

A taxonomic revision of the genus *Cephalaria* (Caprifoliaceae) in Turkey

Ramazan Süleyman GÖKTÜRK*, Hüseyin SÜMBÜL

Department of Biology, Faculty of Science, Akdeniz University, Antalya, Turkey

Received: 02.10.2013

Accepted: 01.04.2014

Published Online: 15.08.2014

Printed: 12.09.2014

Abstract: The morphological features of *Cephalaria* Schrad. ex Roem. & Schult. were studied based on our specimens collected between 1994 and 2010 in Turkey and herbarium specimens from various herbaria. In the present study, typifications, a list of synonyms, descriptions, ecology, phytogeographical regions, conservation status, and distribution of all studied taxa are given. Taxonomic relationships between similar species are discussed. Illustrations of habit, flower, calyx, involucler, and involucler and receptacular bracts of some species are given. Colour images of some species are also provided. Additional new characters were determined that were not previously given in descriptions of *Cephalaria* species in the *Flora of Turkey*, and a new identification key has been prepared for the Turkish species. In addition, *Cephalaria demirizii* Göktürk & Sümbül is given as a new species from Turkey, while *C. amana* Rech.f. is made a synonym of *C. taurica* Szabó. Lectotypes are designated for *C. transylvanica* (L.) Schrad., *C. cilicica* Boiss. & Kotschy, *C. setosa* Boiss. & Hohen., *C. sparsipilosa* V.A.Matthews, and *C. taurica*.

Key words: Caprifoliaceae, *Cephalaria*, Turkey, morphology, taxonomy

1. Introduction

The name of *Cephalaria* Schrad. ex Roem. & Schult. originates from the Greek word kephale (head). Its species have flowers densely arranged on the floral receptacle in the form of a head. The genus *Cephalaria* is distributed worldwide, particularly in 2 different regions. The main centres of distribution of *Cephalaria* are in South Africa and in the Holarctic Kingdom (Mediterranean area, Balkan Peninsula, South Ukraine, Caucasia, Iran, West China, and Middle East) (Szabó, 1940). While the total number of the species of *Cephalaria* was 65 worldwide until 1940, this number has subsequently increased to 94 through the studies conducted by a number of researchers and by us. *Cephalaria* was represented by 29 species in the *Flora of Turkey and the East Aegean Islands* (Matthews, 1972). Since then, 11 new species and 1 new subspecies have been described from Turkey (Davis et al., 1988; Sümbül, 1991; Göktürk and Sümbül, 1997; Göktürk et al., 2003; Göktürk and Sümbül, 2003; Kuş and Göktürk, 2005; Aksoy et al., 2007; Parolly and Eren, 2007; Göktürk et al., 2012). The total number of species of *Cephalaria* reported from Turkey is 39 and the total number of taxa of *Cephalaria* is 41 in Turkey.

Some of the *Cephalaria* taxa are known to have economic importance. In Caucasia, the yellow flowers of *C. gigantea* (Ledeb.) Bobrov are used in dyeing the wool

utilised in the carpet business (Szabó, 1940). In Kars Province of Turkey, yellow flowers of *C. gigantea* are used for medicinal purposes (uretic, menstruation regulator, rheumatism, lung diseases, cardiac diseases) (Güneş and Özhatay, 2011). The seeds of *C. syriaca* Schrad. are used to obtain bread with a delayed staling rate by mixing them with bread wheat (Baytop, 1994). In the Antalya region, the fruiting capitula of *C. balansae* Raus is used in treating epigastric burning and as dried flower (personal observation).

The genus *Cephalaria* was included within Dipsacaceae, together with *Dipsacus* L., *Knautia* L., *Pteroccephalus* Vaill. ex Adans., *Scabiosa* L., and *Morina* L., by Coulter (1823). The family was divided into 2 tribes by De Candolle (1830): Morineae (including a single genus, *Morina*) and Scabioseae (including *Cephalaria*, *Dipsacus*, *Knautia*, *Pteroccephalus*, and *Scabiosa*). Phylogeny at the generic and infrageneric levels of Dipsacaceae was first studied by Ehrendorfer (1965). The morphology and anatomy of the flowers and the phylogeny, palynology, and karyology of Dipsacaceae were studied by Verlèque (1977, 1986). The work of Verlèque demonstrated that the evolution within the Dipsacaceae followed complex paths and that several genera were polyphyletic. In terms of infrageneric grouping, the section *Sphaerodipsacus* of the genus *Dipsacus* is the sister group to a clade composed of the section *Dipsacus* and the genus *Cephalaria*. Thus, the

* Correspondence: gokturk@akdeniz.edu.tr

genus *Dipsacus* is paraphyletic as currently circumscribed (Caputo and Cozzolino, 1994). According to Temsch and Greilhuber (2010), *Cephalaria* is the sister taxon of *Dipsacus*, and with regard to genome size *C. leucantha* (L.) Schrad. is similar to *Dipsacus pilosus* L. Chromosome number is $n = 9$ in *Cephalaria* (Verlâque, 1977). Some essential oil, fatty acid, and antioxidant activity studies have been performed on *Cephalaria* (Kırmızıgül et al., 2007, 2012; Sarıkahya, 2013).

The genus *Cephalaria* has long been regarded as belonging to the Dipsacaceae, whereas according to APG III it is included within the larger family Caprifoliaceae (Reveal and Chase, 2011). The phylogenetic position of Dipsacaceae within the Dipsacales has been studied extensively. Dipsacaceae is included in the herbaceous Valerina clade of the Caprifoliaceae clade, along with *Triplostegia* Wall. ex DC., Valerianaceae, and Morinaceae. *Triplostegia* was traditionally part of Valerianaceae in the tribe Triplostegieae (Backlund, 1996; Donoghue et al., 2001; Carlson et al., 2009).

Turkey is one of the richest countries in the world in terms of flora and new Turkish species were added in 2013 and 2014 (Öztürk and Çetin, 2013; Karaman Erkul and Aytaç, 2013a; Koç and Aksoy, 2013; Uzunhisarcıklı et al., 2013; Sağıroğlu and Akgül, 2014). In addition to this, there are revisions of some genera from Turkey (Yıldız and Çırpıcı, 2013; Karaman Erkul and Aytaç, 2013b; Akan and Aytaç, 2014).

The study aims to (re)evaluate the status of individual taxa in the genus *Cephalaria* through the examination of herbarium and our own specimens from the whole area of distribution, and particularly Turkey, to expand and amplify the morphological descriptions, give detailed illustrations for some taxa, and (re)evaluate threat categories based on IUCN (2001) criteria.

2. Materials and methods

The studied specimens were collected in Turkey between 1994 and 2010. Specimens for morphological studies were dried according to standard herbarium techniques and stored in the Akdeniz University Herbarium.

Studied specimens were identified by using the monograph on *Cephalaria* (Szabó, 1940), the *Flora of Turkey and the East Aegean Islands* and its supplements (Matthews, 1972; Davis et al., 1988; Duman, 2000), and other related floras (Boissier, 1875; Bobrov, 1957; Halacsy, 1968; Hayek and Markgraf, 1970; Ferguson, 1976; Feinbrun-Dothan, 1978; Pignatti, 1982; Meikle, 1985; Lack, 1991). In addition, a large number of herbarium specimens were checked from the ANK, AEF, BULU, CUFH, EGE, GAZI, HUB, ISTE, ISTE, KNYA, OMUB, and VANF herbaria and the Akdeniz University Herbarium. Images of the type specimens of some *Cephalaria* species studied

were obtained from the Kew (K), Berlin (B), Edinburgh (E), Linnean Herbarium (LINN), Vienna-Herbarium (W), University Vienna Herbarium (WU), Herbarium Haussknecht (JE), and Geneva (G) virtual herbaria. Threat categories of the taxa were assessed according to IUCN criteria (IUCN, 2001). The abbreviations used in the text are as follows: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient. Authors of plant names are written according to Brummitt and Powell (1992).

3. Results

Cephalaria Schrad. ex Roem. & Schult., Syst. Veg. 3: 1 (1818).

Annual or perennial herbs, glabrous or hairy. Stem erect, rarely procumbent or ascending. Leaves opposite, simple to pinnate. Capitula globose, subglobose, ovoid, ovate-cylindrical, radiant or subradiant. Involucral bracts coriaceous, in several rows. Receptacular bracts similar, larger than involucral bracts. Calyx minute, cupuliform. Corolla tubular, 4-lobed, white, cream or yellow, rarely bluish, hairy outside. Stamen 4, connate at corolla; anthers exerted from corolla lobes. Involucel usually 4- or 8-angled, 8-ridged, apex usually with 4 or 8 teeth.

Type: *Cephalaria alpina* (L.) Schrad. ex Roem. & Schult., Syst. Veg. 3: 43 (1818).

Cephalaria taxa growing in Turkey:

1. *Cephalaria aristata* K.Koch
2. *Cephalaria joppensis* (Rchb.) Coult. ex DC.
3. *Cephalaria transylvanica* (L.) Schrad.
4. *Cephalaria cilicica* Boiss. & Kotschy
5. *Cephalaria setosa* Boiss. & Hohen.
6. *Cephalaria syriaca* Schrad.
7. *Cephalaria stapfii* Hausskn.
8. *Cephalaria speciosa* Boiss. & Kotschy
9. *Cephalaria duzceensis* Aksoy & Göktürk
10. *Cephalaria davisiana* Göktürk & Sümbül
11. *Cephalaria sumbuliana* Göktürk
12. *Cephalaria demirizii* Göktürk & Sümbül
13. *Cephalaria stellipilis* Boiss.
14. *Cephalaria elazigensis* Göktürk & Sümbül var. *elazigensis*
Cephalaria elazigensis Göktürk & Sümbül var. *purpurea* Göktürk & Sümbül
15. *Cephalaria elmaliensis* Hub.-Mor. & V.A.Matthews
16. *Cephalaria hirsuta* Stapf
17. *Cephalaria peshmenii* Sümbül
18. *Cephalaria szaboi* Hayek
19. *Cephalaria paphlagonica* Bobrov
20. *Cephalaria anatolica* Shkhiyan
21. *Cephalaria tuteliana* Kuş & Göktürk
22. *Cephalaria isaurica* V.A.Matthews
23. *Cephalaria media* Litv.
24. *Cephalaria aytachii* Göktürk & Sümbül

25. *Cephalaria balansae* Raus
 26. *Cephalaria gigantea* (Ledeb.) Bobrov
 27. *Cephalaria procera* Fisch. & Avé-Lall.
 28. *Cephalaria tchihatchewii* Boiss.
 29. *Cephalaria kotschyi* Boiss. & Hohen.
 30. *Cephalaria sparsipilosa* V.A.Matthews
 31. *Cephalaria microcephala* Boiss.
 32. *Cephalaria hakkiarica* V.A.Matthews
 33. *Cephalaria lycica* V.A.Matthews
 34. *Cephalaria scoparia* Contandr. & Quézel
 35. *Cephalaria dirmilensis* Hub.-Mor.
 36. *Cephalaria gazipashensis* Sümbül subsp. *gazipashensis*
Cephalaria gazipashensis Sümbül subsp. *pilifera* Parolly, Kürschner & Eren
 37. *Cephalaria ekimiana* Göktürk & Sümbül
 38. *Cephalaria salicifolia* Post
 39. *Cephalaria taurica* Szabó

A new identification key for the taxa growing in Turkey

1. Annuals
 2. Fruiting involucrel without apical teeth 1. **aristata**
 2. Fruiting involucrel with 4 or 8 apical teeth
 3. Fruiting involucrel with 4 apical teeth 4. **cilicica**
 3. Fruiting involucrel with 8 apical teeth (sometimes 4 are minute)
 4. Capitula ovoid
 5. Awn of receptacular bracts shorter than bracts, cream 5. **setosa**
 5. Awn of receptacular bracts equal to or longer than bracts, purplish 6. **syriaca**
 4. Capitula globose
 6. Receptacular bracts mucronate 2. **joppensis**
 6. Receptacular bracts awned
 7. Receptacular bracts usually ovate to lanceolate, ciliate margin 3. **transylvanica**
 7. Receptacular bracts obovate to linear-obovate, not ciliate margin 7. **stapfii**
1. Perennials
 8. Plant with stellate hairs
 9. Only lower leaves with sparse stellate hairs, stem hollow 12. **demirizii**
 9. Stem and leaves with dense stellate hairs, stem not hollow
 10. Plant stout, taller than 1 m high
 11. Lower leaves simple
 12. Lower leaves deflexed from petiolate; capitula globose, 2–2.5 cm in flower 9. **duzceensis**
 12. Lower leaves not deflexed from petiolate; capitula ovate-globose, 2.5–4.5 cm in flower 8. **speciosa**
 11. Lower leaves lyrate
 13. All bracts blackish at apex; involucrel bracts acute or subacute; receptacular bracts ovate-oblong 10. **davisiana**
 13. All bracts straw-coloured at apex; involucrel bracts obtuse; receptacular bracts oblong or narrowly oblanceolate 11. **sumbuliana**
10. Plant slender, up to 1 m high
 14. Lower and cauline leaves oblong-spathulate 13. **stellipilis**
 14. Lower and cauline leaves lanceolate
 15. Capitula ovoid; involucrel bracts ovate-orbicular or orbicular; involucrel sericeous 14. **elazigensis**
 15. Capitula subglobose; involucrel bracts ovate; involucrel pilose 15. **elmaliensis**
8. Plant glabrous or with simple hairs
 16. Corolla pale blue, mauve, blue, purple, pink, lilac, or white
 17. Plant up to 3 m; capitula squarrose, large, 2–3 cm diameter in flower 25. **balansae**
 17. Plant up to 1.3 m; capitula ovoid, ovoid-cylindrical or ovoid-orbicular, small, 0.4–1.7 cm diameter in flower
 18. Fruiting involucrel with 4 equal apical teeth 38. **salicifolia**
 18. Fruiting involucrel with 4 long and 4 short teeth or with 8 equal or subequal teeth
 19. Leaves herbaceous; capitula 5–13-flowered 17. **peshmenii**
 19. Leaves coriaceous; capitula at least 15-flowered
 20. Stem procumbent; receptacular bracts oblong-spathulate 33. **lycica**
 20. Stem erect or ascending; receptacular bracts oblong, lanceolate-cuneate or ovate-oblong
 21. Involucrel bracts brown at apex; receptacular bracts oblong; fruiting involucrel with 8 equal or subequal teeth 37. **ekimiana**

21. Involucral bracts pale purple, lilac, straw-coloured or purple-lilac at apex; receptacular bracts lanceolate-cuneate or ovate-oblong; fruiting involucl with 4 long and 4 short teeth
22. Involucral bracts orbicular, with hyaline and shortly fimbriate margin 34. **scoparia**
22. Involucral bracts ovate, ovate-lanceolate or suborbicular, ciliate margin
23. Simple lower leaves narrowly lanceolate or spatulate 35. **dirmilensis**
23. Simple lower leaves lanceolate, oblanceolate or obovate 36. **gazipashensis**
16. Corolla cream, pale yellow or yellow
24. Lower leaves simple
25. Stem sericeo-villous or densely retrorse-pilose in lower part
26. Stem sericeo-villous in lower part; leaves sericeo-villous 18. **szaboii**
26. Stem retrorse-pilose in lower part; leaves adpressed pilose or pubescent
27. Fruiting involucl with 4 long and 4 short teeth 16. **hirsuta**
27. Fruiting involucl with 8 minute equal teeth
28. Simple lower leaves lanceolate; involucral bracts ovate; capitula ovoid 20. **anatolica**
28. Simple lower leaves oblanceolate; involucral bracts oblong; capitula subglobose 24. **aytachii**
25. Stem glabrous, puberulent, pubescent, sparsely pilose, strigose or velutinous
29. Fruiting involucl with 4 equal teeth 38. **salicifolia**
29. Fruiting involucl with 8 teeth
30. Stem glabrous in lower part
31. Upper leaves simple, linear; fruiting involucl with 8 minute teeth 19. **paphlagonica**
31. Upper leaves 1–2 pinnatisect; fruiting involucl with 4 long and 4 short teeth 39. **taurica**
30. Stem hairy in lower part
32. Fruiting involucl with 8 unequal minute teeth
33. Involucral bracts oblong or ovate-oblong; corolla yellow 21. **tuteliana**
33. Involucral bracts ovate; corolla pale yellow or cream 23. **media**
32. Fruiting involucl with 4 long and 4 short teeth
34. Stem pilose, setose or puberulent in lower part, glabrous in upper part
35. Simple lower leaves elliptic; upper stem leaves simple 22. **isaurica**
35. Simple lower leaves lanceolate or ovate-lanceolate; upper stem leaves pinnatisect
36. Leaves coriaceous; involucral bracts ovate 30. **sparsipilosa**
36. Leaves herbaceous; involucral bracts broadly ovate or obovate spatulate 39. **taurica**
34. Stem puberulent for whole length
37. Receptacular bracts ovate-oblong to narrowly obovate, puberulent and usually pilose or sericeous also 31. **microcephala**
37. Receptacular bracts broadly obovate to broadly spatulate, puberulent or glabrous 32. **hakkiarica**
24. Lower leaves lyrate to pinnatisect
38. Leaf surface glabrous (except young *C. balansae* leaves)
39. Capitula squarrose 25. **balansae**
39. Capitula globose or ovoid
40. Stem puberulent in upper part 31. **microcephala**
40. Stem glabrous in upper part
41. Upper leaves simple; receptacular bracts oblong 28. **tchihatchewii**
41. Upper leaves pinnatisect; receptacular bracts ovate-oblong or obovate-spathulate 39. **taurica**
38. Leaf surface puberulent, pubescent, tomentose or pilose (except mature *C. balansae* leaves)
42. Stem glabrous in upper part
43. Fruiting involucl with 8 minute equal or unequal teeth
44. Involucral bracts oblong or ovate-oblong, obtuse; receptacular bracts lanceolate or oblong-lanceolate, acute 21. **tuteliana**
44. Involucral bracts ovate, acute; receptacular bracts ovate-oblong, attenuate-acuminate 20. **anatolica**
43. Fruiting involucl with 4 long and 4 short teeth
45. Young leaves softly tomentose; capitula squarrose 25. **balansae**
45. Leaves and capitula not above
46. Leaves coriaceous; upper leaves pinnatisect 30. **sparsipilosa**

46. Leaves herbaceous; upper leaves simple 28. **tchihatchewii**
 42. Stem puberulent, sparsely pilose or strigose in upper part
 47. Involucral bracts obtuse
 48. Fruiting involucl with 8 minute equal or unequal teeth
 49. Involucral bracts oblong; fruiting involucl with 8 minute equal teeth 24. **aytachii**
 49. Involucral bracts ovate; fruiting involucl with 8 minute unequal teeth 23. **media**
 48. Fruiting involucl with 4 long and 4 short teeth
 50. Stem and leaves puberulent 31. **microcephala**
 50. Stem pilose; leaves adpressed pilose 16. **hirsuta**
 47. Involucral bracts acute or acuminate
 51. Capitula less than 2 cm in diameter in flower 20. **anatolica**
 51. Capitula 2–6 cm in diameter in flower
 52. Stem and leaves pubescent 29. **kotschyi**
 52. Stem and leaves sparsely pilose
 53. Capitula 2–4 cm in diameter in flower, subradiant; receptacular bracts abruptly acuminate ..
 27. **procera**
 53. Capitula 4–6 cm in diameter in flower, radiant; receptacular bracts gradually acuminate
 26. **gigantea**

Species descriptions

1. *Cephalaria aristata* K.Koch, Linnaea 24: 445 (1851)
 (Figure 1).

