 0.8–2 mm long) and occasionally on the valves. Seeds 0.9–1.1 × 0.8–1 mm, yellowish.

Chromosome number: *n* = 10 (Contandriopoulos, 1976)

Area: Palestine, Lebanon, Syria, southern Anatolia.

Habitat: Fields, stony places, 100–2000 m.

Phenology: Flowering March – May

Illustration: Fig. 22.

Representative specimens examined: LEBANON: Nahr ad Damur, 8.v.1949, *Mouterde 9598* (G); Beyrouth, 18.v.1816, *Gaillardot s.n.* (G-Boiss.); In planitie Coele-syriaca (Bekâa) prope Rajak, 16.v.1910, *Bornmüller 12118* (G); Oued Zénati, 24.vi.1911, *Clavé s.n.* (P); Rayak, Bekaa, cultures, 1000 m, 11.v.1957, *Pabot s.n.* (G); Tourzaya, audessus de Byblos, 16.iv.1957, *Pabot s.n.* (G); Antiliban: entre Aïn Bigé et kaf Zent, 18.v.1817, *Gaillardot 2040* (G); Zahlé-Bekaa, s.d., *Frere Luis s.n.* (P); In felsen bei Ghazir, 28.iv.1934, *Busujan 103* (W). PALESTINE: Wadi Shomrya, Carmel, 9.iv.1942, *Davis 4379* (G, W); Carmel, v.1846, *Boissier s.n.* (G); Thabor, 19.iv.1896, *Forrek s.n.* (W); Jerusalem, iv.1846, *Boissier s.n.* (G, P); Ouadi Qandil, 5.v.1954, *Pabot s.n.* (G); Mt.

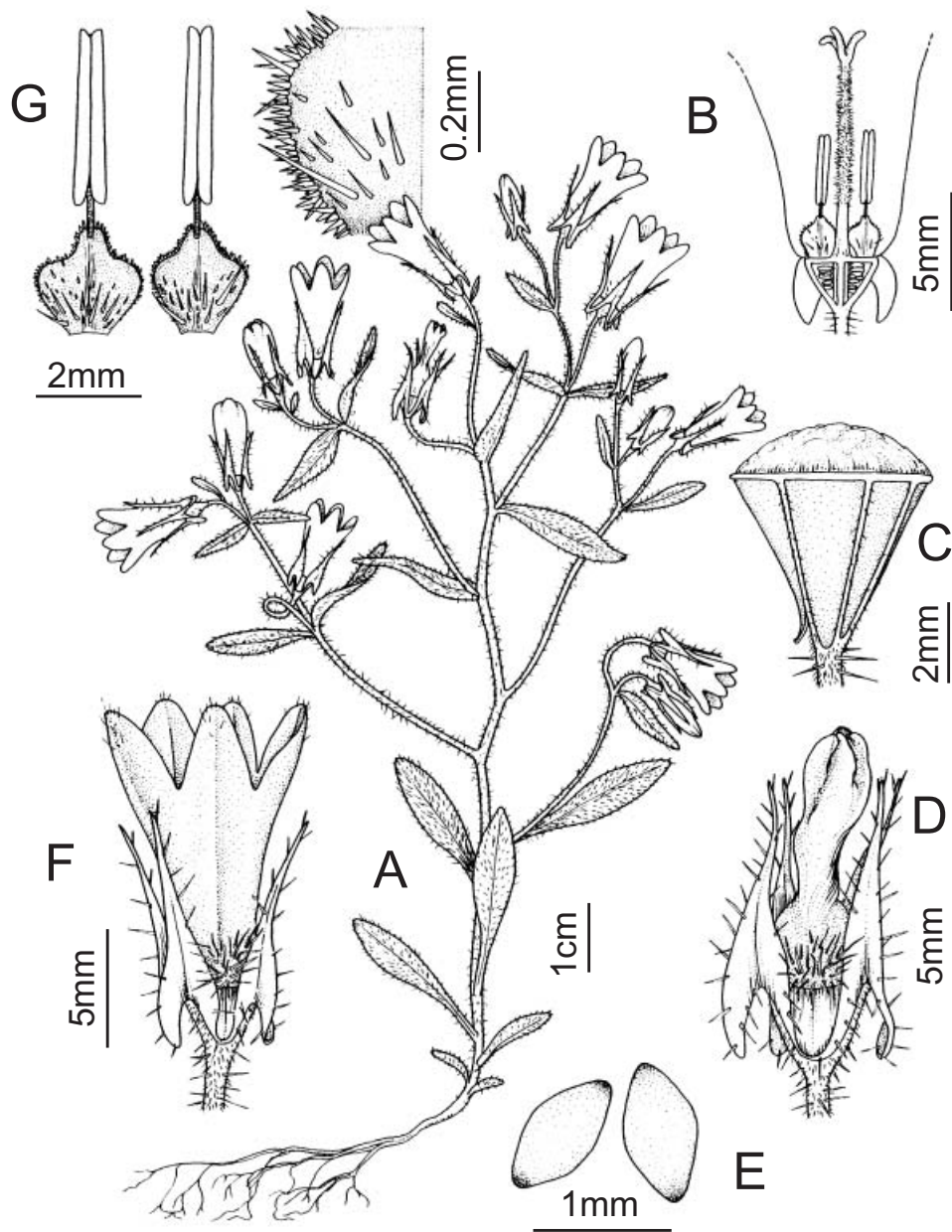


Figure 21. *Campanula saxonorum*. A: Turkey, Aghakoei, 20.vi.1894, *Sintenis*, 6014 (P); B–G: Turkey, Tunceli, Nozat, 1700 m, 14.vii.1957, *Davis & Hedge D 31124* (G, W). A: habit; B: dissection of a flower; C: capsule; D: fruiting calyx; E: seeds; F: flower; G: stamens and detail of the base of stamen (right).

Ebal, 19.iv.1942, *Davis 4482* (G, W); Jerusalem, Messal-ebe, 3.v.1933, *Eig et al.* 292 (MA 120924); Samarie, 13.iv.1880, *Barbey s.n.* (G); Haifa, 15.iv.1897, *Bornmüller 1093* (G); El Wadi, 5.vi.1938, *Mouterde 6416* (G); Kfar Tibnite vers Beaufort, 6.v.1946, *Mouterde 8526* (G); Jerusalem, Sheikh garrah, 2.iv.1963, *Maitland 78* (G) Inter segetes vs. Eden, 20.vii.1855, *Kotschy s.n.* (G, MPU); Jerusalem, 15.iv.1912, *Dinsmore 6014* (MA 120925). SYRIA: Syriae borealis, env. de Homs, v.1910, *Haradjan s.n.* (G); Cote de Son Qalat Makal, Banias,

19.iv.1952, *Pabot s.n.* (G); Champs de blé sur la rive gauche et près de l'embouchure du Sainih, c. Saïda, 21.iv.1853, *Blanche s.n.* (G, MPU); Alep, 29.iv.1841, *Kotschy 182* (G); champs audessous de Aïn Hallalie, premières collines du Liban, à l'est de Saïda, Syrie, 11.v.1858, *Gaillardot s.n.* (MPU, G); Aïn Hallalie, 11.v.1858, *Gaillardot 1378* (P); Port naturel du Litani, 31.v.1955, *Mouterde 11536* (G); Rarhayat el Foukhar, 15.v.1938, *Gombault 5190* (P); Hasmiyeh, 19.iv.1934, *Mouterde 3002* (G); Syrie S, N de Deraa, Hauran,