= *Cephalaria calva* Boiss. & Balansa, Diagn. Pl. Orient. ser. 2(6): 95 (1859); = *C. sintenisii* Freyn, Oesterr. Bot. Z. 44: 144 (1894); = *C. gracilis* Bordz, Trudy Bot. Sada Imp. Yur'evsk. Univ. 13: 22 (1912); = *C. armena* Grossh., Trudy Tiflissk. Bot. Sada ser. 2(1): 29 (1920).

Type: [Turkey. A9 Artvin] im Tschorukgebiete auf Porphy und Kalk, 750–1525 m, *K.Koch s.n.* (B).

Slender, erect annual herbs. Stem up to 1.5 m tall, striate in middle and upper part, glabrous or setose. Leaves herbaceous, lyrate to pinnatisect, long pilose, oblong in outline, with 2–8 segments; segments entire or serrate, terminal segment larger than lateral ones; lower leaves 4–13 × 1.3–5 cm; all segments lanceolate, acute at apex, lateral segments 1–3 × 0.4–0.6 cm, terminal segment 3–8 × 0.5–1.3 cm; cauline leaves similar to lower leaves, 3–9 × 0.9–3.5 cm; all segments lanceolate, acute at apex, lateral segments 0.5–3 × 0.2–0.5 cm, terminal segment 2–7 × 0.5–0.8 cm; upper leaves sessile, 1–5 × 0.2–1 cm; all segments linear-lanceolate or linear, acute or acuminate at apex, lateral segments, 6–10 × 0.5–2 mm, terminal segment 1–4.2 × 0.1–0.7 cm. Capitula globose, 1.5–3 cm in diameter in flower, 1.5–2.5 cm in diameter in fruit. Involucral bracts ovate, 4–7 × 2–4 mm, completely purple or straw-coloured, straw-coloured in dorsal and at base, sparsely purple at apex, white villose, margin sparsely ciliate, obtuse at apex; receptacular bracts oblong, 9–15 × 0.3–0.5 mm, straw-coloured or straw-coloured at base purple in dorsal and at apex, awn with purplish inner streak, villose outside, margin sparsely ciliate, acuminate at apex. Calyx cupuliform, 1–2 mm in diameter, with numerous long hair-like setae. Corolla 12–15 mm long in

outer, 9–11 mm long inner, whitish, pale yellow, pale blue or pale lilac, adpressed pilose outside. Involucl 3–5 mm long in fruit, 4-angled, brown, glabrous, sparsely pilose or pubescent, without apical teeth at apex. *Fl.* 6–9, *Fr.* 7–9.

Habitat: Steppe, rocky places, fields, disturbed and marshy places; 350–2050 m. *Distribution:* Irano-Turanian element. Turkey (Black Sea region, Central and East Anatolia) and Armenia. *IUCN category:* LC.

Specimens examined: Turkey. **A6** Tokat: Niksar, marshy ground, 350 m, 4.9.1954, *P.H.Davis* 24847 & *Polunin* (ANK). **A8** Gümüşhane: Bayburt, Taila forest, 1450 m, 16.7.1983, *Ş.Yıldırım* 5702. (HUB). Erzurum: 5 km west of Horosan, Ağrı to Erzurum, 1580 m, 21.8.1972, *Hub-Mor.* 8041 (ANK); Pasinler, around Karaçuha station, 1590 m, 9.8.1983, *A.Güner* 5233 & *K.Sorkun* (HUB, ANK); İspir, Maden, Köprübaşı, roadsides, 1200 m, 15.8.2000, *R.S.Göktürk* 4512 & *F.Göktürk* (Akdeniz Univ. Herb.). Artvin: Yusufeli, Sarıgöl, 880 m, 30.7.1991, *A.Güner* 9944, *T.Ekim*, *M.Koyuncu* & *H.Karaca* (HUB, GAZI). **B6** Sivas: Yıldızeli, between Kırkpınar-Bayat village, stony steppe, 1700 m, 18.7.1979, *T.Ekim* 5153 & *A.Düzenli* (ANK); Pınarbaşı, between Malak-Hayriye village, roadsides, 1700 m, 15.8.1984, *N.Çelik* 295 (CUFH); Taşlıdere, between Esenyurt-Yenice village, 1400–1500 m, 3.7.1985, *Ş.Civelek* 1880 (CUFH); Zara, 15 km south of Bolucan, 1800 m, 25.6.1986, *N.Çelik* 4248 (CUFH); Yıldızeli, Pamukpınar, 1415 m, 21.8.1988, *Ş.Civelek* 4741 (CUFH); Hafik road 15 km, marshy ground, 1300–1400 m, 27.9.1992, *E.Dönmez* 1407 (CUFH); Cumhuriyet University campus, slopes, 1300 m, 15.7.1996, *R.S.Göktürk* 3860 (Akdeniz Univ. Herb.); Taşlıdere, 10–15 km from Sivas to Kayseri, roadsides, 1300 m, 15.7.1996, *R.S.Göktürk* 3864 & *E.Dönmez* (Akdeniz Univ. Herb.); between Yeniçubuk-Gemerek, roadsides, 1200 m, 10.8.2000, *R.S.Göktürk* 4470

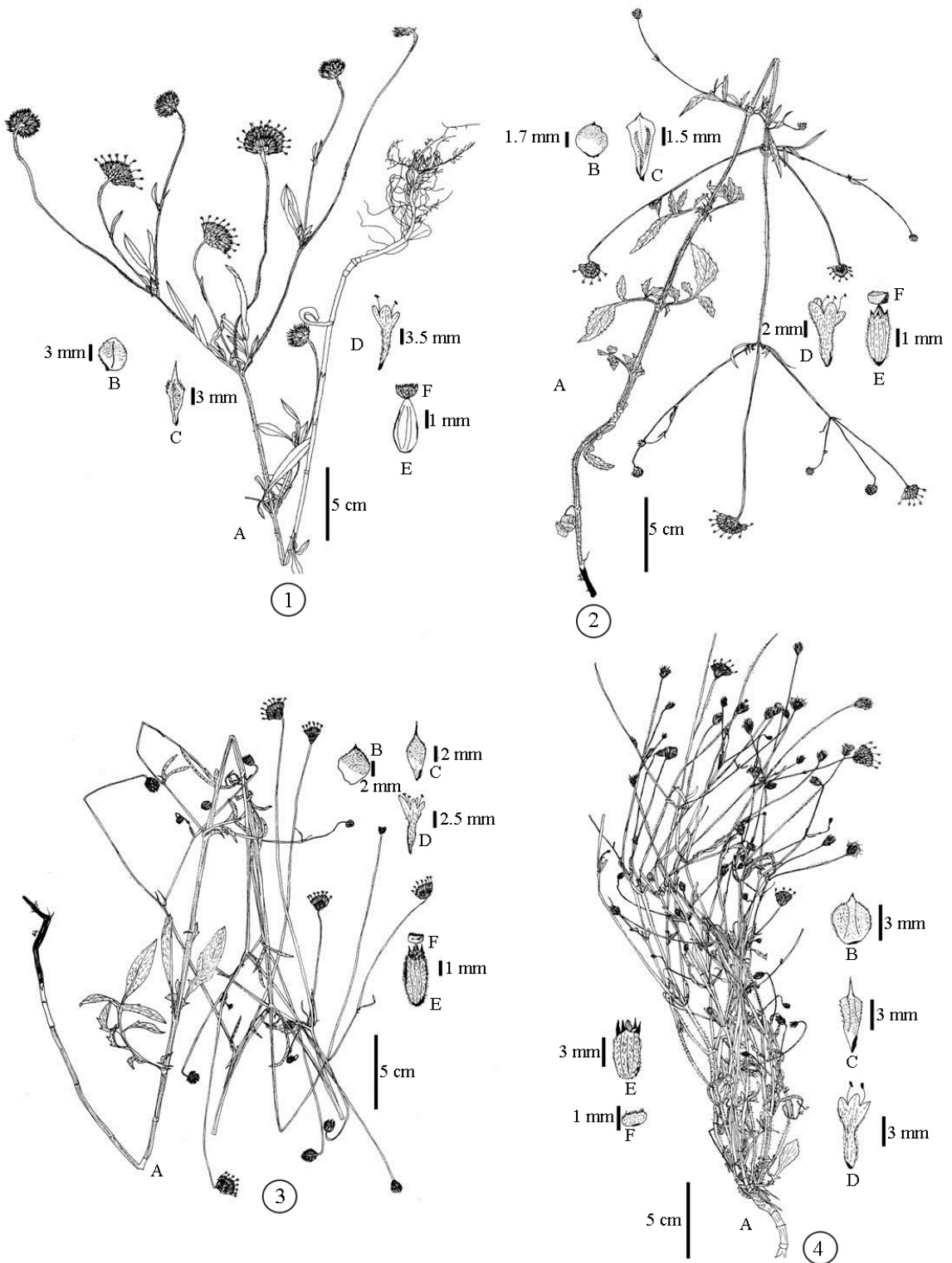


Figure 1. 1- *Cephalaria aristata*, 2- *C. joppensis*, 3- *C. transylvanica*, 4- *C. cilicica*. A- habit, B- involucre bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

& *F.Göktürk* (Akdeniz Univ. Herb.). Kayseri: Akkuşla, above Ganişeyh village, stony places, 1500–1700 m, 8.8.1995, *R.S.Göktürk* 3498 & *M.R.Tunç* (Akdeniz Univ. Herb.); between Kayseri-Pınarbaşı, Bünyan crossroad, fields, 1435 m, 19.7.2010, *R.S.Göktürk* 7480 (Akdeniz Univ. Herb.). **B7** Sivas: Zara, İmranlı to Refahiye, roadsides, 1600 m, 10.8.2000, *R.S.Göktürk* 4476 & *F.Göktürk* (Akdeniz Univ. Herb.). **B8** Erzurum: Aşkale, Tercan, hillsides in disturbed steppe, 1800 m, 1957, *P.H.Davis* 32670 & *Hedge* (ANK); Agriculture Faculty field, 1800 m, 27.6.1978, *T.Ekim* 1301 & *A.Günçan* (ANK) **B9** Van: Hoşap to Havasor, 30.7.1954, *P.H.Davis* 23300 & *Polunin* (ANK).

Cephalaria aristata is similar to *C. microdonta* (endemic to Georgia), but differs from *C. microdonta* in involucrel and receptacular villose outside and involucrel without apical teeth at apex.

2. *Cephalaria joppensis* (Rchb.) Coult. ex DC., Prodr. 4: 648 (1830) (Figure 1).

= *Scabiosa transsylvanica* Sieber ex DC., Avis. Pl. 7 (1821) non L. (1753); ≡ *Scabiosa joppensis* Rchb., Hort. Bot. 1: 67 (1827), t. 17 (1824) nomen superfluum; = *Succisa joppica* Spreng., Syst. Veg. 1: 378 (1824); = *Cephalaria joppica* (Spreng.) Bég., Fl. Italia 3: 144 (1903).

Type: Palestine-Joppe, 1818, *F.W.Sieber* & *F.Kohaut* s.n. (Typified by *A.F.Igersheim* & *J.Walter* in 2012, W).

Slender, erect annual herbs. Stem up to 2 m tall, striate in middle and upper part, hollow, glabrous or setose in middle and lower part, sparsely setose in upper part. Leaves herbaceous, lyrate, subadpressed pilose or glabrous, oblong in outline, with 2–10 segments; segments entire, serrate, dentate, crenate-serrate, terminal segment larger than lateral ones; lower leaves 6–18 × 3–7.5 cm, lateral segments lanceolate, narrowly lanceolate or ovate-oblong, 0.8–5 × 0.2–2 acute at apex, terminal segment lanceolate or ovate-oblong, 4.5–8.5 × 1.3–4 cm, acute or subacuminate at apex; cauline leaves similar to lower leaves, 4–15 × 1–8 cm, lateral segments lanceolate, linear-lanceolate or ovate-oblong, 0.3–4.5 × 0.1–2 cm, acute at apex, terminal segment lanceolate or ovate-oblong, 2–7 × 0.7–2.5 cm, acute at apex; upper leaves sessile, 0.8–4 × 0.1–1 cm, lateral segments linear, 0.2–10 × 0.5–2 mm, acuminate at apex, terminal segment linear-lanceolate or linear, 1.5–3 × 0.2–0.5 cm, acuminate at apex. Capitula globose, 0.6–1.8 cm in diameter in flower, 0.5–1.4 cm in diameter in fruit. Involucrel bracts ovate or broadly ovate, 3–4 × 2–3 mm, straw-coloured, pubescent, obtuse or subacute at apex; receptacular bracts obovate to spatulate, 5–7 × 2–3 mm, straw-coloured in dorsal and at base, pale brown at apex, pubescent, mucronate at apex. Calyx cupuliform, 1 mm in diameter, entire margin. Corolla 5–9 mm long, whitish, blue or pink, adpressed pilose outside. Involucrel 4–5 mm long in fruit, 8-angled, pale brown, pilose, with 8 subequal apical teeth at apex. *Fl.* 6–7, *Fr.* 7–8.

Habitat: Phrygana, disturbed area, roadsides, canal margins; 5–200 m. *Distribution*: East Mediterranean element. Turkey (South Anatolia), Syria, Palaestina, South Italy, and Sicilia. *IUCN category*: LC.

Specimens examined: Turkey. **C3** Antalya: Manavgat, Side, roadsides, 5 m, 20.6.1995, *R.S.Göktürk* 3403 (Akdeniz Univ. Herb.); 8–10 km from Manavgat to Alanya, Hacer Çeşmesi, canal margins, marshy ground, 5 m, 1.7.1995, *R.S.Göktürk* 3405 & *M.R.Tunç* (Akdeniz Univ. Herb.). **C4** Mersin: Gülnar, Şarлак village, roadsides, 200 m, 22.9.1995, *R.S.Göktürk* 3574 & *M.R.Tunç* (Akdeniz Univ. Herb.); Tarsus, Gökbeören, c. 300 m, 11.7.1988, *Y.Gemici* 3409 (EGE). **C5** Mersin: Erdemli, Kumkuyu, roadsides, 15 m, 12.8.1995, *R.S.Göktürk* 3523 & *M.R.Tunç* (Akdeniz Univ. Herb.); Silifke, Atakent, roadsides, 10 m, 12.8.1995, *R.S.Göktürk* 3525 & *M.R.Tunç* (Akdeniz Univ. Herb.). Adana: 1–2 km from Kozan to Adana, roadsides, 100 m, 12.8.1995, *R.S.Göktürk* 3521 & *M.R.Tunç* (Akdeniz Univ. Herb.).

In the specimens of this species as collected by us, which has no close relatives in Turkey, some characteristics, although displaying differences from those as given in the *Flora of Turkey*, show parallelism with both the Italian and Palestinian floras and the descriptions in the monograph (Feinbrun-Dothan, 1978; Pignatti, 1982). These characteristics are that the edges of the leaf segments are not only serrate, but also dentate and crenate-dentate, and that they, in the form of involucrel in fruit, do not have 4 long and 4 short teeth, but rather 8 subequal teeth as stated in the *Flora of Turkey* (Matthews, 1972).

3. *Cephalaria transylvanica* (L.) Schrad., Cat. Sem. Hort. Gott. (1814) (Figure 1).

≡ *Scabiosa transylvanica* L., Sp. Pl. 98 (1753) non Sieber (1821); = *Cephalaria allionii* A.Kern. ex Strobl, Oesterr. Bot. Z. 32 (4): 130 (1882); = *C. sillingeri* Domin, Acta Bot. Bohem. 9: 255 (1930).

Lectotype (here designated): Herb. Linn. No. 120. 4 (LINN).

Slender, erect annual herbs. Stem up to 1.5 m tall, striate, glabrous, puberulent and/or setose, branched above. Leaves herbaceous, pinnatisect, densely or sparsely pubescent or setose; lower leaves oblong in outline, 4–20 × 1.7–4 cm, with 6–10 segments, lateral segments oblong-lanceolate, 0.5–3.5 × 0.1–0.9 cm, entire or serrate, acute or subacute at apex, terminal segment larger than lateral ones, lanceolate, 2.5–6.5 × 0.8–2.5 cm, serrate, acute at apex; cauline leaves lanceolate in outline, 3–11 × 1.5–2 cm, with 4–8 segments, lateral segments linear-lanceolate to oblong, 0.5–3 × 0.2–0.6 cm, entire, acute or subacute at apex, terminal segment larger than lateral ones, lanceolate, 2.5–6.5 × 0.5–2 cm, serrate, entire or acute at apex; upper leaves sessile, lanceolate in outline, 0.7–3 × 0.2–0.6 cm, with 2–4 segments, lateral segments, linear, 0.5–3 ×

0.1–0.8 mm, entire, acuminate at apex, terminal segment larger than lateral ones, linear-lanceolate or linear, 0.5–2.5 × 0.2–0.3 cm, entire, subacuminate at apex. Capitula globose, 0.5–2.5 cm in diameter in flower, 0.5–2 cm in diameter in fruit. Involucral bracts ovate, 4–5.5 × 2–3 mm, completely straw-coloured or straw-coloured in dorsal and at base, purple at apex, puberulent, margin sparsely ciliate, mucronate at apex; receptacular bracts ovate to lanceolate, 6–9 × 2–3 mm, completely straw-coloured or straw-coloured in dorsal and at base, purple at apex, puberulent, margin ciliate, awned (2–3 mm) or acuminate at apex. Calyx cupuliform, 1 mm in diameter, with numerous long hair-like setae. Corolla 7–11 mm long, pale blue, lilac or white, adpressed pilose outside. Involucel 4–5 mm long in fruit, 4-angled, brown or pale brown, sparsely or densely pilose, with 8 minute apical teeth at apex (sometimes 4 are minute). *Fl.* 6–10, *Fr.* 7–10.

Habitat: Roadsides, fields, margin of marshy areas, steppe, canal margins, calcareous slopes; 5–1600 m. *Distribution:* Multiregional element. Turkey (Marmara, West Black Sea, Aegean, Mediterranean, Central Anatolia, and East Anatolia), South (except Spain) and Central Europe, Balkans, Romania, South and Central Russia, Crimea, Caucasus. Widespread. *IUCN category:* LC.

Specimens examined: **A1** Çanakkale: Lapseki to Çanakkale, Umurbey, roadsides, 20–25 m, 24.7.2001, *O.D.Düşen* 2419 & *S.Düşen* (Akdeniz Univ. Herb.). **A2** Bursa: Uludağ University campus, roadsides, 200 m, 16.8.2001, *O.D.Düşen* 2425 & *S. Düşen* (Akdeniz Univ. Herb.); Bursa to Uludağ, roadsides, 300 m, 21.7.2002, *R.S.Göktürk* 4997 (Akdeniz Univ. Herb.); between Mustafakemalpaşa-Susurluk, roadsides, 20 m, 23.7.2002., *R.S.Göktürk* 2002 (Akdeniz Univ. Herb.). İstanbul: Bahçeşehir, İspartakule, north-west slopes, 50 m, 22.7.2002, *R.S.Göktürk* 5022 (Akdeniz Univ. Herb.). **A4** Çankırı: north of Tüney village, 680–750 m, 17.7.1976, *Buttler* 21539 (ANK). Kırıkkale: Sulakyurt, between Sulakyurt-Hamzalı, roadsides, 750 m, 9.8.1996, *R.S.Göktürk* 3927 (Akdeniz Univ. Herb.). **B1** İzmir: Aliğa to Bergama, marshy ground, 5 m, 13.7.1996, *R.S.Göktürk* 3846 (Akdeniz Univ. Herb.); Bornova, Ege University campus, roadsides, 5 m, 23.7.2002, *R.S.Göktürk* 5025 (Akdeniz Univ. Herb.). Balıkesir: Edremit to Balıkesir, roadsides, 150 m, 13.7.1996, *R.S.Göktürk* 3849 (Akdeniz Univ. Herb.). **B2** Manisa: Akhisar, 9.9.1948, *H.Bağda* (ANK); Gördes to Demirci, roadsides, 14.7.1996, *R.S.Göktürk* 3855 (Akdeniz Univ. Herb.). İzmir: Ödemiş, Bozdağ, Gölcük plateau, steppe, openings in *Astragalus*, 1400 m, 12.7.1996, *R.S.Göktürk* 3841 (Akdeniz Univ. Herb.). Balıkesir: Dursunbey, roadsides, 600–650 m, 28.7.2001, *O.D.Düşen* 2423 & *S.Düşen* (Akdeniz Univ. Herb.). **B3** Eskişehir: Sivrihisar, east of Aşağıkepen village, roadsides, 900 m, 13.8.1997, *R.S.Göktürk* 4012 (Akdeniz Univ. Herb.). Afyon: Afyon to Burdur, Kocatepe, 1200

m, roadsides, 13.8.1997, *R.S.Göktürk* 4013 (Akdeniz Univ. Herb.). **B4** Ankara: Sincan, İstasyon district, roadsides, 800 m, 22.7.1993, *R.S.Göktürk* 3022 (Akdeniz Univ. Herb.); Ankara to Kazan, Susuz, roadsides, 800 m, 27.7.1995, *R.S.Göktürk* 3443 (Akdeniz Univ. Herb.); Ankara to Sivrihisar, around Sincan crossroad, roadsides, 700 m, 19.7.2002, *R.S.Göktürk* 4992 (Akdeniz Univ. Herb.). **B8** Muş: Muş to Varto, roadsides, 1350 m, 2.8.2001, *R.S.Göktürk* 4727-A & *M.Göktürk* (Akdeniz Univ. Herb.). **C2** Denizli: Çal, Aşağı Seyit village, Değirmendere, side of Menderes riversides, 800 m, 10.7.1996, *R.S.Göktürk* 3802 (Akdeniz Univ. Herb.). **C3** Antalya: Kemer, west of Kemer, roadsides, 15 m, 16.7.1995, *R.S.Göktürk* 3415 (Akdeniz Univ. Herb.); Konyaaltı, around harbour, roadsides, 5 m, 20.7.1994, *R.S.Göktürk* 3374. (Akdeniz Univ. Herb.); Serik, Belek, roadsides, 5 m, 2.8.1994, *R.S.Göktürk* 3387 (Akdeniz Univ. Herb.). **C4** Konya: Cihanbeyli, Damlakuyu village, roadsides, 900 m, 21.8.2000, *R.S.Göktürk* 4532 (Akdeniz Univ. Herb.). **C5** Konya: Ereğli, Aydos mountain, between Berendi-Kiraman, calcareous slopes, 1600 m, 28.6.1976, *S.Erik* 1752 (HUB). Adana: Ceyhan, Ceyhan to Kozan, roadsides, 100 m, 12.8.1995, *R.S.Göktürk* 3520 & *M.R.Tunç* (Akdeniz Univ. Herb.); Kozan, Kozan to Adana roadsides, 100 m, 12.8.1995, *R.S.Göktürk* 3521 & *M.R.Tunç* (Akdeniz Univ. Herb.).

Cephalaria transylvanica is similar to *C. cilicica* but differs from *C. cilicica* in its involucel with 8 minute apical teeth at apex. Although plant length was stated to be a maximum of 120 cm in the *Flora of Turkey* and the *Flora of Europe*, plant length was observed to extend up to 150 cm in some collected specimens (*R.S.Göktürk* 3385, 3387, and 3388). Furthermore, in addition to white and lilac corolla, light blue specimens were also found (*R.S.Göktürk* 4532 and 4727-A).

4. *Cephalaria cilicica* Boiss. & Kotschy, *Diagn. Pl. Orient. ser. 2(5): 106 (1856)* (Figure 1).

Lectotype (here designated): [Turkey. C5 Mersin] Village de Bouloukli, pres de Mersina (Cilicie), *Balansa* 788 (K with barcode K000762944 seen as photo).

Slender, erect annual herbs. Stem up to 1 m tall, simple or branched, striate in middle and upper part, hollow, setose or rarely glabrous. Leaves herbaceous; lower leaves simple or sublyrate; simple leaves lanceolate-elliptic, 1.8–5 × 0.5–1.9 cm, adpressed pilose, entire or serrate, acute at apex; sublyrate leaves oblong in outline, 3.8–9 × 1.2–3.2 cm, with 2–8 segments; segments adpressed pilose, serrate, acute at apex, lateral segments oblong or oblong-lanceolate, 0.8–2.3 × 0.3–0.9 cm, terminal segment larger than lateral ones, elliptic, 3–5 × 0.8–2.2 cm; cauline leaves simple or sublyrate; simple leaves lanceolate to linear-lanceolate, 2.3–9 × 0.4–2.5 cm, completely adpressed pilose, entire or serrate, acute at apex; sublyrate leaves oblong in outline, 3–6 × 0.4–1 cm, with 2–10 segments, segments

adpressed pilose, serrate or entire, acute at apex, lateral segments oblong or oblong-lanceolate, $0.4-1.1 \times 0.1-0.6$ cm, terminal segment larger than lateral ones, elliptic to linear-lanceolate, $2.8-3.2 \times 0.4-1.6$ cm; upper leaves simple or lyrate-pinnatisect; simple leaves linear or linear-lanceolate, $0.3-3 \times 0.1-0.3$ cm, completely adpressed pilose, entire, acute or acuminate at apex; lyrate-pinnatisect leaves oblong in outline, $2.1-4 \times 0.4-0.9$ cm, with 2-4 segments; segments glabrous or sparsely adpressed pilose, entire, acuminate at apex, lateral segments linear, $2-4 \times 1$ mm, terminal segment larger than lateral ones, linear-lanceolate, $1.5-2.7 \times 0.1-0.2$ cm. Capitula globose, $0.8-2$ cm in diameter in flower, $0.5-1.5$ cm in diameter in fruit. Involucral bracts ovate, $4-6 \times 2-3$ mm, straw-coloured in dorsal and at base, purple at apex, puberulent or sparsely setose, margin sparsely ciliate, obtuse or apiculate at apex; receptacular bracts oblong or linear-oblong, $6-8 \times 2-2.5$ mm, straw-coloured in dorsal and at base, purple at apex, puberulent, purple awned (2-3 mm), margin sparsely ciliate, acuminate at apex. Calyx cupuliform, 1 mm in diameter, dentate. Corolla 6-8 mm long, white or bluish or pale lilac, adpressed pilose outside. Involucel 4-6 mm long in fruit, 4-angled, pale brown, pilose, with 4 short, broad apical teeth. *Fl.* 6-8, *Fr.* 7-9.

Habitat: Roadsides, canal margins, and dry meadow; 30-500 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* [EN B2ab(i,ii,iv): area of occupancy less than 500 km²; known at no more than 5 locations].

Specimens examined: Turkey. **C2** Muğla: Köyceğiz, Sancibeli, roadsides, canal margins, 30 m, 4.9.1991, A.Güner 10176, M.Vural, H.Duman & H.Şağban (HUB, GAZI). Antalya: Finike to Elmalı, Yalnız village, roadsides, 500 m, 14.8.1995, R.S.Göktürk 3533 (Akdeniz Univ. Herb.); Kumluca to Antalya, roadsides, 100 m, 14.8.1995, R.S.Göktürk 3534 (Akdeniz Univ. Herb.). **C3** Antalya: Kemer, west of Kasaba, dry meadow, 10 m, 12.8.1978, H.Peşmen 4056 & A.Güner (HUB, GAZI). **C5** Adana: Kozan, Kozan to Adana, roadsides, 100 m, 12.8.1995, R.S.Göktürk 3522 & M.R.Tunç (Akdeniz Univ. Herb.).

Cephalaria cilicica grows in the same locality and habitat together with *C. transylvanica* in Adana. *C. cilicica* is similar to *C. transylvanica* but differs from *C. transylvanica* in its involucel with 4 short, broad apical teeth at apex. It should be added to the description of this species that the corolla is blue in colour as well as white in colour, and the involucral bracts are with apiculate terminal as well obtuse at the terminal.

5. Cephalaria setosa Boiss. & Hohen., *Diagn. Pl. Orient. ser. 1*(2): 107 (1843) (Figure 2).

Lectotype (here designated): [Iraq] In proclivibus orientem versus sitis pr. pagum Kurdist. [N. Iraq] Gara [Gara Mount], 5.8.1841, Kotschy 372 (published as 572) (K

within barcode K000762946 seen as photo; isolectotype: K within barcode K000762947 seen as photo).

Slender, erect annual herbs. Stem up to 1.5 m tall, branched above, striate in middle and upper part, densely setose hairy in lower part, sparsely setose in middle and upper part or completely glabrous. Leaves herbaceous, completely setose hairy; lower leaves lyrate to pinnatisect, $3-12 \times 1.5-3.5$ cm, ovate-lanceolate in outline, with 4-6 segments; segments serrate, sparsely dentate, acute at apex, lateral segments ovate or ovate-oblong, $0.8-2.5 \times 0.5-1.3$ cm, terminal segment larger than lateral ones, ovate, $2-6 \times 1-3$ cm; cauline leaves lyrate to pinnatisect, $2.5-7 \times 1-3$ cm, with 4-6 segments; segments serrate, acute at apex, lateral segments ovate to ovate-oblong, $0.6-1.5 \times 0.2-0.7$ cm, terminal segment larger than lateral ones, ovate, $2-3.5 \times 1-2$ cm; upper leaves simple or pinnatisect; simple leaves linear, $4-10 \times 0.5-0.6$ mm, entire, subacuminate at apex; pinnatisect leaves ovate-oblong in outline, $1-2.5 \times 0.2-0.7$ cm; segments entire, acute at apex, lateral segments lanceolate to elliptic-lanceolate, $1-5 \times 0.2-0.6$ mm, terminal segment larger than lateral ones, elliptic-lanceolate, $0.5-1.7 \times 0.2-0.3$ cm. Capitula ovoid, $0.5-2$ cm in diameter in flower, $0.7-1.8$ cm in diameter in fruit. Involucral bracts ovate, $3-5 \times 2-3$ mm, straw-coloured in dorsal and at base, purple at apex, glabrous, puberulent, margin sparsely ciliate, acute or apiculate at apex; receptacular bracts oblong or ovate-oblong, $6-12 \times 2-3$ mm, completely straw-coloured, puberulent or glabrous, ciliate margin, creamy awn shorter than bracts, awned or acuminate at apex. Calyx cupuliform, 1-2 mm in diameter, with 7-10 setae. Corolla 8-12 mm long, white or cream, silky-villose outside. Involucel 4-7 mm long in fruit, 4-angled, sericeous pilose, 4 long and 4 short teeth at apex; long teeth 1-2 mm long, short teeth 0.5-1 mm long. *Fl.* 6-8, *Fr.* 7-9.

Habitat: Banks, roadsides, gravelly and stony places; 675-2800 m. *Distribution:* Irano-Turanian element. Turkey (East Anatolia, South-West Anatolia, and east part of Mediterranean), North Iraq, West Syria, and West Iran. *IUCN category:* NT.

Specimens examined: Turkey. **B7** Tunceli: Pülümür, gorge between Pülümür-Tunceli, 1300 m, 11.7.1957, P.H.Davis 30936 & Hedge (ANK). Diyarbakır: Ergani, between Ergani-Dicle, Bademli (Haslın), stony places, 940 m, 30.7.2001, R.S.Göktürk 4699 & M.Göktürk (Akdeniz Univ. Herb.). **B9** Bitlis: Baykan, between Baykan-Bitlis, rocky places, roadsides, 1100 m, 31.7.2001. R.S.Göktürk 4706 & M.Göktürk (Akdeniz Univ. Herb.). **C6** Kahramanmaraş: Engizek mountain, Aksu district, stony places, 1000-1100 m, 20.6.1987, H.Duman 3453 (GAZI). **C7** Şanlıurfa: 15 km from Şanlıurfa and Gaziantep, roadsides, 675 m, 30.7.2001, R.S.Göktürk 4695 & M.Göktürk (Akdeniz Univ. Herb.). **C9** Hakkari: between Van-Hakkari, Zap stream, *Hub.-Mor.* 428 (ANK).

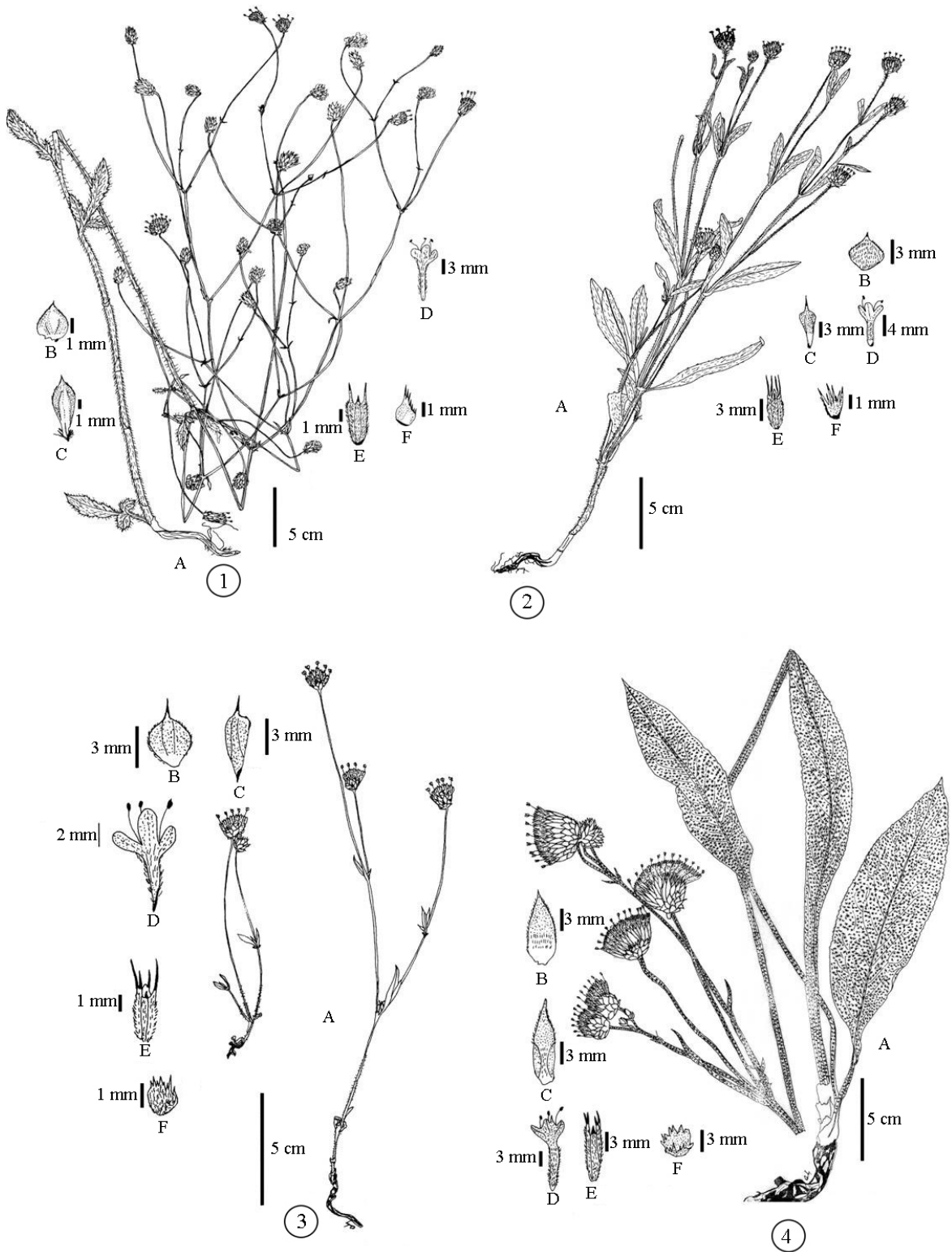


Figure 2. 1- *Cephalaria setosa*, 2- *C. syriaca*, 3- *C. stapfii*, 4- *C. speciosa*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

Cephalaria setosa is similar to *C. tenella*, but differs from *C. tenella* in its stem densely setose hairy in lower part, involucre bracts ovate, receptacular bracts oblong or ovate-oblong, and corolla white or cream.

6. *Cephalaria syriaca* Schrad., Cat. Sem. Hort. Gott. (1814) (Figure 2).