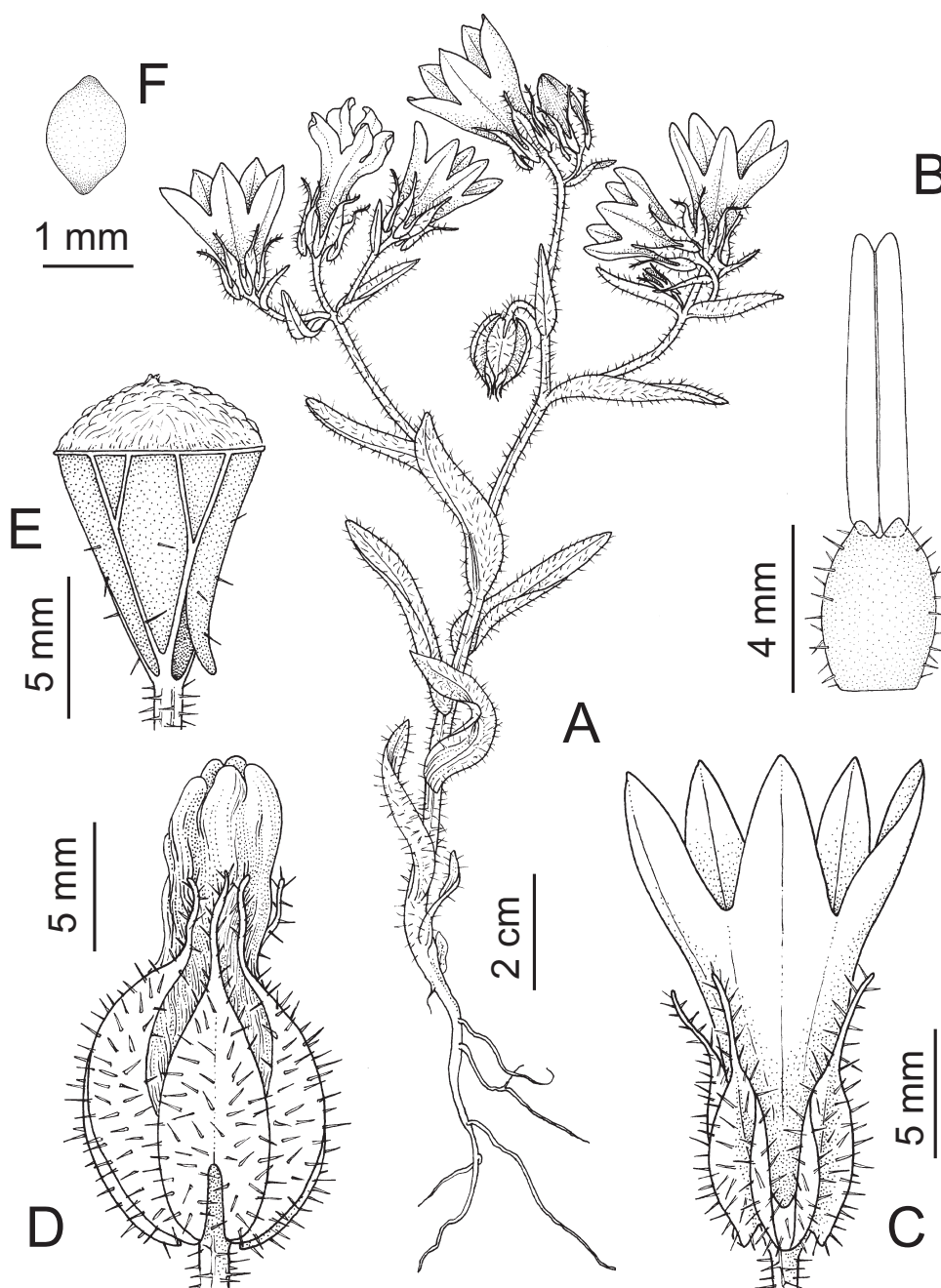


Figure 22. *Campanula strigosa*. Lebanon: Rayak, Bekaa, 1000 m, 11.v.1957, H. Pabot (G). A: habit; B: stamen; C: flower; D: fruiting calyx; E: capsule; F: seed.

13.vi.1956, *Pabot s.n.* (G); Jebel Garbi supra Zebdani, 30.v.1880, *Peyron s.n.* (G). TURKEY: 30 km S of Antioch (Antakia), 6.vi.1938, *Disnmore 14014* (G); Plaine de Mersina, Cilicie, 2.v.1855, *Balansa s.n.* (MPU); Plaine de Mersina, Cilicie, 2.v.1855, *Balansa 625* (G, P, W); Prov. Hatay, Antakya, near St. Peter's Church, *Davis & Hedge 27256* (G); 3–6 km N Halfeti, 23.v.1983, *Sorger 83-3-2* (W); 25 km E Kahta, nebeffluss des Euphrat,

4.v.1980, *Sorger 80-27-45* (W); Maras, Ahir-Dagin, 6.v.1990, *Nydegger 45362* (G).

8. *Campanula reuteriana* Boiss. & Balansa in Boiss., *Diagn. Pl. Orient. Ser. 2, 3: 108* (1856).

Ind. loc.: 'Hab. in Ciliciâ Kotschy pl. exs. 1836 n°. 349, in Ciliciâ propè Gülek Boghas Tauri cl. Balansa Julio fructiferam legit.'

Lectotype: (designated by Rechinger & Schimann-Czeika, 1965: 11) [Turkey], Cilicia, *Kotschy 349* (W, isolectotypes G, P).

Description: Annual 8–30 cm, hispid. Stem erect, simple or dichotomously branched in the upper part, rarely from base. Leaves 10–32 × 5–10 mm, sessile, entire or nearly so, elliptical to oblong-lanceolate, obtuse or acute. Flowers in shortly pedunculate dichasia. Pedicels hispid, with long hairs 0.7–2(2.8) mm long and small hairs (0.1)0.2–0.4(0.5) mm long. Calyx 13–19.5 × 4–6 mm (13–20.6 × 5–7.8 mm in fruit), hispid or strigose, hairs (0.5)0.8–2 mm long; lobes 10–18 mm long (8–15 mm long in fruit), lanceolate, acute; appendages 3.7–4.8 mm long (5.6–6.8 mm long in fruit), rounded, obtuse, concealing ovary in fruit. Corolla 20–29 mm long, divided to 1/3–1/2, campanulate, glabrous or hairy on nerves outside, light violet; lobes 9.6–11 mm long, triangular-ovate, obtuse; tube 12.2–18 mm long. Stamen 8–9.1 mm long; filiform part of filament 0.1 mm long; base 2.7–3 × 2.3–2.5 mm, triangular-ovate, hairy in the margin, hairs c. 0.2 mm long; anthers 5.5–6 mm long; pollen 20–25 µm diameter, with a intermediate density of spinules (1.00–1.16 spinules µm⁻²). Style 9–13.2 mm long, included. Stigma 2–2.1 × 1.4–1.5 mm. Capsule 8.5–9.9 × 6–8.8 mm, concealed by the acresent connivent calyx lobes and appendages, hairy on the keels (hairs 0.7–1.7 mm long) and on the valves (hairs 0.2–0.5 mm long). Seeds 1–1.1 × 0.6–0.8 mm, yellowish.

Chromosome number: $2n = 22$ (Contandriopoulos, 1972, 1980).

Area: South-eastern Turkey, N Iran and N Iraq

Habitat: Rocky slopes, fields. 400–1830 m.

Phenology: Flowering March – May

Illustration: Fig. 23.

Representative specimens examined: IRAN: Iran W, Kuh-i-Marab v.1910, *Strauss s.n.* (W); SYRIA: Ain Syria (Ayn Sajriyah) prope Svedia, 1836, *Kotschy 349I* (W); TURKEY: Amanus, Mount Dumanly, 700 m, 11.vii, *Haradjian s.n.* (W); in monte Tauro, 1836, *Kotschy 349* (P, W); Cilicia: village de Gulek-Boghar, près du défilé des Portes Ciliciennes, 6.vii.1855, *Balansa s.n.* (P); Taurus, VII. 1856, *Balansa s.n.* (G); Cilicia, vi.1860, *Reuter s.n.* (P, W); c. 40 km NW Mardin, 23.vi.1965, *Sorger s.n.* (W); Deirik, sur basalte, 11.v.1955, *Mouterde 493* (G); Elazig, 15 km S von Maden, 14.v.1966, *Eiselt s.n.* (W); Village de Gulek-Boghas, N de Tarrous, 6.vii (G); Mardin, Kasrik Bogazi, 11 km

from Gizre to Sirmak, 400 m, limestone slopes, s.d., *Davis 42650* (G).

9. *Campanula camptoclada* Boiss., *Diagn. Pl. Orient.* Ser. 1, 11: 63 (1849).

Ind. loc.: 'Hab. in fissuris ruppium calidarum in vallis Antilibani circà *Banias* saxis arctè incumbens et secus ea ramos suos curvans. Legi Apr fine.'

Lectotype: (designated here) [Syria], Rochers de Banias, iv-v. 1846, *Boissier s.n.* (G).

Description: Annual 10–32.5 cm, hispid. Stem usually erect, dichotomously branched from base. Leaves 7–25(50) × 2–11(22) mm, sessile (lower leaves sometimes petiolate), entire or nearly so, ovate to ovate-oblong, obtuse or acute. Flowers lateral and terminal. Pedicels hispid, hairs (0.4)1–1.8 mm long. Calyx 7–10.2 × 2–3.1 mm (9–12.4 × 3–4 mm in fruit), hispid hairs 0.6–1.8 mm long; lobes 5–8 mm long (6.3–9 mm long in fruit), ovate to lanceolate, acute or subacute; appendages 2–3.2 mm long (2.5–4 mm long in fruit), rounded, obtuse, concealing ovary in fruit. Corolla 9–23 mm long, divided to 1/4–1/3, tubular-campanulate, glabrous or hairy on nerves outside, limb blue, tube white; lobes 3–6 mm long, ovate to semi-elliptical, obtuse; tube 6–14 mm long. Stamen 6–7.7 mm long; filiform part of filament absent; base 2.3–2.6 × 1.4–1.9 mm, oblong-elliptical, sparsely hairy, hairs 0.1–0.2 mm long; anthers 3.5–5.2 mm long; pollen 20–23 µm diameter, with a low density of spinules (0.40–0.46 spinules µm⁻²). Style 8–12 mm long, included. Stigma 1.8–2.7 × 1–1.4 mm. Capsule 5.5–7.7 × 4.9–5.3 mm, concealed by the acresent connivent calyx lobes and appendages, hairy on the keels (hairs 0.8–1.5 mm long) and on the valves (hairs 0.5–0.8 mm long). Seeds 1.1–1.3 × 0.9–1.1 mm, yellowish.

Chromosome number: Unknown

Area: Jordan, Lebanon, Palestine and Syria.

Habitat: rock crevices.