= *Scabiosa syriaca* L., Sp. Pl. 98 (1753); = *S. sibirica* Lam., Tabl. Encycl. 1: 249 (1791); = *S. dichotoma* Lam., Tabl. Encycl. 1: 249 (1791); = *S. angustifolia* Salisb., Prodr. Stirp. Chap. Allerton 54 (1796); = *Asterocephalus dichotomus* Lag., Gen. Sp. Pl. 8 (1816); = *Cephalaria vaillantii* Schott ex Roem. & Schult., Syst. Veg. 3: 46 (1818); = *Cephalaria papposa* Roem. & Schult., Syst. Veg. 3: 52 (1818); = *Cephalaria syriaca* var. *pedunculata* DC., Prodr. 4: 648 (1830); = *Cephalaria boissieri* Reut., Diagn. Pl. Orient. ser. 2(2): 122 (1856); = *C. syriaca* var. *sessilis* Boiss. ex Post, Fl. Syria 400 (1896); = *C. syriaca* subsp. *phoeniciaca* Bobrov, Trudy Prikl. Bot. 21: 324 (1929); = *C. syriaca* subsp. *emigrans* Szabó, Mat. Term., Közlem. 38: 182 (1940).

Lectotype: Described from Syria. Herb. Linn. No. 120.5, designated by *Hasselquist* (LINN).

Slender or substout, erect annual herbs. Stem up to 1 m, branched above, striate in middle and upper part, setose. Leaves herbaceous, simple, adpressed setose and small puberulent hairy, margin ciliate, entire or serrate, acute at apex; lower leaves oblong-lanceolate, 4–15 × 0.5–4.5 cm; cauline leaves oblong-lanceolate, 2.5–12 × 0.4–4 cm; upper leaves linear-lanceolate or linear, 0.5–2.5 × 0.1–0.3 cm. Capitula ovoid, 0.5–1.5 cm in diameter in flower, 0.7–1.6 cm in diameter in fruit. Involucre bracts ovate or ovate-rotundate, 3–6 × 3–5 mm, straw-coloured, adpressed hairy, ciliate margins, apiculate or long aristate at apex; receptacular bracts ovate to oblong, 7–8 × 2–3 mm, straw-coloured, puberulent or glabrous, margins sparsely ciliate, purple awn longer than bracts or same long. Calyx cupuliform, 1–1.5 mm in diameter, with numerous long hair-like setae. Corolla blue or lilac, 6–10 mm long, adpressed hairy outside. Involucre 4 angled, 7–9 mm long in fruit, brown or black, pilose, 4 long and 4 short teeth at apex, long teeth 3.5–4 mm long, short teeth 1 mm long. *Fl.* 5–6, *Fr.* 6–8.

Habitat: Fields, waste fields, roadsides, chalky area, steppe, and slopes; 120–2200 m. *Distribution:* Irano-Turanian element. Turkey, South Europe (Spain, Italy, France, Greece), Palaestina, Syria, Iran, Armenia, Georgia, Afghanistan, Pakistan, and Turkestan. *IUCN category:* LC.

Specimens examined: Turkey, **A4** Ankara: Kızılcahamam, Kargasekmez, roadsides, 900–1000 m, 12.7.1974, *O.Ketenoğlu* 93 (ANK). **A9** Kars: Sarıkamış, Karakurt, Agop, 1550–1600 m, 14.7.1979, *O.Güneş* 1364 (HUB). **B2** Denizli: between Çivril-İşikli, fields, c. 800–850 m, 6.6.1983, *Y.Gemici* 2014 (EGE). **B4** Ankara: around

Agriculture Faculty, 20.7.1945, *H.Bağda s.n.* (ANK); Ankara to Konya, Yavşan steppe, 17.5.1953, *H.Birand* 1484 (ANK); Beytepe, steppe, 850 m, 16.5.1975, *S.Erik* 1299-A (HUB). Konya: Karapınar, Obruk, Giyimir plateau, fields, 1100 m, 28.6.1983, *H.Dural* 1407 (KNYA). **B5** Niğde: 3 km nordwestlich von Ulukışla, steppe, 11.8.1973, 1400 m, *F.Holtz* 633, *P.Hänel* & *T.Kesercioğlu* (EGE). **B6** Sivas: Cumhuriyet University campus, steppe, 1250–1350 m, 22.7.1983, *N.Çelik* 2539 (CUFH); Sivas to Kayseri, Taşlıdere, roadsides, 1250–1300 m, 21.9.1984, *Ş.Civelek* 1243 (CUFH); Ulaş, between Tecer village-Deliktaş, roadsides and streamside, 1750 m, 24.6.1986, *N.Çelik* 4232 (CUFH); Zara, between Zara-İmranlı, chalky hills, 1350 m, 3.7.1991, *M.Aydoğdu* 3219 & *E.Hamzaoğlu* (GAZI). Kahramanmaraş: Göksun, Höbek mountain, 1700 m, *P.H.Davis* 20195 (ANK). Malatya: Malatya to Gölbaşı, 4.7.1968, *A.Pamukçuoğlu* (ANK); between Doğanşehir-Gölbaşı, 4.7.1968, *A.Pamukçuoğlu s.n.* (HUB). **B7** Elazığ: İbalar village, İbalar stream, c. 850 m, 27.6.1980, *H.Evren* 392 (ANK). Diyarbakır: between Diyarbakır-Ergani, Ahmetli village, roadsides and fields margin 780 m, 13.6.1976, *D.Baş* & *O.Adıgüzel s.n.* (ISTF); between Diyarbakır-Ergani, around Devegeçidi bridge, roadsides, 650 m, 30.7.2001, *R.S.Göktürk* 4702-A & *M.Göktürk* (Akdeniz Univ. Herb.). **B9** Bitlis: Hizan, between Çökekyazı-Aladana village, Şeftalan stream, steppe, 1600 m, 26.8.1989, *Y.Altan s.n.* (VANF). Van: Yedikilise, Bakraçlı village, around old cemetery, wheat fields, 2200 m, 1.8.2001, *R.S.Göktürk* 4719, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.). **B10** Van: Özalp, east of Dönerdere village, wheat field, 2150 m, 24.6.1996, *F.Özgekçe* 3260-B. (VANF). **C3** Antalya: Topçular, roadsides, 50 m, 6.6.1993, *R.S.Göktürk* 2941 (Akdeniz Univ. Herb.). Isparta: Eğirdir, east of Eğirdir lake, wheat fields, 940 m, 2.6.1975, *R.Çetik* 7159 (KNYA). **C4** Antalya: Gazipaşa, Cimbite plateau, 1700 m, 13.7.1982, *H.Sümbül* 1362 (HUB). Konya: Seydişehir, between Seydişehir-Susuz, Kızpınarı, 1350 m, 16.8.1980, *H.Ocakverdi* 908 (KNYA). **C5** Konya: Ereğli, Aydos mountain, between Berendi-Kıraman, calcareous places, 1500 m, 13.7.1977, *S.Erik* 2484 (HUB). **C6** Kahramanmaraş: Engizek mountain, near Aksu district, fields and roadsides, 1100 m, 12.6.1987, *H.Duman* 3161 (GAZI). Gaziantep: Nizip, Birecik, cornfield on marly soil, 14.5.1957, *P.H.Davis* (27964) & *Hedge* (ANK); Kahramanmaraş-Adana crossroad, roadsides, 900 m, 10.8.1995, *R.S.Göktürk* 3513 & *M.R.Tunç* (Akdeniz Univ. Herb.). Gaziantep: Gaziantep to Adana, roadsides, 950 m, 29.7.2001, *R.S.Göktürk* 4687 & *M.Göktürk* (Akdeniz Univ. Herb.). **C7** Şanlıurfa: Birecik, from Birecik 56 km, wheat field, 20.5.1956, *Hub.-Mor.* 63 (ANK); between Akçakale-Şanlıurfa, c. 450 m, 17.5.1957, *P.H.Davis* 28118 & *Hedge* (ANK); wheat field, c. 500 m, 8.5.1967, *M.Zel* 1119 (ANK). **C8** Şırnak: near city, cemetery, 1380 m, 26.6.1997,

A.A.Dönmez 5743 & Ş.Yıldırım (HUB). Siirt: Batman, fields, 530 m, 14.6.1967, G.Oğuz 4461 (EGE).

No close relatives.

7. *Cephalaria stapfia* Hausskn., Beih. Bot. Centralbl. 19(2): 268 (1906) (Figure 2).

Type: [Turkey. C8 Mardin] bei Mardin, *Sintensis* 1888: 1314 (holo. E; iso. BR, K)

Slender, erect annual herbs. Stem up to 70 cm tall, simple or branched, setose in lower part, glabrous in upper part. Leaves herbaceous, lyrate, oblong-lanceolate in outline, glabrous, sparsely puberulent, margin sparsely setose, with 2–6 segments, lateral segments small, oblong, entire or serrate margin, acute or subobtuse at apex, terminal segment larger than lateral ones, lanceolate-elliptic, entire or serrate margin acute at apex; lower leaves 2.5–11 × 0.6–1.8 cm, lateral segments 0.6–1.4 × 0.2–0.5 cm, terminal segment 1.8–8 × 0.7–1.3 cm; cauline leaves 1–6 × 0.3–1.4 cm, lateral segments 3–7 × 1–1.5 cm, terminal segment 0.7–5 × 0.2–1 cm; upper leaves sessile, 1.2–3 × 0.8–1 cm, lateral segments 1–3 × 0.3–0.5 mm, terminal 0.8–2.3 × 0.6–0.9 cm. Capitula globose, 1–1.5 cm in diameter in flower, 0.8–1.2 cm in diameter in fruit. Involucral bracts ovate, 4–6 × 3–4 mm, cream, sparsely purple at apex, pubescent, margin sparsely ciliate, mucronate at apex; receptacular bracts obovate to linear-obovate, 7–10 × 2–3 mm, cream, pubescent, abruptly attenuate-aristate. Calyx cupuliform, 1–1.5 mm in diameter, with irregular teeth. Corolla 8–12 mm long, bluish or pale yellow, adpressed pilose outside. Involucel 4–7 mm long in fruit, brown, pilose, with 8 apical teeth (2 long, 2 middle, and 4 short); long and middle teeth 1.5–2 mm, short teeth 0.5–0.7 mm. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Fields, roadsides and riversides; 600–650 m.

Distribution: Irano-Turanian element. Turkey (South-East Anatolia) and North Iraq. *IUCN category:* [CR B1ab(i,ii,iv); C2a(ii): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location; all mature individuals placed in 1 population and estimated mature individuals fewer than 100].

Specimens examined: Turkey. **B7** Diyarbakır: between Diyarbakır-Ergani, near Devegeçidi bridge, riversides and roadsides, 650 m, 13.7.1976, *H.Demiriz*, *B.Tutel*, *H.Malyer* (ISTF 29730); *ibid.*, 30.7.2001, *R.S.Göktürk* 4702 & *M.Göktürk* (Akdeniz Univ. Herb.).

No close relatives.

8. *Cephalaria speciosa* Boiss. & Kotschy, Fl. Orient. 3: 121 (1875) (Figures 2 and 3).

Type: [Turkey. B8/9 Muş] inter Koweg [Kovik, Oğlakçı] et Goschkar prov. [Goşkar, Yarılsu] [in Varto district], Mush Armenia australis, 1525–1830 m, *Kotschy* 403 (holo. WU-JE with barcode JE00016202 seen as photo; iso. K).

Stout, erect perennial herbs. Stem up to 1.5 m, simple, striate, covered with densely stellate hairy and densely

retorse stellate hairy in lower part. Leaves coriaceous, densely stellate hairy; lower leaves simple, oblong-lanceolate, 10–40 × 2.5–6.5 cm, entire or crenate-serrate, acute or acuminate; cauline leaves lyrate, lanceolate or oblong-lanceolate in outline, 8–24 × 3–6 cm, with 2–6 segments, lateral segments lanceolate, 1–3 × 0.2–1.2 cm, entire, acute or subacuminate, terminal segment larger than lateral ones, oblong-lanceolate, 5–21 × 1.5–6 cm, margins entire or crenate-serrate, acute or acuminate at apex; upper leaves simple or lyrate, sessile; simple leaves linear or linear-lanceolate, 0.8–4 × 0.2–0.8 cm, entire, acuminate or subacuminate; lyrate leaves with 2–4 linear-lanceolate segments, 1–4.5 × 0.2–0.8 cm, entire, acuminate or subacuminate, lateral segments linear, 0.3–0.5 × 0.1–0.2 cm, terminal segment larger than lateral ones, linear-lanceolate, 0.8–3.5 × 0.2–0.8 cm. Capitula ovate to globose, 25–50-flowered, 2.5–4.5 cm in diameter in flower, 2–3.5 cm in diameter in fruit. Involucral bracts ovate to triangular-lanceolate, 7–15 × 3–7 mm, completely straw-coloured in dorsal side and rarely purple at apex, pubescent or adpressed pilose, margins ciliate, acuminate or subacuminate at apex; receptacular bracts triangular-lanceolate, 12–20 × 3.5–6 mm, straw-coloured, pubescent and adpressed pilose in dorsal side and apex, margins ciliate, acuminate at apex. Calyx cupuliform, 2–3 mm in diameter, with irregular teeth. Corolla cream or pale yellow, 9–15 mm long, densely adpressed hairy outside. Involucel 4-angled, 7–13 mm long in fruit, pilose, 4 long and 4 short teeth at apex; long teeth 4 mm long, short teeth 2 mm long. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Rocky places and roadsides; 1370–2300 m.

Distribution: Endemic to Turkey (East Anatolia). Irano-Turanian element. *IUCN category:* LC.

Specimens examined: Turkey. **B7** Erzincan: Keşiş mountain, Cimin, rocky slopes, c. 2300 m, 28.8.1957, *P.H.Davis* 31828 (ANK); Yayla başı village, Kazankaya mountain, 1500–2300 m, 7.8.1980, Ş.Yıldırım 3861 (HUB); Kemah, above Kömürköy, steppe, 1850 m, 31.7.1996, A.A.Dönmez 5367 (HUB). Tunceli: Ovacık, Munzur mountain, Aksu stream, c. 1700 m, 21.7.1957, *P.H.Davis* 31462 & *Hedge* (ANK). Tunceli: Ovacık, Munzur mountain, Karagöl valley, 1350–1500 m, 8.9.1979, Ş.Yıldırım 2443 (HUB). **B8** Erzincan: Aşkale to Tercan, dry rocky places, c. 1700 m, 25.8.1957, *P.H.Davis* 32657 & *Hedge* (ANK); between Tercan-Aşkale, slopes, 1765 m, 17.8.2000, *R.S.Göktürk* 4528 & *F.Göktürk* (Akdeniz Univ. Herb.); Erzincan to Sivas, slopes, 1500 m, 17.8.2000, *R.S.Göktürk* 4531 & *F.Göktürk* (Akdeniz Univ. Herb.). Muş: Muş to Solhan, hillsides, c. 1350 m, 31.8.1954, *P.H.Davis* 24783 & *Polunin* (ANK); Varto, Muş to Varto, rocky slopes, 1350 m, 2.8.2001, *R.S.Göktürk* 4727 & *M.Göktürk* (Akdeniz Univ. Herb.); Varto, Varto to Erzurum, Seferek pass, rocky slopes, 1800 m, 2.8.2001, *R.S.Göktürk* 4730



Figure 3. A- General view of *Cephalaria speciosa* in nature, B- close-up view of *C. speciosa*'s flowering capitula, C- general view of *C. elazigensis* var. *purpurea* in nature, D- close-up view of *C. elazigensis* var. *purpurea*'s flowering capitula, E- general view of *Cephalaria elmaliensis* in nature, F- general view of *C. paphlagonica* in nature, G- general view of *C. tuteliana* in nature, H- close-up view of *C. tuteliana*'s flowering capitula.

& *M. Göktürk* (Akdeniz Univ. Herb.); between Muş-Solhan, roadsides, 1600 m, 2.8.2001, *R.S.Göktürk* 4732 & *M.Göktürk* (Akdeniz Univ. Herb.).

Cephalaria speciosa is similar to *C. davisiana* and *C. sumbuliana* but differs from *C. davisiana* in its lower leaves simple, capitula ovate to globose, 2.5–4.5 cm in diameter in flower, involucre bracts ovate to triangular-lanceolate, 7–15 × 3–7 mm, completely straw-coloured, acuminate or subacuminate, receptacular bracts triangular-lanceolate, 12–20 × 3.5–6 mm, completely straw-coloured, and differs from *C. sumbuliana* in its nonrhizomatous, lower leaves simple, oblong-lanceolate, capitula ovate to globose, 2.5–4.5 cm in diameter in flower, involucre bracts ovate to triangular-lanceolate, 7–15 × 3–7 mm, acuminate or subacuminate at apex, receptacular bracts triangular-lanceolate, 12–20 × 3.5–6 mm, acuminate at apex.

9. *Cephalaria duzceensis* Aksoy & Göktürk, Nordic J. Bot. 25: 65 (2007) (Figure 4).

Type: Turkey. A3 Düzce: Gölyaka, Elmacık mountain, Balıklı area, behind Konaş, Melik stream, open rock area of *Pinus sylvestris* forest, on disturbed ground, 644 m, 30.8.2004, *N.Aksoy* 5339 (holo. ISTO; iso. GAZI, AIBO, Akdeniz Univ. Herb.).

Slender, erect, rhizomatous, perennial herb. Stem up to 1.5 m tall, simple, branched from the middle or upper part, solid or hollow, sparsely stellate hairy throughout and retrorse hairy in lower part. Leaves coriaceous, stellate hairy on both surfaces; lower leaves simple, deflexed from petiole, oblong-lanceolate or ovate-lanceolate, 15.5–22 × 2.8–4.7 cm, crenate or crenate-serrate at margin, acute at apex; cauline leaves simple or rarely lyrate, lanceolate; simple leaves and segments of lyrate leaves entire or crenate-serrate at margin, acute at apex, 7.8–13.5 × 1.5–4 cm; lyrate leaves 8–13 × 1.3–4 cm, with 2 linear-lanceolate segments, 1.1–2 × 0.3–0.5 cm, terminal segment larger than lateral ones, lanceolate, 6–12 × 1.3–4.2 cm; upper cauline leaves simple or very rarely lyrate, linear-lanceolate or linear; simple leaves 1–5.5 × 0.2–0.7 cm, acute or subacuminate at apex; lyrate leaves with 2 linear segments, 1.1–2 × 0.3–0.5 mm, terminal segment larger than lateral ones, narrowly lanceolate, 0.8–4.5 × 0.3–0.6 cm. Capitula globose, 2–2.5 cm in diameter in flower, 2.5–3 cm in diameter in fruit. Involucre bracts narrowly ovate-oblong, completely black or straw-coloured, 8–12.5 × 3.5–5 mm, pilose with densely adpressed hairs, ciliate margin, mucronate at apex; receptacular bracts narrowly oblong-lanceolate, completely straw-coloured or basal and dorsal surface straw-coloured but brown at apex, 13–15.5 × 1.5–2.5 mm, densely pilose with adpressed hairs, margin ciliate, subacuminate at apex. Corolla 9.14–12.05 mm long, cream, pilose with densely adpressed hairs on the outside. Involucre 6.1–7.1 mm long in fruit, 4-angled, sericeous, with 4 short and 4 long teeth at apex. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Stony slopes, open rock area of *Pinus sylvestris* forest, on disturbed ground; 644–1265 m. *Distribution*: Endemic to Turkey (North Anatolia). Euxine element. *IUCN category*: [CR B1ab(i,ii,iv): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location].

Specimens examined: A3 Düzce: Gölyaka, Elmacık Dağı, Kardüz area, upper side of Melik stream, Karaardıç, open rock area of *Pinus sylvestris* and *P. nigra* forest, on disturbed ground, 1265 m, 6.8.2005, *N.Aksoy* 5978 (Düzce Univ. Herb.).

Cephalaria duzceensis is similar to *C. speciosa*, but differs from *C. speciosa* in its rhizomatous, lower leaves deflexed from petiole, capitula globose, 2–2.5 cm diameter in flower, 2.5–3 cm in diameter in fruit, corolla cream, involucre bracts narrowly ovate-oblong, completely black or straw-coloured, 8–12.5 × 3.5–5 mm, mucronate at apex, receptacular bracts narrowly oblong-lanceolate, completely straw-coloured or basal and dorsal surface straw-coloured and brown only at apex, 13–15.5 × 1.5–2.5 mm, subacuminate at apex, involucre 6.1–7.1 mm long in fruit, sericeous.

10. *Cephalaria davisiana* Göktürk & Sümbül, Turk. J. Bot. 36(4): 313 (2012) (Figure 4).

Type: Turkey. C6 Kahramanmaraş: between Göksun-Sarız, east of Doğankonak village, Binboğa mountain, mountain slopes, 1700–2000 m, 3.8.2001, *R.S.Göktürk* 4733 & *M.Göktürk* (holo. Akdeniz Univ. Herb.; iso. ANK, GAZI, HUB).

Stout, erect perennial herbs. Stem up to 1.5 m, simple, striate, covered with densely stellate hairy and densely retrorse stellate hairy in lower part and beneath capitula. Leaves coriaceous, hairy; lower leaves simple or lyrate, simple leaves and segments of lyrate leaves margin entire or crenate-serrate, acute or acuminate at apex, oblong-lanceolate or oblong, 10–34 × 4–7 cm, lyrate leaves oblong-lanceolate in outline, 12–50 × 3.5–12 cm, with 2–6 lanceolate segments; lateral segments, 1–5.5 × 0.8–2.5 cm, terminal segment larger than lateral ones, oblong-lanceolate, 8–28 × 4–8 cm; cauline leaves lyrate, lanceolate or oblong-lanceolate in outline, 8–25 × 2–8 cm, with 2–6 lanceolate segments, 1–3 × 0.2–1.2 cm, entire, acute or subacuminate at apex, terminal segment larger than lateral ones, oblong-lanceolate or lanceolate, 5–18 × 2–6 cm, margins entire or crenate-serrate, acute or acuminate at apex; upper leaves simple or lyrate, sessile; simple leaves and segments of lyrate leaves margins entire, acuminate or subacuminate at apex; simple leaves linear or linear-lanceolate, 0.7–4.2 × 0.2–0.8 cm; lyrate leaves lanceolate or oblong-lanceolate in outline, 1.2–6 × 0.2–0.8 cm, with 2–4 linear segments, 0.2–0.5 × 0.1–0.2 cm, terminal segment larger than lateral ones, linear-lanceolate, 1–5 × 0.2–0.7 cm. Capitula globose, 30–50-flowered, 1.5–2.5

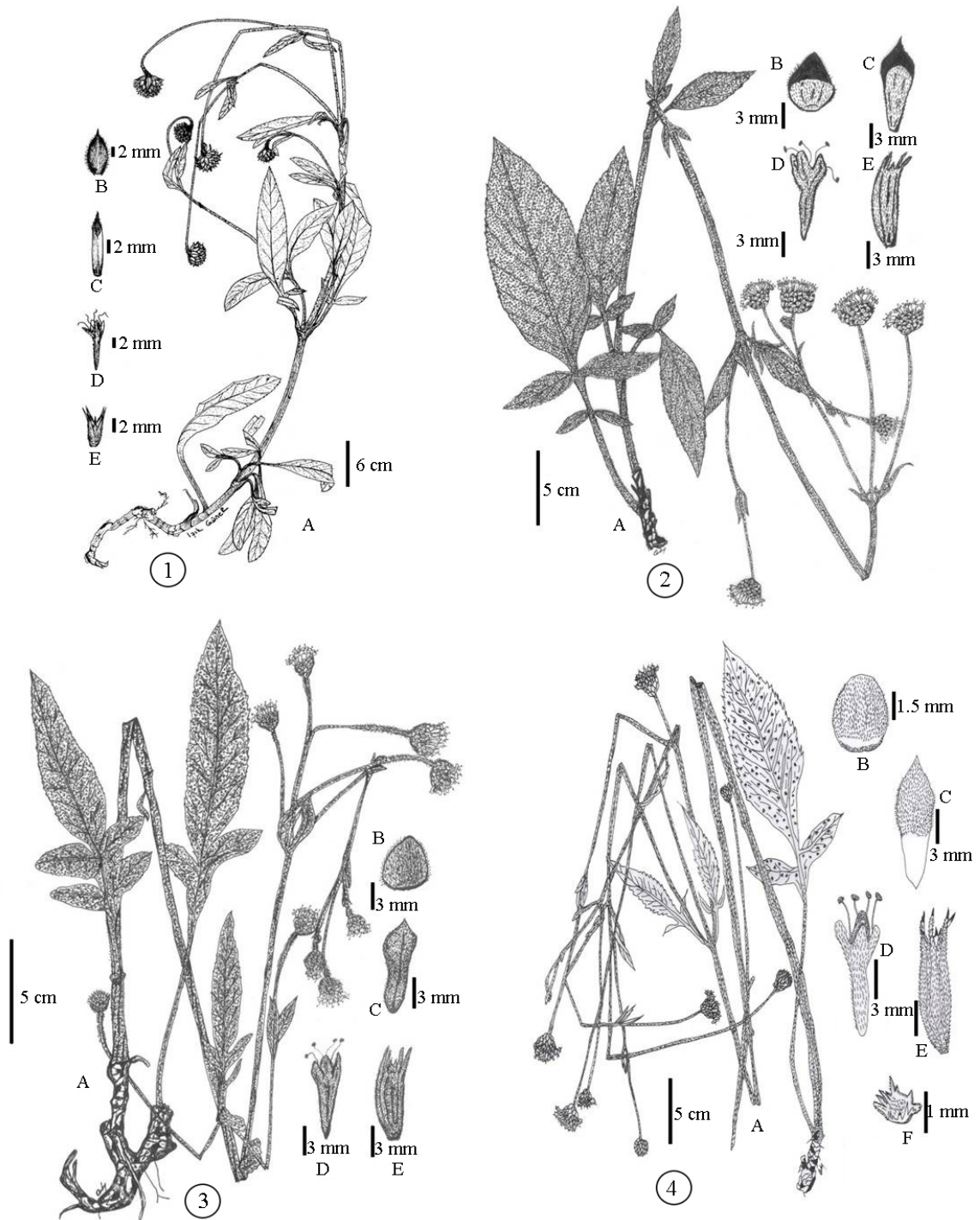


Figure 4. 1- *Cephalaria duzceensis*, 2- *C. davisiana*, 3- *C. sumbuliana*, 4- *C. demirizii*. A- habit, B- involucre bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

cm in diameter in flower, 1.5–3 cm in diameter in fruit. Involucre bracts ovate-orbicular or triangular-ovate, 6–9 × 4–8 mm, completely blackish or blackish in dorsal side and at apex, pubescent or adpressed pilose, margins long ciliate, acute or subacute at apex; receptacular bracts ovate-

oblong, 8–11 × 3–5 mm, straw-coloured in dorsal side and base, black at apex, pubescent or sparsely adpressed pilose, margins ciliate, acuminate or subacuminate at apex. Calyx cupuliform, 1–2 mm in diameter, with irregular teeth. Corolla 8–14 mm long, yellow or pale yellow, densely

adpressed hairy outside. Involucel 4-angled, 7–14 mm long in fruit, pilose, 4 long and 4 short teeth at apex, long teeth 3–3.5 mm long, short teeth 1–1.5 mm long. *Fl.* 7–9, *Fr.* 8–9.

Habitat: Mountain slopes, stony slopes, rocky places, under forest and clearings; 1400–2100 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean (mt.) element. *IUCN category:* [VU B2ab(i,ii,iv): area of occupancy less than 2000 km², known at no more than 10 locations].

Specimens examined: Turkey. **B6** Kahramanmaraş: Göksun, Fındık village, Kandil mountain, north slopes, under forest and clearings, 1600–2100 m, 27.7.1981, *B.Yıldız* 3068 (HUB). Kayseri: Sarız, Yeşilyurt, Binboğa mountain, rocky places, 1800 m, 9.8.1995, *R.S.Göktürk* 3502 & *M.R.Tunç* (Akdeniz Univ. Herb.). **C6** Kahramanmaraş: Göksun, Binboğa mountain, Yalak, c. 2000 m, *P.H.Davis* 20159 (ANK); Ahır mountain, Akdere, near Yalnız ardıç bağları, high mountain steppe, 1400 m, 13.9.1991, *Z.Aytaç* 5552 & *H.Duman* (GAZI); Göksun, Değirmendere, between Büyükçamurlu-Yanıktepe, stony slopes, 1600 m, 20.8.1993, *M.Ekici* 1694 (GAZI); Göksun, between Göksun-Sarız, east of Doğankonak village, Binboğa mountain, mountain slopes, 1700–2000 m, 9.8.1995, *R.S.Göktürk* 3508 & *M.R.Tunç* (Akdeniz Univ. Herb., ANK, GAZI, HUB); between Göksun-Kahramanmaraş, Püren pass, rocky places, 1550 m, 5.8.2003, *R.S.Göktürk* 5153 (Akdeniz Univ. Herb.).

Cephalaria davisiana is similar to *C. speciosa*, *C. sumbuliana*, and *C. elmaliensis* but differs from *C. speciosa* in its lower leaves simple or lyrate, oblong-lanceolate, capitula globose, 1.5–2.5 cm in diameter in flower, involucre bracts ovate-orbicular or triangular-ovate, 6–9 × 4–8 mm, completely blackish or blackish on dorsal side and at apex, acute or subacute, receptacular bracts ovate-oblong, 8–11 × 3–5 mm, blackish at apex. It differs from *C. sumbuliana* in its nonrhizomatous, lower leaves simple or lyrate, oblong-lanceolate, involucre bracts ovate-orbicular or triangular-ovate, completely blackish or blackish on dorsal side and at apex, acute or subacute at apex, receptacular bracts ovate-oblong, blackish at apex. It differs from *C. elmaliensis* in its lower leaves simple or lyrate, oblong-lanceolate, capitula globose, involucre bracts ovate-orbicular or triangular-ovate, 6–9 × 4–8 mm, completely blackish or blackish on dorsal side and at apex, acute or subacute, receptacular bracts ovate-oblong, 8–11 × 3–5 mm, blackish at apex.

11. *Cephalaria sumbuliana* Göktürk, Turk. J. Bot. 36(4): 316 (2012) (Figure 4).

Type: Turkey. C4 Konya: Seydişehir, 21st km from Seydişehir to Akseki, rocky places, under and in clearings in *Abies* forest, 1435 m, 8.8.2000, *R.S.Göktürk* 4466 & *F.Göktürk* (holo. Akdeniz Univ. Herb.; iso. ANK, GAZI, HUB).

Stout, rhizomatous, erect perennial herbs. Stem up to 1.3 m, simple, striate, densely stellate hairy, densely retrorse stellate hairy in lower part and beneath capitula. Leaves coriaceous, densely stellate hairy; lower leaves lyrate, lanceolate or ovate-lanceolate in outline, 5–44 × 3.5–13 cm, with 2–6 oblong or oblong-lanceolate segments, 2–5 × 0.3–2.5 cm, entire or crenate-serrate, acute or obtuse at apex, terminal segment larger than lateral ones, oblong-lanceolate or lanceolate, 8–28 × 2–6 cm, crenate or crenate-serrate, acute at apex; cauline leaves lyrate, lanceolate or oblong-lanceolate in outline, 9–20 × 3–10 cm, with 2–6 oblong-lanceolate segments, 2–6 × 0.5–2 cm, entire or crenate-serrate, acute at apex, terminal segment larger than lateral ones, oblong-lanceolate or lanceolate, 6.5–13 × 1.5–4.5 cm; upper leaves simple or lyrate, sessile; simple leaves and segments of lyrate leaf margins entire, subacuminate at apex; simple leaves linear or linear-lanceolate, 0.8–3 × 0.1–0.4 cm; lyrate leaves linear-lanceolate or lanceolate in outline, 2–8 × 1.2–2 cm, with 2–4 linear segments, 0.5–1.5 × 0.1–0.4 cm, terminal segment larger than lateral ones, linear-lanceolate, 2.5–7 × 0.3–0.9 cm. Capitula globose, 1–2 cm in diameter in flower, 1.5–2.5 cm in diameter in fruit. Involucre bracts broadly ovate-orbicular or orbicular, 6–9 × 5–9 mm, straw-coloured, long pilose hairy, margins long ciliate, obtuse at apex; receptacular bracts oblong or narrowly oblanceolate, 8–12 × 3–4 mm, straw-coloured, pubescent or adpressed pilose hairy, margins ciliate, acute or short acuminate at apex. Calyx cupuliform, 1.5–2.5 mm in diameter, subirregular teeth. Corolla 8–12 mm long, cream or pale yellow, densely adpressed hairy outside. Involucel 4-angled, 7–10 mm long in fruit, striate, densely adpressed pilose hairy, 4 long and 4 short teeth at apex; long teeth 3–3.5 mm long, short teeth 1–1.5 mm long. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Rocky places, under *Abies* forest and clearings; 1435–1800 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* [EN B2ab(i,ii,iv): area of occupancy less than 500 km², known at no more than 5 locations].

Specimens examined: Turkey. **C4** Konya: Seydişehir, 21st km from Seydişehir to Akseki, rocky places, under and in clearings in *Abies* forest, 1435 m, 4.7.2002, *R.S.Göktürk* 4865 & *F.Göktürk* (Akdeniz Univ. Herb.); *ibid.*, 1.8.2002, *R.S.Göktürk* 5040 & *M.Göktürk* (Akdeniz Univ. Herb.). Karaman: Ermenek, Kazancı, Kazancı plateau, Kırkkuyu, 1800 m, 19.07.1984, *H.Sümbül* 3217 (HUB).

Cephalaria sumbuliana is similar to *C. speciosa*, *C. davisiana*, and *C. elmaliensis* but differs from *C. speciosa* in its rhizomatous, lower leaves lyrate, lanceolate or ovate-lanceolate in outline, capitula globose, 1–2 cm in diameter in flower, involucre bracts broadly ovate-orbicular or orbicular, 6–9 × 5–9 mm, obtuse, receptacular bracts oblong or narrowly oblanceolate, 8–12 × 3.5–6 mm,

acute or short acuminate. It differs from *C. davisiana* in its rhizomatous, lower leaves lyrate, lanceolate or ovate-lanceolate in outline, involucre bracts broadly ovate-orbicular or orbicular, completely straw-coloured, obtuse, receptacular bracts oblong or narrowly oblanceolate, completely straw-coloured. It differs from *C. elmaliensis* in its rhizomatous, lower leaves lyrate, lanceolate or ovate-lanceolate in outline, capitula globose, involucre bracts broadly ovate-orbicular or orbicular, 6–9 × 5–9 mm, obtuse, receptacular bracts oblong or narrowly oblanceolate, 8–11 × 3–5 mm, completely straw-coloured.

12. *Cephalaria demirizii* Göktürk & Sümbül sp. nov. (Figure 4).

Type: Turkey. B8 Diyarbakır: Hazro district, Uzunargıt village, Anbarsırtı, around Değirmen, stream sides and rocky places, 900 m, 31.7.2002, R.S.Göktürk 5038 & M.Göktürk (holo. Akdeniz Univ. Herb., GAZI; iso. ANK, HUB).

Diagnosis: *Affinis Cephalaria speciosa et C. stellipili, sed a C. speciosa caulis omnino glaberibus (non vestitis cum stellate-pilis), foliis inferioribus lyratis (non simplicibus), bracteis involucrelibus ovate-oblongis vel late ovatis (non ovatis triangulare-lanceolatis), bracteis receptacularibus oblonge-lanceolatis vel oblanceolatis (non triangulare-lanceolatis) differt. A C. stellipili caulis omnino glaberibus (non vestitis cum stellate-pilis), foliis inferioribus lyratis (non simplicibus) etc.*

Slender, erect perennial herbs. Stem up to 1.5 m, simple, shiny, striate, hollow, glabrous. Leaves coriaceous, crenate-serrate or entire margin; lower leaves lyrate, ovate-lanceolate or oblong in outline, sparsely stellate hairy, 7–35 × 1–9 cm, with 2–4 segments of oblong-lanceolate segments, 2.5–5 × 1–2 cm, acute at apex, terminal segment larger than lateral ones, lanceolate or oblong-lanceolate, 6–17 × 1.5–6 cm, acute or acuminate at apex; cauline leaves lyrate, lanceolate or ovate-lanceolate in outline, glabrous, 8–16 × 2–7 cm, with 2–4 segments of lanceolate or oblong-lanceolate segments, 1.7–4 × 0.5–1.7 cm subacuminate at apex, terminal segment larger than lateral ones, lanceolate 5–13 × 1.7–5 cm, acuminate or subacuminate at apex; upper leaves simple linear or linear-lanceolate, glabrous, 0.8–4.5 × 0.1–0.2 cm, subpungent at apex. Capitula globose or subglobose, 1–2.5 cm in diameter in flower, 1–2.7 cm in diameter in fruit; corolla 8–12 mm long, cream or pale yellow, densely adpressed pilose outside. Involucre bracts ovate-oblong or broadly ovate, 5–17 × 3–5 mm, straw-coloured, pubescent and adpressed pilose outside, ciliate margin, obtuse or subacute at apex; receptacular bracts oblong-lanceolate or oblanceolate, 9–12 × 3–4 mm, straw-coloured, pubescent outside, ciliate margin, acute or subacute at apex. Involucel 9–13 mm long in fruit, narrowly ovate-oblong, 4-angled, brown, pilose, 4 long and 4 short teeth at apex; long teeth 3–3.5 mm, short teeth 1–1.5 mm. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Stream sides and rocky places; 900 m. *Distribution*: Endemic to Turkey (South-East Anatolia). Irano-Turanian element. *IUCN category*: [CR B1ab(i,ii,iv); C2a(ii): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location; all mature individuals placed in 1 population and estimated mature individuals fewer than 100].