Phenology: Flowering March – April

Illustration: Feinbrun-Dothan (1977: 480)

Representative specimens examined: JORDAN: Wadi Tawadin (near Safad), 3.v.1942, *Davis 4594* (W). LEBANON: El Wadi, près Zahle, 5.vi.1938, *Gombault 5194* (P); Ruines du Château de Beaufort, S Liban, 5.v.1955, *Mouterde s.n.* (G). PALESTINE: Mt. Carmel, Wadi Shomrya, 9.iv.1942, *Davis 4397* (G); Between Binyamina and Kabara, rock crevices at the west foot of Carmel, 9.iv.1942, *Davis 4476* (W). SYRIA: Rochers de Baniyas,

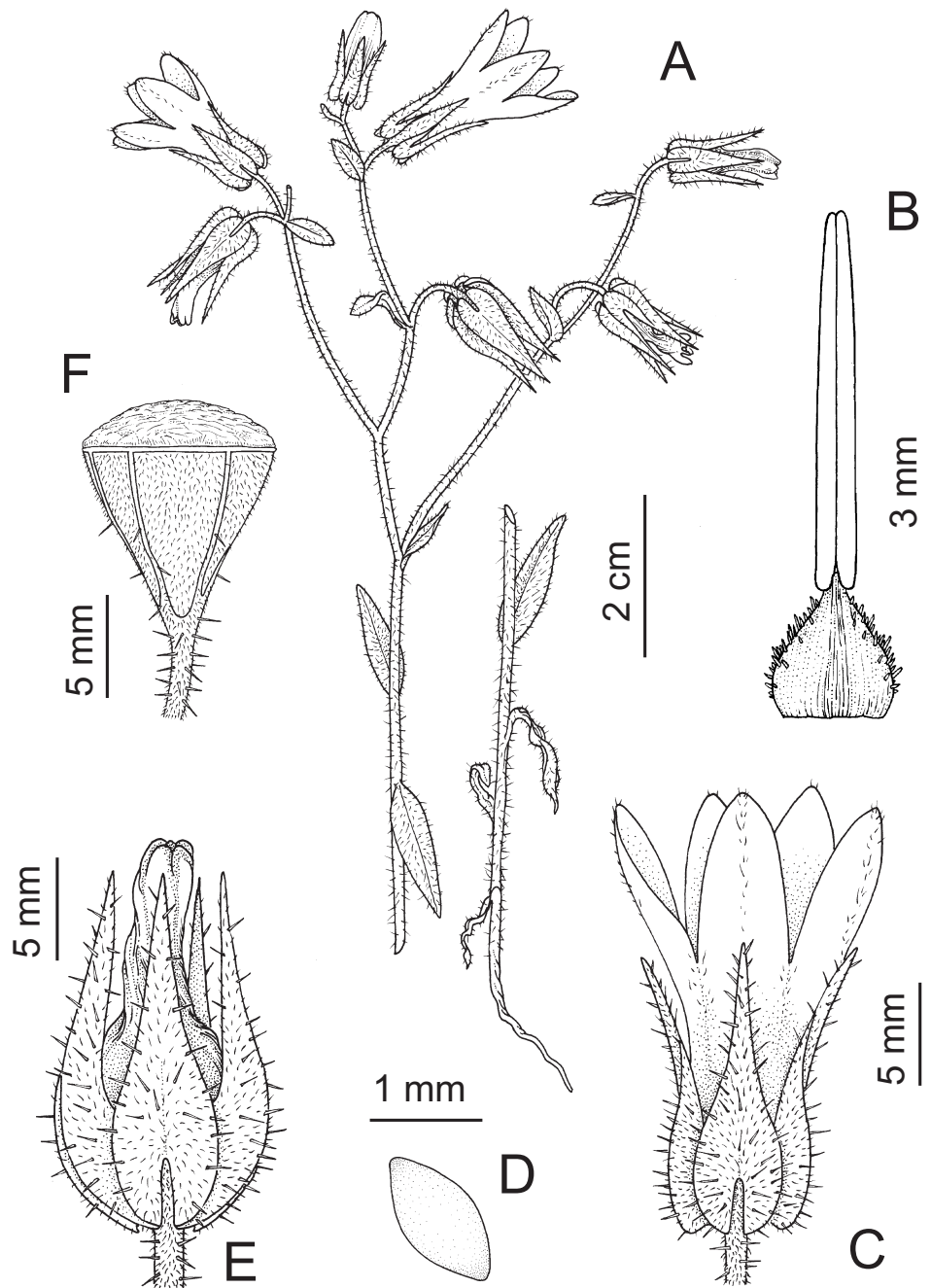


Figure 23. *Campanula reuteriana*. Turkey [Cilicia] in monte Tauro, 1836, *Kotschy 349* (W). A: habit; B: stamen; C: flower; D: seed; E: fruiting calyx; F: capsule.

4.v.1846, *Boissier s.n.* (G); Baniyas, 2.vi.1884, *Peyron s.n.* (G); Baniyas, iv.1937, *Mouterde s.n.* (G).

10. *Campanula propinqua* Fisch. & C.A. Mey., *Index Sem. Hort. Petrop.* 2: 32 (1836).

≡ *Roucela propinquax* '*Roucela:propinqua*' (Fisch. & C.A. Mey.) Karadze in *Zametki Sist. Geogr. Rast.* 32: 55 (1976).

Ind. loc.: 'Hab. in provincia Aderbeidschan Persiae borealis, locis sterilibus siccis.'

Lectotype: (designated by Damboldt, 1978: 48) [Iran] described from material cultivated in Hort. Petrop. with provenance: in provincia Adzerbeidschan Persiae borealis, *Szovits s.n.* (LE, isolectotype P).

= *C. pestalozzae* Boiss., *Diagn. Pl. Orient. Ser. 1*, 11: 62 (1849).

Ind. loc.: 'Hab. in Caramaniâ ubi legit amic. Dr Pestalozza.'

Lectotype: (here designated) (Turkey), Caramania, 1846, *Pestalozza s.n.* (G).

= *C. balansae* Boiss. & Hausskn. in Boiss., *Fl. Orient.* 3: 931 (1875).

Ind. loc.: 'Hab. in arenosis et glareosis torrentium regionis alpinae inferioris montis Masmeneudagh Cappadociae (Bal !) et Berytdagh Cataoniae (Haussk !). *Fl. Jul Aug.*'

Lectotype: (designated by Damboldt, 1978: 48) [Turkey], in glær. torrentium Berit-dagh, Taurus Cataonicus, 15.viii. 1865, *Haussknecht s.n.* (G).

= *C. propinqua* var. *parviflora* Turrill in *Bull. Misc. Inform.* 1929: 229 (1929).

Ind. loc.: 'N. Persia: Yam, Dik Dash, north-west of Tubriz, August 1928, *Gilliat-Smith* 2645.'

Lectotype: (designated by Rechinger & Schimann-Czeika, 1965: 13) [Iran], Yam, Dik Dosh, NW Tabriz, *Gill.-Sm.* 2465 (K).

Description: Annual 3–15(27) cm, hispid. Stem usually erect, simple or dichotomously branched from base. Leaves 5–20(30) × 3–10 mm, entire or incised-dentate, lower subsessile, spatulæ; cauline sessile, elliptical to oblong-lanceolate, obtuse. Flowers terminal. Pedicels hispid, with long hairs 0.7–0.9 mm long and small hairs 0.2–0.4 mm long. Calyx 3.4–10.4 × 1.4–2 mm (9–12.5 × 2.6–4 mm in fruit), hispid, hairs c. 0.8 mm long; lobes 2–7 mm long (5–9 mm long in fruit), linear-lanceolate, acute; appendages 0.9–3.4 mm long (1.5–3.5 mm long in fruit), ovate to triangular, acute or obtuse, usually concealing ovary in fruit. Corolla 5.8–17 mm long, divided to 1/3–1/2, narrowly tubular-campanulate, hairy outside at base and along the nerves, violet or blue-violet; lobes 2–6 mm long, triangular-ovate, obtuse; tube 5–11 mm long, hairy outside at base and on the nerves. Stamen 6.4–7.8 mm long; filiform part of filament 0.25–1 mm long; base 0.9–2 × 0.7–1.2 mm, oblong to ovate, sparsely hairy in the margin, hairs c. 0.1 mm long; anthers 3.8–5 mm long; pollen 20–24 µm diameter, with an intermediate density of spinules (2.60–2.71 spinules µm⁻²). Style 5.5–7.5 mm long, included or occasionally subexserted. Stigma 0.5–3.1 × 0.6–1.5 mm. Capsule 5–6.2 × 4–5.2 mm, concealed by the acrescent connivent calyx lobes and appendages, hairy on the keels (hairs 0.7–0.9 mm long) and on the valves (hairs 0.2–0.5 mm long). Seeds 1–1.2 × 0.4–0.5 mm, yellowish.

Chromosome number: 2n = 16 (Contandriopoulos, 1972, 1976).

Area: north-western Iran, eastern Turkey, and southern Caucasus (Nakhichevan and Georgia).

Habitat: Fields, steppes, dry slopes, sandy and stony places. 60–2000 m.

Phenology: Flowering March – July

Illustration: Fig. 24, Fedorov (1976); pag. 135: 4.

Notes: *Campanula propinqua* is considerably variable, mainly in plant size and general shape. This high variability resulted in the description of many taxa. Victorov & Elenovskiy, (1998) proposed including *C. propinqua* in *C. dichotoma*, in order to combine two rather similar and variable species. However, two characters discriminate them: the presence of two hair types in pedicels and fruits of *C. propinqua*, with only one type in *C. dichotoma*; and the different shape of staminal appendages in both species. In addition, the divergent chromosome number supports the view that *C. propinqua* and *C. dichotoma* deserve taxonomic recognition at the specific level.

None of the morphological features used by Boissier (1849) to distinguish *C. pestalozzae* appear to be constant. Damboldt (1978) included *C. pestalozzae* within the variation of *C. propinqua*. However, *C. propinqua* has a large variability in the size of its floral parts, and shows no relation with any other characters or with its ecological and geographical distribution.

Campanula propinqua var. *parviflora* Turrill is probably a mere variant of *C. propinqua* without any taxonomic value. Plants from northern Iran do not differ from other accessions of the species.

Representative specimens examined: IRAN: Azerbaijan W, Sharhestan, Marand, 23.vi.1965, Scharef 6485 (W); Persia boreal s.d., *Szovits s.n.* (P, LE); Azerbaijan E, 9 km SE of Marand, 16.vii.1964, *Grant s.n.* (W); Azerbaijan: prope station viae ferr. Nagram, 24.v.1933, *Prilipro s.n.* (P); Azerbaijan W; Serow, 7.vii.1968, *Petrovitz 165* (W); Aderbidjan, s.d. *Aucher-Eloy 4901* (G); Azerbaijan orientate., in jugo inter Marand et Sufian, 1600–1750 m, 6.vi.1971, *Rechinger 41204* (G); Azerbaijan occidentalis, in jugo Quschi inter Shapur et Rezaiyeh, 13.vi.1971, *Rechinger 41899* (G); in valle fluvii Qotur W Khvoy versus fines Turcicas, 11.vi.1971, *Rechinger 41740* (W); Azerbaijan occidentalis: in valle fluvii Quotur, W Khvoy, 17.vii.1974, *Rechinger 49548* (G); Azerbaijan orientate. in arenoso glareosis a Bunab boreo.occidentem vs., 15.vi.1977, *Rechinger 56798* (G). TRANSCAUCASUS, NAKHICHEVAN: pr. Pag. Arincz, 3.vii.1952, *Fedorov & Smoljanianova s.n.* (W, G); Aznabiurt; 2.vi.1960, *Magmanesian s.n.* (MA 560705); Shakhbuz, 2.vi.1934, *Grossheim & Gurvitsh s.n.* (W); prope pag. Arincz, 3.vii.1952, *Prilipro s.n.* (P); (G); Nachiczewan: prope pag. Aznajurt, 8.vi.1947, A. Grossheim *et al.* s.n. (G). TRANSCAUCASUS, GRUCIYA:

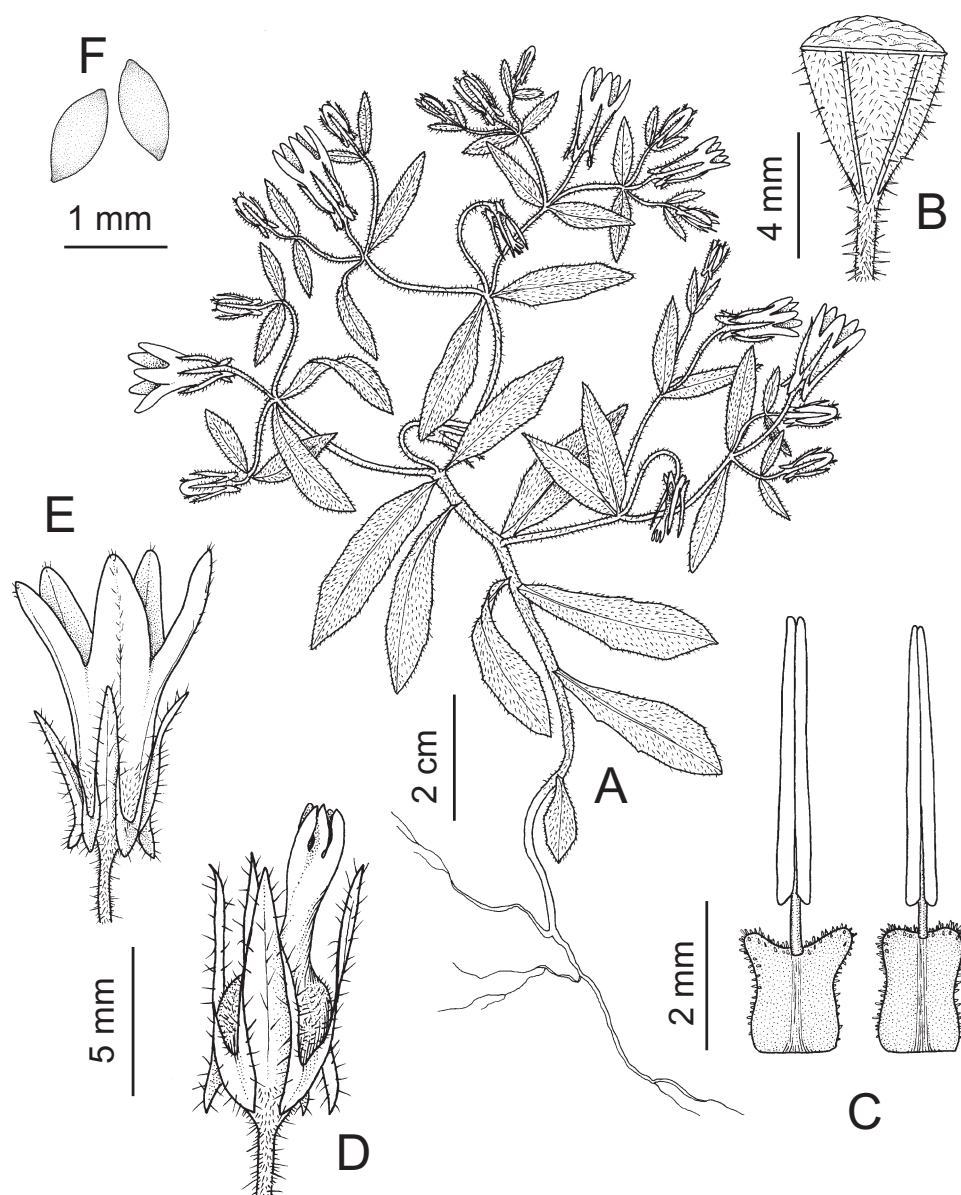


Figure 24. *Campanula propinqua*. A–F: Iran, in valle fluvii Qetur, W Khroy, 17.vi.1971, *Rechinger 41740* (W); A: habit; B: capsule; C: stamens; D: fruiting calyx; E: flower; F: seeds.

Vallis Bardus-Zai, prov. Karo, 21.vi.1904, *Schicliowsky* (COI). TURKEY: Armenia turcica, Egin, in campis prope Szanduk, 15.vi.1890, *Hausknecht s.n.* (G); Kurdistania W, Taurus Cataonicus, inter urbem Malatia et vicum Kjatcha, in declivibus glaeriosis inter Kory et Furendscha, 19.vii.1910, *Handel-Mazzetti 2493* (W); Berithdagh, Cataoniae, 15.viii.1865, *Hausknecht s.n.* (W); Adalia, 16.iv.1860, *Bourgeau s.n.* (P, W); Isparta, Anamas-Schlucht (Zindan Magarasi) am Ayvali Cay (Köprüirmagi), 25.vi.1969, *Fitz & Spitzenberger 977* (W); Malatya, Malatya-Pörtuge, 26 km anch Abzweigung Kube Dâg Südseite, 17.vii.1982, *Nyedgger 17211*

(G); Bingöl, Elazig-Bingöl, 21 km W Bingöl, 19.vii.1982, *Nyedgger 17243* (G); Gümüsane, Torul-Siran, 40 km N Siran, 1280 m, *Nyedgger 19119* (G); Dogancal, Sivas Department, 2.vii.2001, *Aldasoro 2731* (MA); Anamurium, 22.iv.1985, *Nyedgger 40394* (G); Antalaya: Gazipasa-Alanya, 15 km E Alanya, 2.v.1986, *Nyedgger 41581* (G); Toakt, Zile-Amasya, 5 km N Zile, 27.vi.1987, *Nyedgger 42959* (G); Adalia, sur les pelouses, 16.iv.1860, *s.r.* (G); Asia minor, oest Pontus, 1858, *Tchihatchef s.n.* (G); près Ispir, 6.vi.1862, *Bourgeau 453* (G); Armenia prope Ispir, vi.1853, *Huet du Pavillon s.n.* (G).

11. *Campanula hierosolymitana* Boiss., Diagn. Pl. Orient. Ser. 1, 11: 62 (1849).

Ind. loc.: 'Hab. ad pedem rupium propè Hierosolymam juxtà speluncas Regnum et Judicum dictas et in Samarià propè Naplouse. Legi Maio ineunte.'

Lectotype: (designated here) [Palestine], aux pieds des rochers à Jerusalem, Naplouse, iii-iv. 1846 Boissier s.n. (G).

Description: Annual 5–30 cm, hispid. Stem erect, simple or dichotomously usually branched in the upper part, rarely from base. Leaves 5–40 × 4–15 mm, sessile, entire or nearly so, ovate to oblong, obtuse or subacute. Flowers in groups of 2–3. Pedicels hispid, hairs 1.5–2.5 mm long. Calyx 6–16 × 2–3.8 mm (8–17 × 3–4.5 mm in fruit), rather densely hirsute, hairs 1.6–2.5(3) mm long; lobes 4–10 mm long (12 mm long in fruit), ovate to lanceolate, acute; appendages 2–3 mm long (2.5–3 mm long in fruit), ovate to rounded, obtuse, concealing ovary in fruit. Corolla 10–22 mm long, divided to 1/3–1/2, tubular-campanulate, glabrous or hairy on nerves outside, light or deep violet; lobes 3–7 mm long, ovate to triangular-ovate, obtuse; tube 7–15 mm long. Stamen 6.5–8 mm long; filiform part of filament 0–0.2 mm long; base 1.5–1.9 × 1.3–1.7 mm, oblong-elliptical, sparsely hairy in the margin, hairs 0.2 mm long; anthers 5–5.8 mm long; pollen 20–22 µm diameter, with a intermediate density of spinules (0.8–1.1 spinules µm⁻²). Style 8.4–11 mm long, included. Stigma 1.5–2 × 0.5–0.7 mm. Capsule 5–7 × 5–6.5 mm, concealed by the acrescent connivent calyx lobes and appendages, hairy on the keels (hairs 1.5–2 mm long) and on the valves (hairs 0.2–0.4 mm long). Seeds 1 × 0.4–0.45 mm, yellowish.