Specimens examined: Turkey. B8 Diyarbakır: Hazro, Uzunargıt (Zuğur), around Değirmen, stream sides and rocky places, 890–930 m, 3.8.1976, H.Demiriz, S.Alakuş & H.Olgaç s.n. (ISTF 30009).

Etymology: This new species is named in honour of Prof Dr Hüsnü Demiriz, who contributed to the Turkish flora.

The new species is different from both *C. speciosa* and *C. stellipilis* Boiss. In the Table, *C. demirizii*, *C. speciosa*, and *C. stellipilis* are compared on the basis of their vegetative organs (i.e. cauline and leaves) and reproductive organs (i.e. capitula, involucre bracts, receptacular bracts, and involucel).

13. *Cephalaria stellipilis* Boiss., Diagn. Pl. Orient. ser. 1(10): 76 (1849) (Figure 5).

Type: [Lebanon] in siccis calidis dumosis ad radices montis Gebel Scheik (Hermon) Antilibani supra Rascheya, 06.1846, Boissier s.n. (iso. K).

Slender, erect perennial herbs. Stem simple or branched from base, up to 1 m, suffrutescent at the base, with stellate hairs. Leaves coriaceous, simple, with minute lateral segment, densely stellate hairs on both surface, entire, acute at apex; lower leaves oblong-spathulate, 5.5–15 × 0.8–3 cm; cauline leaves oblong-spathulate, 4–10 × 0.6–1.5 cm; upper stem leaves linear-lanceolate or linear, 0.8–7 × 0.1–0.3 cm. Capitula subglobose, 1–2.5 cm in diameter in flower, 1–1.75 cm in diameter in fruit. Involucre bracts ovate, 4–6 × 3–4 mm, completely straw-coloured or straw-coloured at base, brown in dorsal and at apex, sparsely ciliate margin, acute or subobtuse at apex; receptacular bracts ovate to narrowly ovate, 7–11 × 3–4 mm, completely straw-coloured or straw-coloured at base, purple-brown in dorsal and at apex, pubescent, sparsely ciliate margin, acuminate or subacuminate at apex. Calyx cupuliform, 1–2 mm in diameter, irregular teeth. Corolla 8–12 mm long, yellow or cream, densely adpressed pilose outside. Involucel 4-angled, oblong, 7–8 mm long in fruit, pilose, 4 long and 4 short teeth at apex; long teeth 2–3 mm long, short teeth 1 mm long. *Fl.* 6–9, *Fr.* 7–9.

Habitat: Steppe, slopes, mountain steppe, and stony places; 1400–2050 m. *Distribution*: Irano-Turanian element. Turkey (East Anatolia) and Lebanon. *IUCN category*: [VU B1ab(i,ii,iv): area of occupancy less than 20000 km², known at no more than 10 locations].

Specimens examined: Turkey. B6 Kayseri: above Kaynar, Hınzır mountain, Eriklidere, 1950 m, 12.9.1979,

Table. A comparison of *Cephalaria demirizii*, *C. speciosa*, and *C. stellipilis*.

Characters	Taxa <i>C. demirizii</i>	<i>C. speciosa</i>	<i>C. stellipilis</i>
Stem	Slender, shiny, hollow, completely glabrous	Stout, not shiny, not hollow, clothed in stellate hairs	Slender, not shiny, not hollow, clothed in stellate hairs
Lower leaves	Lyrate, ovate-lanceolate or oblong in outline, sparsely stellate hairs	Simple, oblong-lanceolate in outline, densely stellate hairs	Simple, oblong-spathulate in outline, densely stellate hairy
Cauline leaves	Lyrate, ovate-lanceolate or lanceolate in outline, glabrous	Lyrate, lanceolate or oblong-lanceolate, densely stellate hairs	Simple, oblong-spathulate, densely stellate hairs
Terminal segment of cauline leaves	Lanceolate	Oblong-lanceolate	—
Upper leaves	Glabrous, subpungent	Densely stellate hairs, acuminate or subacuminate	Densely stellate hairs, acute
Capitula	1–2.5 cm in diameter in flower, 1–2.7 cm in diameter in fruit	2.5–4.5 cm in diameter in flower, 2–3.5 cm in diameter in fruit	1–2.5 cm in diameter in flower, 1–1.75 cm in diameter in fruit
Involucral bracts	Ovate-oblong or broadly ovate, obtuse or subacute	Ovate to triangular-lanceolate, acuminate or subacuminate	Ovate, acute or subobtusate
Receptacular bracts	Oblong-lanceolate or oblanceolate, 9–12 × 3–4 mm, acute or subacuminate	Triangular-lanceolate, 12–20 × 3.5–6 mm, acuminate	Ovate or narrowly ovate, 7–11 × 3–4 mm, acuminate
Involucel	9–13 mm long in fruit	7–13 mm long in fruit	7–8 mm long in fruit

N.Çelik 831 (AEF); *ibid.*, 13.9.1979, *N.Çelik* 863 (ANK). Kahramanmaraş: Göksun, east of Doğan Konak village, Binboğa mountain, stony places, 1700–1900 m, 9.8.1995, *R.S.Göktürk* 3505 & *M.R.Tunç* (Akdeniz Univ. Herb.); Öksüz mountain, stony places, 1500–1600 m, 26.7.1987, *H.Duman* 3764 (GAZI); Ahır mountain, south of Karagöl, high mountain steppe, 1750–1800 m, 31.7.1991, *Z.Aytaç* 4215 & *H.Duman* (GAZI); Ahır mountain, Yalnız ardiç, steppe, 1450 m, 22.07.1992, *Z.Aytaç* 5551 & *H.Duman* (GAZI); *ibid.*, 10.8.1995, *R.S.Göktürk* 3509 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ahır mountain, Akdere, slopes, 1500 m, 10.8.1995, *R.S.Göktürk* 3512 & *M.R.Tunç* (Akdeniz Univ. Herb.); between Göksun-Kahramanmaraş, Değirmendere village, slopes, 1450 m, 15.7.2002, *R.S.Göktürk* 4950 (Akdeniz Univ. Herb.); *ibid.*, 27.7.2007, *R.S.Göktürk* 6078 (Akdeniz Univ. Herb.).

Cephalaria stellipilis is similar to *C. elmaliensis* but differs from *C. elmaliensis* in its stem not striate, suffrutescent, lower and stem leaves oblong-spathulate, involucral bracts broadly ovate, acute or subobtusate at apex, receptacular bracts ovate or narrowly ovate, acuminate or subacuminate at apex, pubescent, involucel 7–8 mm long.

14. *Cephalaria elazigensis* Göktürk & Sümbül, Israel J. Pl. Sci. 51(1): 61 (2003).

Slender, erect perennial herbs. Stem simple or branched from base, up to 1 m, somewhat suffrutescent at the base, minute stellate hairs in lower and middle part, glabrous in

upper part. Leaves coriaceous, simple, with minute stellate hairs on both surfaces, serrate or entire margin, subpungent at apex; lower leaves lanceolate, petiolate, 6–25 × 1–3 cm; cauline leaves similar to lower leaves, lanceolate, but short petiolate, 5–16 × 0.8–2.7 cm; upper leaves linear or linear-lanceolate, sessile, 0.5–6 × 0.1–0.4 cm. Capitula ovoid or ovoid-subglobose, 1–1.75 cm in diameter in flower, 1–1.5 mm in diameter in fruit. All bracts straw-coloured, rarely purple-brownish at apex, margin ciliate; involucral bracts ovate-orbicular or orbicular, 4–7 × 4–6 mm, pubescent outside, mucronate at apex; receptacular bracts oblong-spathulate or spathulate, 7–14 × 3–5 mm, pubescent and pilose outside, mucronate at apex. Calyx cupuliform, 2–3 mm in diameter, irregular teeth. Corolla 9–14 mm long, yellow or purple, densely adpressed pilose outside. Involucel 4-angled, oblong, 8–14 mm long in fruit, light brown, sericeous, 4 long and 4 short teeth at apex; long teeth 4 mm long, short teeth 2 mm long. *Fl.* 7–8, *Fr.* 8–9.

C. elazigensis includes 2 varieties:

1. Corolla yellow; fruiting involucel 8–10 mm long
..... var. **elazigensis**

1. Corolla purple; fruiting involucel 11–14 mm long
..... var. **purpurea**

var. **elazigensis** Israel J. Pl. Sci. 51(1): 62 (2003) (Figure 5).

Type: Turkey. B7 Elazığ: Maden, 8 km from Maden to Ergani, dry slopes, 900 m, 30.7.2001, *R.S.Göktürk* 4698 &

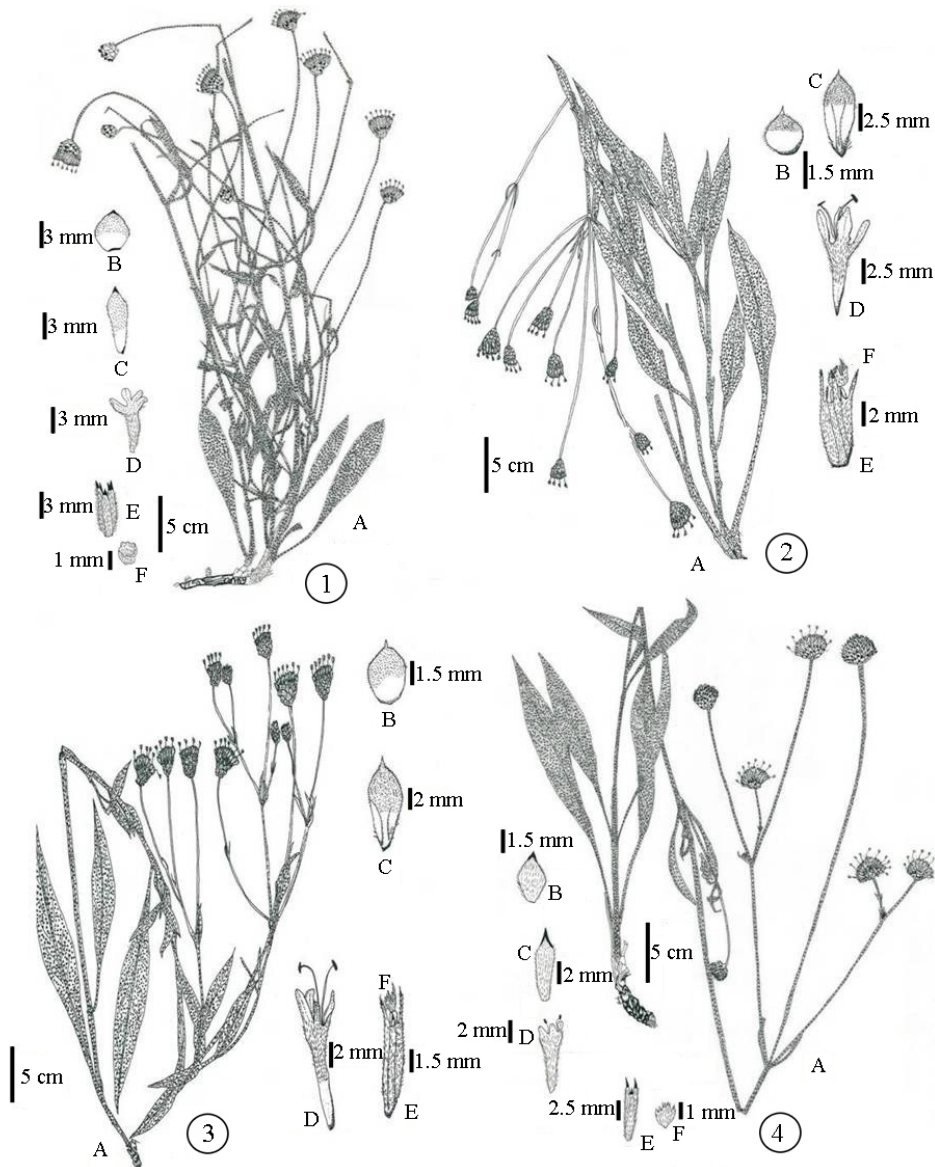


Figure 5. 1- *Cephalaria stellipilis*, 2- *C. elazigensis* var. *elazigensis*, 3- *C. elazigensis* var. *purpurea*, 4- *C. elmaliensis*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

M.Göktürk (holo. Akdeniz Univ. Herb.; iso. ANK, HUB, GAZI).

Habitat: Dry slopes; 900 m. *Distribution*: Endemic to Turkey (East Anatolia). Irano-Turanian element. *IUCN category*: [CR B1ab(i,ii,iv): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location].

var. **purpurea** Göktürk & Sümbül, Israel J. Pl. Sci. 51(1): 62 (2003) (Figures 3–5).

Type: Turkey. B7 Elaziğ: Maden, 8 km from Maden to Ergani, dry slopes, 900 m, 30.7.2001, *R.S.Göktürk* 4697 & *M.Göktürk* (holo. Akdeniz Univ. Herb.; iso. ANK, HUB, GAZI).

Habitat: Dry slopes, calcareous slopes; 900–1255 m. *Distribution*: Endemic to Turkey (East and Central Anatolia). Irano-Turanian element. *IUCN category*: [EN B2ab(i,ii,iv): area of occupancy less than 500 km²; known at no more than 5 locations].

Specimens examined: Turkey. **B5** Kırşehir: between Kırıkkale-Kırşehir, 3 km from Kaman crossroad to Kaman, 1255 m, calcareous stony slopes, 16.7.2003, *E.Hamzaoğlu* 3537 (Bozok Univ. Herb., Akdeniz Univ. Herb.); *ibid.*, 28.7.2007, *R.S.Göktürk* 6090 (Akdeniz Univ. Herb.).

Cephalaria elazigensis is similar to *C. elmaliensis* and *C. stellipilis* but differs from *C. elmaliensis* in its stem suffrutescent, glabrous in upper part, leaves

apex subpungent, corolla yellow or purple, involucre bracts ovate-orbicular or orbicular, mucronate at apex, receptacular bracts oblong-spathulate or spathulate, mucronate at apex, pubescent and pilose, involucre sericeous, 8–14 mm long. It differs from *C. stellipilis* in its stem glabrous in upper part, lower and stem leaves lanceolate, leaves' apex subpungent, corolla yellow or purple, involucre bracts ovate-orbicular or orbicular, mucronate at apex, receptacular bracts oblong-spathulate or spathulate, mucronate at apex, pubescent and pilose, involucre sericeous, 8–14 mm long.

15. *Cephalaria elmaliensis* Hub.-Mor. & V.A. Matthews, Notes Roy. Bot. Gard. Edinburgh 31: 326 (1972) (Figures 3–5).

Type: Turkey. C2 Antalya: Elmalı, Ak Da., 1700 m, 23.06.1965, *F. Sorger* 65–27–5 (holo. Hb. Hub.-Mor.).

Slender, erect perennial herbs. Stem up to 1 m, striate, covered with densely minute stellate hairy and densely antrorse stellate hairy in lower part. Leaves coriaceous, densely minute stellate hairy; lower leaves simple, lanceolate, 10–26 × 1.3–4 cm, entire or crenate-serrate, acute; cauline leaves simple or lyrate; simple leaves similar to lower leaves, small, lanceolate, 5–15 × 0.7–3 cm, entire, crenate-dentate, acute; lyrate leaves narrowly ovate-lanceolate in outline, 6–15.5 × 0.8–1.6 cm, with 2–6 segments; segments lanceolate, acute, lateral segments 5–20 × 2–5 mm, entire, terminal segment larger than lateral ones, 4–11 × 1.2–1.3 cm, entire or crenate-dentate; upper leaves simple, linear-lanceolate, 0.7–7 × 0.1–0.4 cm, entire, subacute. Capitula subglobose, 1–2 cm in diameter in flower, 1–2.3 cm in diameter in fruit. Involucre bracts ovate, 4–6 × 2.5–3 mm, completely straw-coloured or brown, straw-coloured on dorsal side and at base, brown at apex, pubescent or pilose, ciliate margins, acute at apex; receptacular bracts narrowly ovate or lanceolate, 8–12 × 2–3 mm, straw-coloured at base, brown in dorsal and apex, pubescent and pilose, sparsely ciliate margins, acuminate at apex. Calyx cupuliform, 1–3 mm in diameter, with irregular teeth. Corolla yellow or cream, 8–12 mm long, densely adpressed hairy outside. Involucre 4-angled, 10–12 mm long in fruit, pilose, 4 long and 4 short teeth at apex; long teeth 3 mm long, short teeth 1 mm long. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Stony ground and openings in *Cedrus libani*; 1700–1900 m. *Distribution:* Endemic to Turkey (South-West Anatolia). East Mediterranean element. *IUCN category:* [VU B2ab(i,ii,iv): area of occupancy less than 2000 km², known at no more than 10 locations].

Specimens examined: Turkey. C2 Antalya: Elmalı, Çıglıkara, near security building, openings in *Cedrus libani*, 1700–1900 m, 25.8.1993, *H. Duman* 5345, *Z. Aytaç* & *A.A. Dönmez* (GAZI, Akdeniz Univ. Herb.); *ibid.*, 12.8.1995, *R.S. Göktürk* 3532 (Akdeniz Univ. Herb.); Elmalı, Çıglıkara,

between Ayıngediği-Kaş gediği, openings in *Cedrus libani*, stony ground, 1750 m, 17.8.2007, *R.S. Göktürk* 6111 (Akdeniz Univ. Herb.).

Cephalaria elmaliensis is similar to *C. stellipilis* but differs from *C. stellipilis* by its stem striate, herbaceous, lower and stem leaves lanceolate, involucre bracts ovate, subacute at apex, receptacular bracts narrowly ovate or lanceolate, acuminate at apex, pubescent and pilose, involucre 10–12 mm long.

16. *Cephalaria hirsuta* Stapf, Denkschr. Kaiserl. Akad. Wiss., Wien, Math.-Naturwiss. Kl. 50: 55 (1885) (Figure 6).

Type: [W. Iran] in agro Ecbatanensi (Media), *Pichler s.n.* (holo. WU; iso. K).