Chromosome number: unknown.

Area: Lebanon, Jordan, Palestine, Syria and south-eastern Turkey.

Habitat: Rocky places and arid slopes. 100–1200 m.

Phenology: Flowering March – May

Illustration: Feinbrun-Dothan (1977: 479).

Representative specimens examined: JORDAN: Wadi es Sik, 1880, *Barbey* s.n. (G); Zerka Main to Jebel Atturus, 25.iv.1945, *Davis* 9368 (G, W). PALESTINE: ad pagum Malcha, prope Hierosolym., 19.iv.1855, *Kotschy* s.n. (W); Kinrot valley, Upper Jordan Valley, 2 km NE of Kibbutz Haon, 2.iv.1989, *Danin et al.* 39048 (G); Jerusalem, près de Bassis de Salomon, 26.iv.1883, *Cramer* s.n. (G); Jericho, in declivitatibus aridis as Ain-Sultan et Wadi-Kilt, 30.iii.1897, *Bornmüller* 1095 (W); Env. de Jersualem, Joffé (MPU); De

Mezleh à Mà Màs, 15.iv.1906, *Aaronschii* s.n. (MPU); Shomron, outlet of W. Fari'a, 6.iv.1927, *Eig et al.* s.n. (MPU); Jerusalem, Messallebe, 3.v.1933, *Amdursky* s.n. (W); Wadi Beidan near Nablus, 23.iv.1942, *Davis* 4531 (G, W); Nebi Youn, 29.v.1950, *Mouterde* s.n. (G); Jerusalem, Romema, v.1954, *Barkay* s.n. (MA 203052); Naplouse, Jinsafoud, 6.iv.1955, *Kasapligil* 2460 (G); SYRIA: Nebi Youn, 29.v.1950, *Mouterde* s.n. (G); TURKEY: Syria, prope Alexandrette (Iskenderum), 1834, *Montbret* 18 (W).

12. *Campanula dichotoma* L., Cent. Pl. II: 10 (1756).
Ind. loc.: 'Habitat in Sicilia, Syria.'

Lectotype: (designated by Victorov & Elenvsky, 1998: 56) *Boccone* P. 1674. Icones et descriptiones. p. 83, Table 45, fig. 1.

= *C. afra* Cav. in *Anales Ci. Nat.* 3: 21 (1801).

Ind. loc.: 'El Sr. Broussonet la encontró en Salé.'

Lectotype: (here designated) [Morocco], Herbario Cavanilles, Mogador, Salé, *Broussonet* s.n. (MA 120963).

= *C. dichotoma* ssp. *afra* (Cav.) Maire in *Cavanillesia* 2: 174 (1930).

= *C. kremeri* Boiss. & Reut., *Pugill. Pl. Afr. Bor. Hispan.* 75 (1852).

= *C. dichotoma* var. *parviflora* Ball in *J. Linn. Soc., Bot.* 16: 553 (1878).

= *C. dichotoma* ssp. *kremeri* (Boiss. & Reut.) Nyman, *Consp. Fl. Eur.* 477 (1879).

= *C. afra* var. *parviflora* (Ball) Font Quer in *Mem. Real Acad. Ci. Barcelona* 25: 342 (1936).

Ind. loc.: 'Hab. in rupestribus ad mare et septentrionem spectantibus promontorii Mers el Kebir propè Oran (Aprili 1849, Boiss. & Reut).'

Lectotype: (designated here). [Algeria], Oran, montes supra Mers el Kbir, iii- 1849, *Boissier & Reuter* s.n. (G).

= *C. decipiens* Schult. in *Roem. & Schult., Syst. Veg.* 5: 142 (1819).

Ind. loc.: 'In Calabria' (no authentic material found).

= *C. dichotoma* var. *brachiata* A. DC., *Monogr. Campan.* 237 (1830).

Ind. loc.: 'Varietas β in Mauritaniâ (Thibaud! Salzml)'

Lectotype: (designated here) Mauritania, 1815, *Thibaud* s.n. (G)

= *C. dichotoma* var. *pallida* Maire in *Bull. Soc. Hist. Nat. Afrique N.* 23: 199 (1932).

= *C. afra* var. *pallida* (Maire) Dobignard in *Candollea* 47: 455 (1992).

Ind. loc.: 'Hab. in lapidosis calcareis Imperii marocconi austro-occidentalis Agadir-n-Ighir; prope Herculis Promontorium.'

Lectotype: (designated here) Morocco, Agadir-n-Ighir, 13.iv. 1931, *Maire s.n.* (P)

= *C. leptosiphon* Pau & Sennen in Sennen, *Diagn. Nouv.* 195 (1936).

Ind. loc.: 'Hab.-Maroc: Atlas Rifain, Targuist, à Bab-Izugar, 1230 m. Leg. Sennen et Mauricio.'

Lectotype: (designated here) Morocco, Atlas Rifain, Targuist à Bab-Izugar, 1230 m, 20.vi. 1933, *Sennen & Mauricio s.n.* (MA 121002). Isolectotypes (G, MAF 2911).

= *C. occidentalis* Y. Nyman in *Willdenowia* 20: 113 (1991).

Ind. loc.: 'Canary Islands, Tenerife: Masca, below the village, about 500 m, 12.3. 1982, *Lindblad s.n.*'

Holotype: Canary Islands, Tenerife: Masca, below the village, 500 m, 12.iii. 1982, *Linblad s.n.* (UPS).

Description: Annual 5–30(57) cm, hispid. Stem erect, dichotomously branched in the upper part, rarely from base. Leaves 6–30(60) × 3–15(31) mm, sessile, entire or nearly so, ovate to oblong, obtuse or acute. Flowers generally in shortly pedunculate dichasia. Pedicels hispid, hairs 1.3–2.2 mm long. Calyx 6.6–15(21) × 1.5–4.2 mm (7.8–21.5 × 3–5 mm in fruit), rather densely hirsute, hairs 1.1–2 mm long; lobes 4–10(15) mm long (5.5–15 mm long in fruit), ovate-lanceolate to lanceolate, acute; appendages 1.8–4(6.5) mm long [2.3–4.5(6.5) mm long in fruit], rounded or ovate, obtuse, usually concealing ovary in fruit. Corolla (5)10–20(30) mm long, divided to 1/4–1/3, tubular-campanulate, glabrous or hairy on nerves outside, light violet; lobes 3–10 mm long, broadly elliptical to obovate, obtuse; tube 5–15 mm long. Stamen 5–9.2 mm long; filiform part of filament (0.5)0.7–1(1.5) mm long; base 1.4–2.8 × 1–2.3 mm, triangular, triangular-ovate to broadly obovate, hairy in the margin, hairs 0.1–0.2 mm long; anthers (2.4)4–5(6) mm long; pollen 22–29 µm diameter, with a low density of spinules (0.24–0.27 spinules µm⁻²). Style (4.9)7–11(15) mm long, included. Stigma 0.9–2.4 × 0.5–1.4 mm. Capsule 5–9.7 × (3)4.9–7 mm, concealed by the crescent connivent calyx lobes and appendages, hairy on the keels and on the valves (hairs 0.5–1.7 mm long). Seeds 0.7–0.9 × 0.3–0.5 mm, yellowish.

Chromosome number: $2n = 24$ (Gadella, 1962, 1964; Thulin, 1976; Contandriopoulos, 1980, 1981).

Area: Western Mediterranean region (Morocco, Algeria, Tunisia, southern Iberian Peninsula, Ibiza in Balearic Islands, Sicily and southern Italy) and Macaronesia (Canary Islands). We have seen only one

specimen from the Dalmatian coast, with an imprecise label, which generates some doubt about its presence in Yugoslavia.

Habitat: Fields, steppes and stony places; 0–1400 m

Phenology: Flowering March – July

Illustration: Sáez & Aldasoro (2001: 128)

Notes: *Campanula dichotoma* is considerably variable in size, leaf shape, and flower size. We have cultivated this species from seeds, and in our opinion the floral variability is associated with pollination syndrome. Well developed plants in nutrient-rich sites are usually allogamous and show larger flowers, but at the end of the flowering period these plants usually possess only small, presumably autogamous, flowers. In poor or dry sites sparse plants are found, with only small flowers. Plants with smaller corollas were described as *C. kremeri* while those with larger corollas were included in *C. afra* or *C. dichotoma*. Later, a plant of the Canary Islands was described as *C. occidentalis* (Nyman, 1991). It has a small corolla, seeming closely related to *C. kremeri*. We have not been able to find any constant morphological feature suggesting that plants of the Canary Islands merit recognition as a separate taxon. We have seen the types of all these species and varieties and after studying them all features suggest that they belong to one variable species, specialized to colonize new habitats and exhibiting a great variability in reproductive behaviour.