Stout, erect perennial herbs. Stem up to 1 m tall, striate, densely retrorse pilose in lower part, sparsely pilose in upper part. Leaves coriaceous; lower leaves simple or lyrate; simple leaves and segments sparsely adpressed pilose and pubescent, densely hirsute hairy at margin, entire or dentate margin, acute at apex; simple leaves lanceolate, oblong-lanceolate, 8–12 × 1.3–2.5 cm; lyrate leaves oblong or oblong-lanceolate in outline, 8–10 × 1.3–2.5 cm, with 2–4 segments, lateral segments oblong or lanceolate, 1–1.7 × 0.3–0.5 cm, terminal segment larger than lateral ones, oblong-lanceolate, 2–6 × 0.8–1.7 cm; cauline leaves lyrate-pinnatisect, oblong-lanceolate in outline, 5–16 × 0.6–3 cm, with 4–7 segments, glabrous or pubescent, densely hirsute at margin; segments entire, serrate or dentate-serrate, acute at apex, lateral segments oblong-lanceolate, 0.8–1.7 × 0.2–0.6 cm, terminal segment larger than lateral ones, lanceolate, oblong-lanceolate, 3–8 × 0.7–2.1 cm; upper leaves lyrate-pinnatisect, oblong-lanceolate in outline, 1.3–2 × 0.4–0.5 cm, 4–9 segments; segments linear-lanceolate, entire, acute at apex, lateral segments 3–5 × 0.8–1 mm, pubescent, terminal segment larger than lateral ones, 5–12 × 1–2 mm, puberulent, sparsely hirsute. Capitula globose, 1–2.5 cm in diameter in flower, 1–1.7 cm in diameter in fruit. Involucre bracts broadly ovate, 3–6 × 2–4 mm, straw-coloured in dorsal and at base, brown at apex, puberulent or pilose, margin sparsely ciliate, obtuse at apex; receptacular bracts ovate-oblong, 6–8 × 2–3 mm, straw-coloured in dorsal and at base, brown at apex, puberulent, ciliate margin, short acuminate at apex. Calyx cupuliform, 1 mm in diameter, densely irregular dentate. Corolla 7–12 mm long, yellow or cream, adpressed pilose outside. Involucre 9–10 mm long in fruit, 4-angled, densely white pilose, 4 long and 4 short teeth at apex; long teeth 3 mm long, short teeth 1.5 mm long. *Fl.* 6–8, *Fr.* 8–9.

Habitat: High mountain steppe and rocky places; 2210–2450 m. *Distribution:* Irano-Turanian element. Turkey (East Anatolia) and West Iran. *IUCN category:* [VU B2ab(i,ii,iv): area of occupancy less than 2000 km², known at no more than 10 locations].

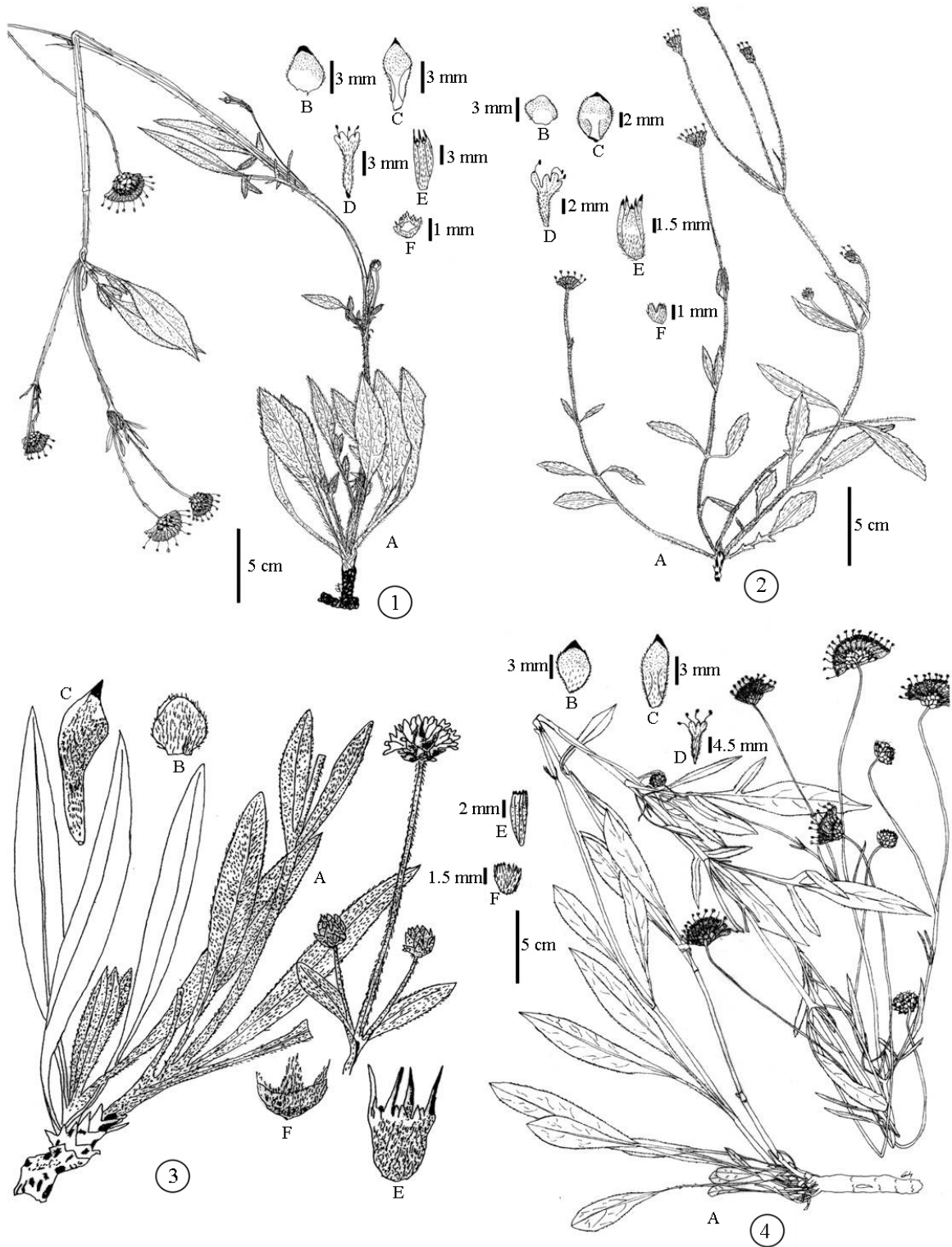


Figure 6. 1- *Cephalaria hirsuta*, 2- *C. peshmenii*, 3- *C. szaboi* (from Szabó, 1940), 4- *C. paphlagonica*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucel, F- calyx.

Specimens examined: Turkey. **B7** Erzincan: An der Grenze zwischen Erzincan und Tunceli, auf dem Pülümür Bergweide, 23.7.1973, F.Holtz 779 & P.Hänel, T.Kesercioğlu (EGE). **B8** Erzurum: Palandöken mountain, Kırkdeğirmen valley, rocky places, 2210 m, 3.08.1969, H.Demiriz, O.Özbay & S.Özyurt s.n. (ATA 642); 21 km from Erzurum to Çat, east of pass, Palandöken mountains, Çamurlu, high mountain steppe, 2350–2450 m, 15.8.2000, R.S.Göktürk 4517 & F.Göktürk (Akdeniz Univ. Herb.).

Cephalaria hirsuta is similar to *C. microcephala*, but differs from *C. microcephala* in its stem pilose, leaves adpressed pilose and pubescent, dentate at margin, involucrel and receptacular bracts brown at apex, involucrel 9–10 mm long in fruit and white pilose hairy.

17. *Cephalaria peshmenii* Sümbül, Edinburgh J. Bot. 48(1): 31 (1991) (Figure 6).

Type: Turkey. C3 Antalya: Çakırlar, Hisarçandır, Çalbalı mountain, east slopes, 1800 m, calcareous rocky slopes, *Cedrus libani* forest, 31.7.1980, H.Peşmen 4945 (holo. HUB).

Slender, ascending-erect, perennial herbs. Stem up to 50 cm tall, branched from at base, densely retrorse pilose in lower part, sparsely pilose in upper part. Leaves herbaceous; lower leaves lyrate, oblong-spathulate, oblanceolate in outline, densely pilose, 5.5–12 × 1–2 cm, with 2–4 segments, lateral segments triangular-lanceolate to lanceolate, 0.4–1 × 0.1–0.5 cm, spreading or subadpressed pilose, entire, inconspicuously acute at apex, terminal segment larger than lateral ones, spathulate, oblanceolate or oblong, 3.5–7 × 0.7–1.5 cm, spreading or subadpressed pilose, serrate at margin, acute to obtuse at apex; cauline leaves simple or lyrate, spreading or subadpressed pilose; simple leaves sessile, oblanceolate, 4–6 × 0.7–1.1 cm, entire or inconspicuously serrate margin, acute at apex; lyrate leaves oblong-lanceolate to spathulate in outline, 3.5–7 × 0.3–1.2 cm, 2–4 segments, lateral segments triangular, linear or linear-lanceolate, 5–10 × 1–3 mm, entire, acute or obtuse at apex, terminal segment larger than lateral ones, oblanceolate, spathulate, 3–4.5 × 0.3–1.2 cm serrate, acuminate to obtuse at apex; upper leaves simple, sessile, linear to narrowly lanceolate, 6–25 × 0.1–5 mm, entire, acuminate at apex. Capitula ovoid-cylindrical, 5–13-flowered, 0.6–1.1 cm in diameter in flower, 0.4–0.6 cm in diameter in fruit. Involucrel bracts ovate, 3–5 × 2–4 mm, straw-coloured, adpressed hairy in dorsal, ciliate margin, obtuse at apex; receptacular bracts ovate-oblong, 6–7 × 2.5–3 mm, straw-coloured in dorsal and at base, purplish at apex, sparsely adpressed hairy in dorsal, ciliate margin, short acuminate at apex. Calyx cupuliform, 1 mm in diameter, dentate. Corolla 6–9 mm long, pale blue, subadpressed pilose outside. Involucrel 5–6 mm long in fruit, densely adpressed pilose at base, 4 long and 4 short teeth at apex; long teeth 1 mm long, short teeth 0.5 mm long. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Calcareous rocky slopes, under *Cedrus libani* and *Pinus nigra* forest; 1100–1800 m. *Distribution:* Endemic to Turkey (South-West Anatolia). East Mediterranean element. *IUCN category:* [CR B1ab(i,ii,iv); C2a(ii): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location; all mature individuals placed in 1 population and estimated mature individuals fewer than 100].

Specimens examined: Turkey. **C3** Antalya: Çakırlar, Hisarçandır, Çalbalı mountain, east slopes, 1800 m, calcareous rocky slopes, under *Cedrus libani* forest, 31.7.1980, H.Peşmen 4945 (holo. HUB); Çakırlar, Hisarçandır, Çalbalı mountain, under *Pinus nigra* forest, 1100–1200 m, 30.8.1995, R.S.Göktürk 3538 & M.R.Tunç (Akdeniz Univ. Herb.); *ibid.*, 14.8.1997, R.S.Göktürk 4243 & O.Ünal (Akdeniz Univ. Herb.).

Cephalaria peshmenii is similar to *C. hirsuta*, but differs from *C. hirsuta* in its stem ascending-erect, lower and stem leaves serrate margin, capitula small, ovoid-cylindrical and up to 13-flowered and corolla pale blue.

18. *Cephalaria szaboii* Hayek, Ann. Nat. Hofmus. Wien. 28: 167 (1914) (Figure 6).

Type: [Turkey. B5/C5 Kayseri] Antitaurus: gebirge zwischen Farash [Yahyalı, Çamlıca] und Argeus [Erciyes], *Siehe* 1912: 331 (iso. E).

Slender, erect, perennial herbs. Stem up to 40 cm tall, densely sericeo-villose in lower part, densely pilose in upper part. Leaves simple, oblong-lanceolate, sericeo-villose, entire, acute at apex. Young leaves densely white lanate hairy; lower leaves 6–20 × 2–3.5 cm; cauline leaves subsessile, smaller than lower leaves; upper leaves sessile. Capitula subglobose, 2.5 cm in diameter in flower. Involucrel bracts broadly ovate, brown or violet, sericeo-villose, obtuse at apex; receptacular bracts 15 mm long, violet at apex, subpilose, attenuate-cuspidate. Calyx cupuliform. Corolla pale yellow. Involucrel 4 long and 4–8 minute teeth in flower, unknown in fruit. *Fl.* 6, *Fr.* unknown.

Habitat: Unknown; 2000 m. *Distribution:* Endemic to Turkey (mountain between Faraşa-Argaeus). Irano-Turanian element. *IUCN category:* DD.

Cephalaria szaboii is similar to *C. hirsuta*, but differs from *C. hirsuta* in its stem sericeo-villose and up to 40 cm, leaves simple and sericeo-villose, and receptacular bracts attenuate-cuspidate.

19. *Cephalaria paphlagonica* Bobrov, Bot. Zhurn. S.S.S.R. 17: 486 (1932) (Figures 3–6).

Type: [Turkey. A5 Amasia] In montis Ak-dagh regione alpina, 1600–1900 m, 13.7.1889, Bornmüller 1074 (holo. LE).

Slender, erect, rhizomatous perennial herbs. Stem up to 80 cm tall, branched from at base, glabrous. Leaves coriaceous, completely sparsely setose or glabrous, setose

at margin; simple leaves and segments entire or sparsely dentate, acute at apex; lower leaves simple, lanceolate to spatulate, 2–16 × 0.5–2 cm; cauline leaves pinnatisect, ovate-lanceolate in outline, 1.1–15 × 0.3–4 cm, with 2–8 segments, lateral segments linear or lanceolate, 0.6–3.5 × 0.1–0.6 cm, terminal segment larger than lateral ones, linear-lanceolate to lanceolate, 1.1–9 × 0.2–2 cm; upper leaves simple, sessile, linear, 0.6–2.5 × 0.1–0.2 cm. Capitula subglobose, 2–3 cm in diameter in flower, 1.5–2.5 cm in diameter in fruit. Involucral bracts ovate, 4–7 × 2–3 mm, straw-coloured or straw-coloured in dorsal and at base, purple-brown at apex, pubescent and sparsely pilose, ciliate margin, obtuse at apex; receptacular bracts ovate-oblong, 5–9 × 2–3 mm, completely straw-coloured or straw-coloured in dorsal and at base, purple-brown at apex, pubescent and sparsely pilose, ciliate margin, acute at apex. Calyx cupuliform, 1–2.5 mm in diameter, with irregular dentate. Corolla 8–15 mm long, pale yellow or cream, adpressed pilose outside. Involucel 5–7 mm long in fruit, 4-angled, pilose, involucel with 8 minute teeth at apex. *Fl.* 6–9, *Fr.* 8–10.

Habitat: Rocky slopes, stony steppe, *Pinus nigra* forest and *Quercus* forest; 930–1900 m. *Distribution:* Endemic to Turkey (West and Middle Black Sea and Central Anatolia). Irano-Turanian element. *IUCN category:* NT.

Specimens examined: Turkey. **A4** Zonguldak: Karabük, Keltepe, *Pinus nigra* forest, 930 m, 18.9.1996, *M.Vural* 7624 & *M.Ekici* (GAZI). Çankırı: Ilgaz, Başaraz village, slopes, 1150 m, 9.8.1996, *R.S.Göktürk* 3932 (Akdeniz Univ. Herb.); *ibid.*, 13.8.2007, *R.S.Göktürk* 6100 (Akdeniz Univ. Herb.); Ilgaz, between Kazancı-Yenice, rocky slopes, 1100–1200 m, 10.8.1996, *R.S.Göktürk* 3953 (Akdeniz Univ. Herb.). **A5** Kastamonu: Tosya, Sekiler village, Seki stream, rocky slopes, c. 1100 m, 28.9.1977, *M.Kılınc* 6857 (ANK, HUB). **B4** Ankara: Kazan, north of Orhaniye village, stony steppe, 1200–1250 m, 24.7.1993, *H.Duman* 5227 (GAZI, Akdeniz Univ. Herb.); *ibid.*, 27.7.1995, *R.S.Göktürk* 3447 (Akdeniz Univ. Herb.). **B5** Kayseri: Felahiye, Özvatan, Kemerli village, Ali Bey stream, slopes, 1200–1350 m, 26.7.1994, *Z.Aytaç* 6705, *M.Ekici* & *A.A.Dönmez* (GAZI, Akdeniz Univ. Herb.). **B6** Kayseri: Bünyan, Akkışla, above Ortaköy, Hınzır mountain, oak forest, 1700 m, 16.9.1981, *N.Çelik* 2072 (CUFH).

Cephalaria paphlagonica is similar to *C. coriacea* (Willd.) Steud. (grows in Caucasia and Crimea), but differs from *C. coriacea* in its lower leaves lanceolate to spatulate and entire or dentate margin, receptacular bracts ovate-oblong and acute at apex.

20. *Cephalaria anatolica* Shkhiyan, Zametki Sist. Geogr. Rast. 28: 26 (1970) (Figure 7).

Type: [Turkey. A8 Erzurum] In viciniis Erzurum, lacus Tortum-gel, 16.8.1910, *P.V.Nestorov s.n.* (holo. LE).

Slender, erect, perennial herbs. Stem up to 1 m tall, branched from at base, pubescent and densely retrorse

hairy in lower part, glabrous in middle and upper part. Leaves subcoriaceous, completely pubescent; simple leaves and segments sparsely setose, entire, acute at apex; lower leaves simple or pinnatisect; simple leaves narrowly lanceolate, 3–12 × 0.4–0.9 cm; pinnatisect leaves lanceolate in outline, 5–16 × 1.5–4 cm, with 10–12 segments, lateral segments lanceolate or oblong, 1–2.5 × 0.2–0.4 cm, terminal segment larger than lateral ones, lanceolate to ovate-lanceolate, 1.5–4 × 0.7–1.5 cm; cauline leaves pinnatisect, lanceolate in outline, 3–11 × 0.5–3 cm, with 8–10 segments, lateral segments linear-lanceolate or oblong, 0.7–2.2 × 0.1–0.5 cm, terminal segment larger than lateral ones, lanceolate, 2–5 × 0.3–1.1 cm; upper leaves simple, sessile, linear, 0.4–3 × 0.1–0.2 cm. Capitula ovoid, 1–1.5 cm in diameter in flower, 0.7–1.2 cm in diameter in fruit. Involucral bracts ovate, 4–6 × 3–4 mm, straw-coloured, sparsely pale reddish-brown, pubescent, ciliate margin, acute at apex; receptacular bracts ovate-oblong, 6–9 × 3–3.2 mm, straw-coloured in dorsal and at base, reddish-brown at apex, pubescent, ciliate margin, attenuate-acuminate at apex. Calyx cupuliform, 2–3 mm in diameter, with irregular dentate. Corolla 8–13 mm long, yellow, densely adpressed pilose outside. Involucel 4–6 mm long in fruit, 4-angled, pilose, involucel with 8 minute equal teeth at apex. *Fl.* 6–7, *Fr.* 7–8.