Representative specimens examined: ALGERIA: Oran, iv.1839, *Bové s.n.* (W); Oran, coteaux argillo-calcaires, 24.v.1851, *Durando s.n.* (W); Rochers du Djebel Santo à Oran, 20.iv.1852, *Balansa s.n.* (W); rochers à Lalla-Maghrina, ouest de la province d'Oran, 19.v.1856, *Bourgeau s.n.* (G, MPU); Montagne de la Bouzardah près Alger, 25.v.1859, *Romain s.n.* (MPU); in sterilibus cap Falcon, Oran, v.1856, *Munby s.n.* (MPU); environs d'Alger, iv.1861, *Bourlier s.n.* (MPU); Bou-Saada, sud de la prov. de Constantine, Algérie, 1865, S. *Rebaud s.n.* (W); Mégrin, env. de Tlemcen, 20.iii.1872, Courcière (MPU); In umbrosis ad Mustapha, 5.vi.1894, *Chevallier s.n.* (COI); Alger, v.1899, *Gandoger s.n.* (MA 120944); Le Gouraya de Bougie, Kabylie, vi.1896, *Reverchon s.n.* (COI, MPU); Santa Cruz, Oran, 17.iv.1908, *Faure s.n.* (MA 120938); Djebel Santo, Oran, v.1915, *Alleizette s.n.* (G); El Biar, près Alger, coteaux, 12.vi.1916, *Bianor s.n.* (MA 120942, MA 120947); Oran, iv.1921, *Alleizette s.n.* (MA 120969); Beni Saf, Oran, 1.v.1934, *Maire & Wilczek s.n.* (MA 120934); Oran, montagne des Lions, 25.iv.1934, *Faure s.n.* (MA 120978); Wilaya, Tizi Ouzou, Djurjura, 10 km E Yakouren, 930 m, 14.vi.1984, *Podlech 39292* (G);

Constantine, s.d. *Joly s.n.* (MPU). BALEARIC ISLANDS: Ibiza, Sommet du Puig d'en Serra, 28.iv.1852, *Vigneix s.n.* (MPU); Ibiza, Puig des Molins, 9.v.1918, *Gros s.n.* (BC 39096); Ibiza, Cala Jondal, 16.v.1918, *Gros s.n.* (MA 120959, BC 39095); Ibiza, Sant Miquel, 19.v.1919, *Font Quer s.n.* (BC 39094); Ibiza, Punta Corb Marí, 23.iv.1988, *Aloina et al. s.n.* (Herb. University Illes Balears); Ibiza, Es Vedrà, 19.iv.1991, *Bibiloni s.n.* (Herb. University Illes Balears). CANARY ISLANDS: Barranco Hondo près Santa Cruz de Tenerife, ii.1852, *Bolle s.n.* (MPU); Tenerife, 1852, *Bolle s.n.* (W); Teneriffa ad barranco Santo près Santa Cruz, 16.iv.1855, *Bourgeau s.n.* (P, W); Teneriffa, Las Mercedes, 4 km NE La Laguna, c. 600–700 m, 13.iv.1968, *Ehrendorfer et al. s.n.* (W); Alrededores de Sta. Cruz de Tenerife, 28.iii.1879, *MasFerrer s.n.* (BC 39110); Jandia, 80 m, 6.iii.1969, *Kunkel 12580* (G); Lanzarote, road to Orzola, 26.iv.1972, *Kunkel s.n.* (G); Lanzarote, Malpais de la Corona, 150 m, 14.iii.1973, *Kunkel s.n.* (G). ITALY: Près de Naples, 1860, *Cappelli s.n.* (G); Insula Inarime, Ischia, Casamicciola, ix.1875, *Levier s.n.* (P); Calabria, 19.iv.1877, *Huter et al. s.n.* (MPU, P); Lasla (prov. di Cosenza), Calabre, Italie, 13.vi.1893, *St-Lager s.n.* (MA 165674); Isola di Capri, vi.1905, M. Guadagno s.n. (MA 120948); Cava dei Tirreni (Salerno), vi.1913, *Guadagno s.n.* (MA 120949); Campania, ad muros humidis in umbrosis, Gragano (Napoli), 10.vii.1913, *Pellanda s.n.* (MA 120946); Salerno, Ravello, 28.vii.1921, *Fiori s.n.* (MAF 61063). MOROCCO: Tanger, vi.1839, *Salzmann s.n.* (COI); Djebel Amsiten, environs d'Agadir, 17.v.1877, *Ibrahim s.n.* (MPU); Djebel Habrid, prov. Chiadma, 1886, *Ibrahim & Grant s.n.* (MPU); Rabat, 1.iii.1888, *Grant s.n.* (MPU); Ceuta, v.1907, *Vicioso s.n.* (MA 120980); Environs de Larache, v.1910, *Vaucher s.n.* (G); Chaouia, Boulkaut in aridis, 15.v.1912, *Pitard s.n.* (G); Casablanca, Aui Seba, 19.v.1912, *Pitard 1838* (P); Settat, El Bahloul, 8.vi.1912, *Pitard 1837* (P); Telata de Reisana, v.1918, *Dantín s.n.* (MA 120939); Meknes, 12.vi.1918, *Benoist s.n.* (P); Volubilis, 23.iv.1920, s.d. (MPU); Marrakech, Djebel Guéliz, 525 m, 4.iv.1921, *Rodié s.n.* (MPU); Tetouan, v.1921, *Alleizette s.n.* (P); Xauen, 14.v.1921, *Vidal López s.n.* (MA 120941); Tetuán, v.1921, *Pau s.n.* (MA 120973); Tánger, 2.v.1921, *Pau s.n.* (MA 120970); Immouzer, Moyen Atlas, 1500 m, 19.vi.1923, *Jahandiez s.n.* (MPU); Larache, 28.vi.1923, *Caballero s.n.* (MA 163049); Boulhaut, gorges calcaires de l'oued Cherrat, 300 m, 21.iv.1924, *Jahandiez s.n.* (MA 120974); Berkane, Zegzel, 18.v.1928, *Faure s.n.* (G); pr. Xauen, in arenosis, 500 m, solo siliceo, 23.v.1928, *Font Quer s.n.* (MA 120981); Gurugú, coteaux, 100 m, Barranco del Lobo, 21.vi.1930, *Sennen & Mauricio s.n.* (MA 120967); Yacinem, v.1930, *Mauricio s.n.* (MA 120975); Segangan, Beni-Sidel, 17 et 24.v.1934, *Sennen & Mauricio s.n.* (MA 120977, COI); Base del Monte Tamarrut, Ifni, 700 m, 6.vi.1934 *Caballero s.n.* (MA

120965); Beni-Bufrah, 24.v.1934, *Sennen & Mauricio s.n.* (MAF 61348); Anti Atlas, El Arba des Ait Baha, 10.iii.1935, *Gattefossé s.n.* (MPU); Beni-Snassen, collines de Tahil, 28.v.1935, *Sennen & Mauricio s.n.* (MA 161405); El Kansera, iii.1937, *Gattefossé s.n.* (MPU); Boulhaut, Quercetum 10.v.1937 *Gattefossé s.n.* (MPU); Anti Atlas occid., 30.iii.1954, *Rungs s.n.* (RAB 4886, COI); Sefrou, 1.vii.1958, *Giscard 40* (RAB 5167); Plateau Central, El Khakarake, Takesbir, 8.vi.1963, *Mathez s.n.* (RAB 44707); Tanger in monte Gibel Kibir, *Durand s.n.* (MPU); Beni Ersine, Jbel Tasiat, 35 km von Ketama, 1330 m, 8.vii.1971, *Dittrich 1221a* (G); Beni Mellal, entre le col du Tizi Mlil et Beni Mellal, 1250–1300 m, 5.vi.1980, *Charpin et al.* (G); Entre Oulad M'Barek y Ouauouzarthe, cerca de Beni-Mellal, 800 m, 12.vi.1982, *Fernández Casas 6752* (MA 430481); 4 km de Boujad, cerca de Kasba-Tadla, 710 m, tomillar ralo sobre calizas, 12.vi.1982, *Fernández Casas 6741* (MA 430480); Agadir, Col de Kerdouss, 930 m, 24.v.1985, *Blanché et al. 9237* (MA 340938); province d'Agadir, rive gauche de l'Oed Emdel 3 km en amont S de Sidi Ifni, 16.iv.1989, *Jacquemoud 4006* (G); prov. Taza, 4 km S Sidi Abdallades-Rhiata, 400 m, 10.v.1989, *Podlech 46391* (G, MA 472213). SICILY: Cefalu, Siciliae septentrionalis, 14.vi.1840, *Heldreich s.n.* (G); ad colles propè Sta. Agostina Piana dei greci, 25.v.1855, *Huet du Pavillon s.n.* (MPU); Palermo a San Martino, v.1879, *Todaro s.n.* (P); Prov. Messina, Galatis, 1.v.1898, *Rigo 209* (P, MA 120943); Messina, v.1901, *Ross s.n.* (BC 39111); Taormina, 100 m, 26.iv.1926, *Spencer s.n.* (BC 39113); Taormina, 300 m, 23.v.1933, *Bornmüller 430* (P); Palermo a Gibbrossa, *Todaro s.n.* (MPU). SPAIN: Almería, in rupestribus montis Mugron, v.1890, *Porta & Rigo s.n.* (MPU); Ronda, broussailles, 21.v.1902, *Dominguez s.n.* (BC 39093); Almería: Barranco del Caballar, 2.v.1921, *Gros s.n.* (MA 120937); Murcia, s.d. *Bernardé s.n.* (G); Cádiz: Provincia de Cádiz, 1925, *Gros s.n.* (MA 190501); Málaga: In quercetis dumetisque Casares; Monte del Duque, 14.v.1932, *Vicioso s.n.* (MA 120961); Sierra Bermeja, alcornocales sobre silúrico, 19.v.1969, *Rivas Goday & Izco s.n.* (MA 219731); Benahavis, Sierra Palmitera, in rupestribus peridotiticis, 4.vi.1978, *Fernández Casas 2289* (MA s.n.); Murcia, 12.iv, *Trèmols s.n.* (MAF 2778); Coto de Alquerías, 19.v.1902, *Ibáñez Jiménez & Pau s.n.* (MA 120936); cerca de Cehegín, sierra de Quipar, 19.vi.1975, *Fernández Casas 2289 sn.* (MA 411999); in cistetis supra Estepona, v.1937, *Boissier s.n.* (P). TUNISIA: c. Temram, 2.v.1884, *Letorneux s.n.* (P); Tunis, 1922, s.d. (MPU); Jendouba, Tabarka, dunas litorales, 28.v.1992, *Benedí et al. s.n.* (MA 557453, MAF 148325). YUGOSLAVIA: Dalmatia, *Petter s.n.* (G).

13. *Campanula ceciliae* Chitt., Gardeners' Chronicle Ser. 3, 89: 397 Fig. 210(1931)

Ind. loc.: 'The several pot plants of this half-hardy annual were raised from seeds collected in Kurdistan, Iraq, in June, 1930.'

Lectotype: (here designated) Gardeners' Chronicle Ser. 3, 89: 411 fig. 210.

Epitype: (here designated) [Iraq], Assyria orientate: in montis Kuh-Sefin reg. Infra pagum Schaklava (Erbil), 8.v.1893, Bornmüller 1554 (P, W).

Campanula ceciliae Rechinger & Schimann-Czeika, in Flora Iranica 13: 12 (1965), nom. illeg.

Ind. loc.: 'It occurs from Kurdistan from 200 m to 800 m.'

Lectotype: (designated by Rechinger & Schimann-Czeika, in Flora Iranica 13: 12, 1965): Bot. Mag. 157, 349 (1934).

= *C. propinqua* [unranked] *grandiflora* Milne-Redh., Bot. Mag. 157: pl. 9349 (1934).

Ind. loc.: 'Armenia and Iraq (Kurdistan).'

Lectotype: (here designated) Bot. Mag. 157, 349 (1934).

Description: Annual 10–30 cm, hispid. Stem erect, simple or dichotomously branched in the upper part, or from base. Leaves 10–40(60) × 4.2–25 mm, sessile, entire or nearly so, elliptical to oblong-lanceolate, obtuse. Flowers in shortly pedunculate dichasia. Pedicels hispid, hairs 0.9–2 mm long. Calyx 16–23 × 1.9–3 mm (26.8–29 × 4–4.5 mm in fruit), hairy along the margin and on nerves, hairs 0.9–1.7 mm long; lobes 12–18 mm long (20–22 mm long in fruit), lanceolate, subacute; appendages 3.8–6 mm long (6.8–7 mm long in fruit), ovate, obtuse, usually concealing ovary in fruit. Corolla 14–35 mm long, divided to 1/3–1/2, tubular-campanulate, glabrous or hairy on nerves outside, light violet; lobes 7–13 mm long, triangular-ovate, obtuse; tube 7–23 mm long. Stamen 6–8.4 mm long; filiform part of filament 0.8–1 mm long; base 1.5–2.3 × 1.2–2.2 mm, subpentagonal to suboblong, hairy on the abaxial surface and on the margin, hairs 0.1–0.3 mm long; anthers 3–5.1 mm long; pollen 19–24 µm diameter, with a low density of spinules (0.70–0.75 spinules µm⁻²). Style 9–11.2 mm long, included. Stigma 1.7–2 × 1–1.5 mm. Capsule 11–12.5 × 9–10 mm, concealed by the ascendent connivent calyx lobes and appendages, sparsely hairy on the keels (hairs 0.6–1.8 mm long). Seeds 1.2–1.5 × 0.4–0.5 mm, yellowish.

Chromosome number: 2n = 20 (Sugiura, 1940, 1942).

Area: Northern Iran, northern Iraq and Turkey

Habitat: Steppes, meadows.

Phenology: Flowering March – May

Illustration: Fig. 25

Notes: Damboldt (1978) subsumed this species in *C. reuteriana* because they only differ in the shape of the calyx lobes. However, in our opinion they can be separated via other useful characters. The main one is stamen shape: the length of filiform part of stamen is different, being 0.8–1 mm long in *C. ceciliae*, while in *C. reuteriana* it is very short or absent (0–0.1 mm long). The shape of the stamen base is also different: winged only in *C. ceciliae* (Fig. 20). Moreover, the size of corolla differs in both species (Fig. 9) and *C. reuteriana* presents two types of hairs in the pedicels and capsules, while *C. ceciliae* only presents one.

In addition, *C. propinqua* [unranked] *grandiflora* Milne-Redh. should be referred to *Campanula ceciliae*.

Representative specimens examined: IRAN: W Iran, in monte Takhi.Soleiman, v.1898, *Strauss s.n.* (W); Bakhtiari, Seghahan, 25.iv.1910, *Schiman.Czeika 15010* (W); Zagros mountains, 51 miles W of Shirez, 23.iv.1973, *Hewer 1919* (W); Luristan, 60 km W of Khorramabad, 30.iv.1966, *Archibald 1622* (W); Kurdistan, 24 km N.W. of Karind, 13.v.1966, *J.C. Archibald 1844* (W 17264); Kurdistan, 75 km W. N.W. of Sanadaj towards Marivan: valley of the Gul.i.Chida, 17.v.1966, *Archibald 1981* (W); Lorestan, Pol.e Ma'luman c. 60 km from Khorramabad on road to Andimeshk, 5.v.1975, *Wendelbo & Assadi 15576* (W). IRAQ: Gotvend, rio Karum, 5.vi.1889, *Jiménez de la Escalera s.n.* (MA 120997); Harran, Mesopotamia, 17.v.1865, *Haussknecht s.n.* (W); Assyria orientate: in montis Kuh.Sefin reg. Infer. Infra pagum Schaklava (Erbil.), 8.v.1893, *Bornmüller 1554* (P, W); Distr. Sulaimaniyah (Kurdistan), Mt. Avroman ad confines Persiae, Tawilla, Sosakan, 15–18.vi.1957, *Rechinger 10131* (G); near Silwan River, 7 km S of Derbenikhan, Sulaimaniyah, Liwa, 26.iv.1963, *Barkley et al. 5110* (W); Diyala river, 30 km south of Durbendikan, Kirkuk, 9.iv.1964, *Barkley 7356* (W). TURKEY: Kurdistania, Mardin, Senar, 6.vi.1888, *Sintenis 921* (W); Siirt: Sirnak to Gizre, 14 km from Sirnak, 8.v.1966, *Davis 42678* (W); NW of Mardin, Diyarbakir, 30.v.1983, *Sorger 83162* (W);

Excluded names

C. bicolor Boiss., nom. nud., in sched. (G)

C. valentina Pourr., nom. nud., in sched. (MAF).

C. obtusiuscula Pau, nom. nud., in sched. (MA)

Campanula afra f. *cleystogama* Font Quer, Iter Maroc. 1927, n°. 636 (1928) nom. nud., in sched.

C. dichotoma f. *longipedunculata* Font Quer, nom. nud., in sched. (BC)

ACKNOWLEDGEMENTS

This work was partially supported by a research grant 'Flora iberica VIII' (DGICYT PB 96–0849). L. Sáez has

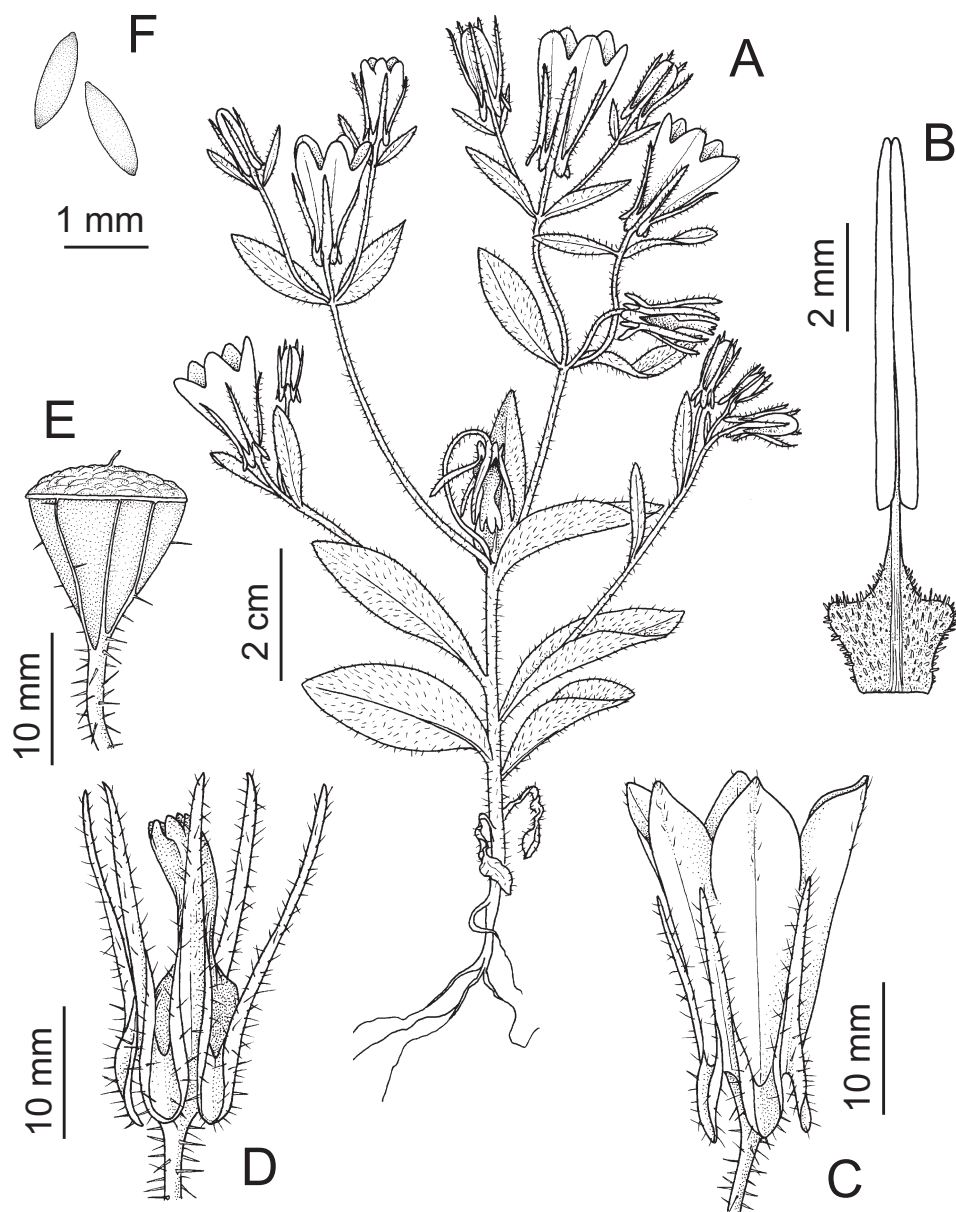


Figure 25. *Campanula cecilii*. A–F: Iraq: in montis Kuh, sefin, infra pagum Schaklava (Erbil), 8.v.1893, Bornmüller 1554 (W). A: habit; B: stamen; C: flower; D: fruiting calyx; E: capsule; F: seeds.

received financial support from a grant (EPO) from the Spanish Scientific Research Council (CSIC)-Institut de Cultura de Barcelona (ICUB) and from the Training and Mobility of Researchers (TMR) Programme of the European Commission, which partially supported the visit to the Museum National d'Histoire Naturelle du Paris. We thank Prof W. Greuter (Botanischer Garten & Botanisches Museum, Berlin), P. Perret (Geneve), S. Castroviejo and C. Aedo (Real Jardín Botánico-CSIC, Madrid) for kindly advising in some nomenclatural problems.

REFERENCES

- Battandier JA, Trabut LC. 1904.** *Flore analytique et synoptique de l'Algérie et de la Tunisie*. Argel.
- Boissier PÉ. 1849.** *Diagnoses Plantarum Orientalium Novarum* Series 1: 11. Genevae.
- Boissier PÉ. 1875.** *Flora Orientalis* 3. Genevae & Basilae.
- Charadze A. 1949.** Opyt sistematiki kavkaskikh vidov roda *Campanula* L. sektsii Medium A. DC. *Notulae Systematicae Ac Geographicae Instituti Botanici Tiphliensis* **15**: 13–33.

- Contandriopoulos J. 1970.** Contribution à l'étude cytotoxonomique des campanulacées du Proche Orient. *Bulletin de la Société Botanique de France* **117**: 55–70.
- Contandriopoulos J. 1972.** Contribution à l'étude cytotoxonomique des campanulacées du Proche Orient. III. *Bulletin de la Société Botanique de France* **119**: 75–95.
- Contandriopoulos J. 1976.** Contribution à l'étude cytotoxonomique des campanulacées du Proche Orient. IV. *Bulletin de la Société Botanique de France* **123**: 33–46.
- Contandriopoulos J. 1980.** IOPB Chromosome numbers. Reports LXVI. *Taxon* **29**: 163–169.
- Contandriopoulos J. 1981.** Contribution à l'étude cytotoxonomique du genre *Campanula* L. en Afrique du nord et centrale. *Boletim da Sociedade Broteriana (2.ª serie)* **53**: 887–906.
- Contandriopoulos J. 1984.** Polyphylétisme des campanules annuelles. *Bulletin de la Société Botanique de France (Lettres Bot 1984, 4/5)* **131**: 315–324.
- Damboldt J. 1976.** Materials for a Flora of Turkey XXXII: Campanulaceae. *Notes from the Royal Botanical Garden, Edinburgh* **35**: 39–52.
- Damboldt J. 1978.** *Campanula* L. In: Davis PH, ed. *Flora of Turkey and East Aegean Islands*, Vol. 6. Edinburgh: Edinburgh University Press, pp. 2–64.
- Fedorov A. 1957.** *Campanula* L. In: Komarov K, ed. *Flora of the U.R.S.S.* Vol. 24. Moscow: URSS Academy of Sciences. 126–501.
- Fedorov A. 1976.** *Campanula* L. In: Tutin TG, Heywood VH, Burges NA, et al., eds. *Flora Europaea*. 4. Cambridge: Cambridge University Press, 74–93.
- Feer H. 1890.** Beiträge zur Systematik und Morphologie der Campanulaceen. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **12**: 613–615.
- Feinbrun-Dothan N. 1977.** In: Zohary M., ed. *Flora Palestine*. Plates, Vol. 3. Jerusalem: Israel Academy of Sciences and Humanities, 476–480.
- Fomin AV. 1907.** Campanulaceae. In: Kusnezow NC, Busch NA, Fomin AV, eds. *Flora Caucasica Critica* 4, 6: 6–152. Jurjev.
- Gadella TWJ. 1962.** Some cytological observations in the genus *Campanula*. *Proceedings Koninklijke Nederlandse Akademie van Wetenschappen Series C* **65** (3): 269–278.
- Gadella TWJ. 1964.** Cytotaxonomic studies in the genus *Campanula*. *Wentia* **11**: 1–104.
- Gadella TWJ. 1966.** Some notes on the delimitation of genera in the Campanulaceae. II. *Proceedings Koninklijke Nederlandse Akademie van Wetenschappen Series C* **69** (4): 509–520.
- Greuter W, Burdet HM, Long G. 1984.** *Med-Checklist*, Vol. 1. Geneva: Conservatoire et Jardin botaniques de la Ville de Genève.
- Holmgren PK, Holmgren NH, Barnett LC. 1990.** *Index Herbariorum. Part I. The Herbaria of the World*, 8th edn. Bronx: New York Botanical Garden.
- Hooker JD. 1878.** *Campanula macrostylo*. *Botanical Magazine* **6394**.
- Maire E. 1932.** Contributions à l'étude de la flore de l'Afrique du Nord. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nordiska* **19**: 163–222.
- Marchal E. 1920.** Recherches sur les variations numériques des chromosomes de la série végétale. *Mémoires de l'académie royale des sciences, lettres et beaux-arts de Belgique. Classe des Sciences* **4**: 5–108.
- Murbeck SV. 1897.** Contributions à la connaissance de la flore du nord-ouest de l'Afrique et plus spécialement de la Tunisie. *Acta Universitatis Lundensia* **33** (12): 115–119.
- Nyman Y. 1991.** *Campanula occidentalis* (Campanulaceae), a new species from the Canary Islands. *Plant Systematics and Evolution* **177**: 185–222.
- Nyman Y. 1992a.** Pollination mechanisms in six *Campanula* species (Campanulaceae). *Plant Systematics and Evolution* **181**: 97–108.
- Nyman Y. 1992b.** Reproduction in *Campanula afra* (Campanulaceae): mating system and the role of the pollen collecting hairs. *Plant Systematics and Evolution* **183**: 33–41.
- Nyman Y. 1993.** The pollen-collecting hairs of *Campanula* (Campanulaceae). I. Morphological variation and the retractive mechanism. *American Journal of Botany*. **80** (12): 1427–1436.
- Post TE, Kuntze O. 1904.** *Lexicon generum phanerogamarum*. Stuttgart: Deutsche verlags-anstalt.
- Proctor M, Yeo P, Lack A. 1996.** *The natural history of pollination*. Rotherwick, Hampshire: Harper-Collins.
- Rechinger KH, Schimann-Czeika H. 1965.** *Campanula* L. In: Rechinger, KH, Schimann-Czeika H., eds. *Flora Iranica*, Vol 13. Graz: Akademische Verlagsgesellschaft, 7–38.
- Sáez L, Aldasoro JJ. 2001.** *Campanula* L. In: Paiva J, Sales F., Hedge IC, Aedo C, Aldasoro JJ, Castroviejo S, Herrero A, Velayos M, eds. *Flora iberica*, vol 14. Madrid: Real Jardín Botánico-CSIC. 104–136.
- Sneath PH, Sokal RR. 1973.** *Numerical taxonomy*. San Francisco: W.H. Freeman.
- Sugiura T. 1940.** A list of chromosome numbers in angiosperm plants VI. *Proceedings of the Imperial Academy of Japan*. **16**: 15–16.
- Sugiura T. 1942.** Studies on the chromosome numbers in Campanulaceae I. Campanuloideae-Campanuleae. *Cytologia*. **12**: 418–434.
- Thulin M. 1976.** *Campanula keniensis* Thulin sp. nov. and notes on allied species. *Botaniska Notiser* **128**: 350–356.
- Victorov VP, Elenvsky AG. 1998.** On the taxonomy of *Campanula dichotoma* and *C. propinqua* (Campanulaceae). *Botanicheskii Zhurnal* **83**: 57–58.