Habitat: Rocky slopes, stony places, and roadsides; 900–1100 m. *Distribution:* Endemic to Turkey (East Anatolia). Irano-Turanian element. *IUCN category:* [EN B2ab(i,ii,iv); area of occupancy less than 500 km²; known at no more than 5 locations].

Specimens examined: Turkey. **A8** Erzurum: Tortum, near Tortum lake, rocky slopes and roadsides, 950 m, 16.8.2000, *R.S.Göktürk* 4520 & *F.Göktürk* (Akdeniz Univ. Herb.); Tortum, near Tortum waterfall, 900 m, 16.8.2000, *R.S.Göktürk* 4521 & *F.Göktürk* (Akdeniz Univ. Herb.); Tortum, between Uzundere-Tortum, roadsides 950 m, 16.8.2000, *R.S.Göktürk* 4522 & *F.Göktürk* (Akdeniz Univ. Herb.).

Cephalaria anatolica is similar to *C. paphlagonica* and *C. coriacea* (endemic to Caucasia and Crimea), but differs from *C. paphlagonica* in pubescent and densely retrorse hairy in lower part, leaves subcoriaceous and completely pubescent, capitula ovoid and 1–1.5 cm in diameter in flower, involucral bracts acute at apex. It differs from *C. coriacea* in pubescent and densely retrorse hairy in lower part, leaves subcoriaceous, capitula ovoid, involucral bracts acute at apex, receptacular bracts ovate-oblong, corolla yellow.

21. *Cephalaria tuteliana* Kuş & Göktürk, Nordic J. Bot. 23(4): 427 (2005) (Figures 3–7).

Type: Turkey. A2(E) İstanbul: Kıraç, Bahçeşehir, north-west slopes, clearings in maquis shrub, 50–80 m, 10.9.1997, *S.Kuş s.n.* et al. (ISTF 37158) (holo. ISTF; iso. Akdeniz Univ. Herb., ISTE).

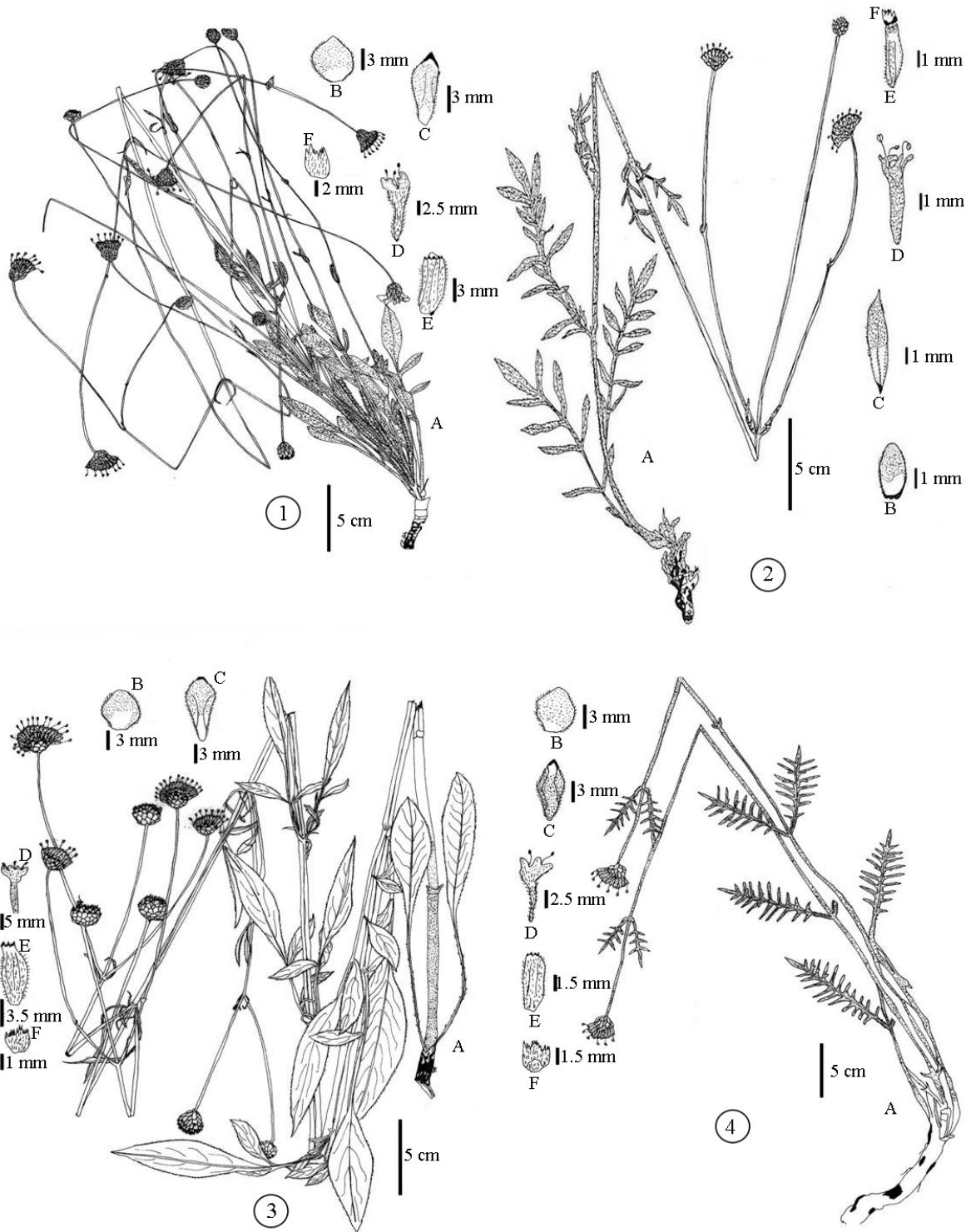


Figure 7. 1- *Cephalaria anatolica*, 2- *C. tuteliana*, 3- *C. isaurica*, 4- *C. media*. A- habit, B- involucre bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

Slender ascending-erect perennial herbs. Stem simple or branched from base, up to 110 cm tall, puberulent and/or retrorse hairy in lower part, puberulent in middle,

glabrous in upper part. Leaves herbaceous, puberulent on both surface, adpressed setose on upper surfaces and at the margins or glabrous, pinnatifid rarely bipinnatifid;

segments entire, acute at apex. Lower and cauline leaves oblong in outline, 5–15 × 2.5–6 cm, with 4–16 segments, lateral segments oblong or lanceolate, 0.7–3.5 × 0.2–0.6 cm, terminal segments as long as lateral segments, lanceolate to oblong, 1.5–3.5 × 0.2–0.9 cm; upper leaves oblong in outline, 0.7–4 × 0.1–1.2 cm, with 2–12 segments, lateral segments linear, 2–7 × 0.5–1 mm, terminal segment conspicuously larger than lateral ones, linear or linear-lanceolate, 0.4–2.3 × 0.1–0.3 cm. Capitula subglobose, 10–20 mm in diameter in flower, 15–20 mm in diameter in fruit, subradiant. Involucral bracts oblong or ovate-oblong, 3–6 × 2.5–3 mm, straw-coloured or purple-brown, pubescent, ciliate margin, obtuse at apex; receptacular bracts lanceolate or oblong-lanceolate, 8–10 × 2–3 mm, completely straw-coloured or purple-brown at apex, pubescent, with ciliate margin, acute or acuminate at apex. Calyx cupuliform, 1–2 mm wide. Corolla yellow, 8–11 mm long, adpressed pilose outside. Involucel 4-angled, 4–6 mm long in fruit, pilose, 8 minute subequal teeth at apex. *Fl.* 6–9, *Fr.* 10–11.

Habitat: Clearings in maquis shrub; 50–100 m.

Distribution: Endemic to Turkey (North-West Anatolia). East Mediterranean element. *IUCN category:* [CR B1ab(i,ii,iv): area of occupancy less than 100 km²; known as severely fragmented].

Specimens examined: Turkey. **A2(E)** İstanbul: Kıraç, Bahçeşehir, Ispartakule, north-west slopes, clearings in maquis shrub, 60–100 m, 22.11.1996, *E.Üzen s.n.* (ISTF 36874); *ibid.*, 28.7.1997, *S.Kuş & M.Yazgan s.n.* (ISTF 37101); *ibid.*, 22.7.2002, *R.S.Göktürk* 5020 (Akdeniz Univ. Herb.).

Cephalaria tuteliana is relatively close to *C. tenuiloba* Strid (endemic to Greece) but differs from it in its stem 30–110 cm (not 20–60 cm), puberulent and/or retrorse hairy in lower part (not sparsely covered setae in lower part), leaves puberulent on both surfaces, adpressed setose on upper surface and at the margins (not sparsely setose at the margins), involucral bracts oblong or ovate-oblong (not broadly ovate or elliptical-ovate), receptacular bracts lanceolate or oblong-lanceolate (not oblanceolate), corolla yellow (not cream), involucel 8 minute subequal teeth (not 4 short apical teeth alternating with 4 minute intermediate teeth), altitude 50–100 m (not 1500–1700 m), habitat clearings in maquis shrub (not rocky places).

22. *Cephalaria isaurica* V.A.Matthews, Notes Roy. Bot. Gard. Edinburgh 31: 326 (1972) (Figure 7).

= *Cephalaria monocephala* Sümbül, Karaca Arbor. Mag. 1: 10 (1991).

Type: Turkey. C4 Antalya: Alanya, Kargıçay between Durbanas-Derince dere, slopes, 2.8.1947, *P.H.Davis* 14468 (holo. E; iso. K).

Slender, erect, rhizomatous perennial herbs. Stem up to 1.3 m tall, shiny, small puberulent hairy in lower

part, glabrous upper part. Leaves coriaceous, glabrous or sparsely setose hairy; simple leaves and segments margin setose, entire, acute at apex; lower leaves simple, elliptic, 3–21 × 1–3.5 cm; cauline leaves pinnatisect, ovate-oblong to ovate-lanceolate in outline, 4–14 × 1.2–4 cm, with 2–4 segments, lateral segments oblong or linear-lanceolate, 0.6–3.5 × 0.1–1 cm, terminal segment larger than lateral ones, linear to lanceolate, 4–9 × 0.5–2 cm; upper leaves simple, sessile or short petiolate, lanceolate, linear-lanceolate or linear, 1–6 × 0.1–0.3 cm. Capitula globose, 1–3 cm in diameter in flower, 0.7–2 cm in diameter in fruit. Involucral bracts ovate, 3–8 × 2–5 mm, straw-coloured, purple-brown or lilac-brown, pubescent, ciliate margin, obtuse at apex; receptacular bracts oblong-ovate, 8–11 × 3–4 mm, straw-coloured in dorsal and at base, purple-brown or reddish-brown at apex, pubescent, ciliate margin, acute at apex. Calyx cupuliform, 1–2 mm in diameter, with irregular dentate. Corolla 12–18 mm long, yellow or cream, sparsely adpressed pilose outside. Involucel 5–8 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 0.1 mm, short teeth 0.05 mm. *Fl.* 6–9, *Fr.* 8–10.

Habitat: Slopes, rocky places, roadsides, stony places, under and in clearings in *Pinus nigra*; 25–1100 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* NT.

Specimens examined: Turkey. **C3** Antalya: between Antalya-Kemer, Göynük, canyon, 25 m, 16.7.2008, *R.S.Göktürk* 7654 (Akdeniz Univ. Herb.); Akseki, between Akseki-Konya, clearings in *Pinus nigra*, 1100 m, 19.9.1995, *R.S.Göktürk* 3551 & *M.R.Tunç* (Akdeniz Univ. Herb.); Akseki, Murtiçi, north of Gülen mountain, clearings in *Pinus brutia*, 890 m, 28.9.2002, *R.S.Göktürk* 5058, *O.Ünal & H.Sarıbaşak* (Akdeniz Univ. Herb.). **C4** Antalya: Gündoğmuş, between Gündoğmuş-Hanboğazı, roadsides, 1100 m, 30.7.1999, *R.S.Göktürk* 4393 & *O.Ünal* (Akdeniz Univ. Herb.); Alanya, around Derince stream, clearings in *Pinus nigra*, stony places, 800 m, 31.8.1993, *H.Duman* 5470 & *Z.Aytaç* (GAZI, Akdeniz Univ. Herb.); Alanya, between Türbelihisar-Köprülü, Yerköprü, under *Pinus nigra*, 1100 m, 1.9.1993, *H.Duman* 5480 & *Z.Aytaç* (GAZI, Akdeniz Univ. Herb.); *ibid.*, 2.8.1995, *R.S.Göktürk* 3492 & *M.R.Tunç* (Akdeniz Univ. Herb.); Karaman: Ermenek, Göktepe district, Daran village, Ayaşlı, Göksu riversides, 600 m, 15.9.1983, *H.Sümbül* 2476 (HUB); *ibid.*, 2.8.1995, *R.S.Göktürk* 3484 & *M.R.Tunç* (Akdeniz Univ. Herb.).

Cephalaria isaurica is similar to *C. uralensis*, but differs from it in its lower leaves simple, capitula globose, involucral bracts straw-coloured, purple-brown or lilac-brown, receptacular bracts oblong-ovate, acute at apex.

23. *Cephalaria media* Litv., Spisok Rast. Gerb. Russk. Fl. Bot. Muz. Imp. Akad. Nauk 6: 155 (1908) (Figure 7).

Type: [Georgia] In urb. Tiflis in ipso. Horto botonico, locis saxosis, 9.8.1903, *S.Michailowsky & A.Fomin s.n.* (holo. LE).

Slender, erect, perennial herbs. Stem up to 1 m tall, branched in lower part, glabrous, puberulent or sparsely adpressed hairy. Leaves subcoriaceous, completely puberulent, margin sparsely setose hairy; simple leaves and segments entire, acuminate at apex; lower leaves simple or pinnatisect; simple leaves linear-lanceolate or lanceolate, sparsely setose, 4–11 × 0.4–1.2 cm; pinnatisect leaves ovate or broadly lanceolate in outline, 4–15 × 1.5–4 cm, with 10–12 decurrent segments; segments linear-lanceolate, lateral segments 1–3 × 0.1–0.8 cm, terminal segment similar to lateral ones, same size, slightly larger than lateral ones, 2–5 × 0.5–1 cm; cauline leaves pinnatisect, ovate-lanceolate in outline, 4–14 × 1–3 cm, with 8–10 decurrent segments, lateral segments linear, 0.8–2.5 × 0.1–0.4 cm, terminal segment linear-lanceolate, 2–3.5 × 0.2–0.6 cm; upper leaves pinnatisect, similar to cauline leaves, small, ovate-lanceolate in outline, 2–4.5 × 0.6–1 cm, with 2–4 segments; segments entire, acuminate at apex, lateral segments linear, 0.5–1.2 × 0.5–0.2 cm, terminal segment linear-lanceolate, 1.5–2.5 × 0.2–0.3 cm. Capitula subglobose, 1–1.5 cm in diameter in flower, 0.8–1.3 cm in diameter in fruit. Involucral bracts ovate, 4–7 × 2–4 mm, straw-coloured, sparsely reddish-brown at apex, pubescent, ciliate margin, obtuse at apex; receptacular bracts ovate to oblong-lanceolate, 7–10 × 2.5–3 mm, straw-coloured, sparsely reddish-brown at apex, pubescent, ciliate margin, acute or subacuminate at apex. Calyx cupuliform, 1.5–2 mm in diameter, with irregular dentate. Corolla 7–11 mm long, pale yellow or cream, adpressed pilose outside. Involucel 5–8 mm long in fruit, 4-angled, hirsute, 8 unequal minute teeth at apex. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Rocky slopes and roadsides; 1500 m. *Distribution:* Irano-Turanian element. Turkey (North-East Anatolia), Transcaucasia, and Dagestan. *IUCN category:* [VU B2ab(i,ii,iv): area of occupancy less than 2000 km², known at no more than 10 locations].

Specimen examined: Turkey. **A8** Erzurum: Tortum, 6 km north of Tortum, rocky slopes, roadsides, 1500 m, 16.8.2000, *R.S.Göktürk* 4519 & *F.Göktürk* (Akdeniz Univ. Herb.).

Cephalaria media is similar to *C. velutina* Bobrov (grows in Caucasia, Dagestan, and Transcaucasia) but differs from *C. velutina* in its stem glabrous, puberulent or sparsely adpressed hairy in lower part, leaves distinguished from stem, involucral bracts pubescent, receptacular bracts acute or subacuminate at apex.

24. *Cephalaria aytachii* Göktürk & Sümbül, *Ann. Bot. Fenn.* 40(2): 123 (2003) (Figure 8).

Type: Turkey. **B3** Eskişehir: Sivrihisar, 8 km from Sivrihisar to Afyon, south of Aşağıkepen village, chalk hills, 900–950 m, 26.8.2001, *R.S.Göktürk* 4742 & *Z.Aytaç* (holo. Akdeniz Univ. Herb.; iso. ANK, HUB, GAZI).

Slender, erect perennial herbs. Stem 20–60 cm tall, simple or branched from base, densely puberulent and

retorse-pilose hairy in lower part, sparsely puberulent in middle and upper part. Leaves coriaceous, densely puberulent and sparsely setose on both surfaces, with a revolute margin, entire and acute or acuminate at apex. Lower leaves simple or pinnatisect; simple leaves oblanceolate, 2–5 × 0.7–1.5 cm; pinnatisect leaves ovate-lanceolate in outline, 3–10 × 1–3 cm, with 4–10 lanceolate or oblong-lanceolate segments, 0.3–2.2 × 0.1–0.3 cm, terminal segment larger than lateral ones, lanceolate or broadly lanceolate, 1.5–4.5 × 0.4–1.1 cm; cauline leaves pinnatisect, ovate-lanceolate in outline, 1–8 × 0.4–0.8 cm, with 2–8 oblong or linear-lanceolate segments, 0.3–1.5 × 0.1–0.3 cm, terminal segment larger than lateral ones, lanceolate or broadly lanceolate, 1–3 × 0.1–0.8 cm; upper leaves simple or pinnatisect; simple leaves sessile, linear to linear-lanceolate, 0.8–2.5 × 0.1–0.2 cm; pinnatisect leaves narrowly lanceolate in outline, 1.1–3.0 × 0.3–0.6 cm, with 2–4 segments in lower part, of linear-lanceolate segments 2–4 × 1 mm, terminal segment larger than lateral ones, linear to linear-lanceolate, 1–2 × 0.1–0.4 cm. Capitula subglobose, 16–20 mm in diameter in flower, 10–15 mm in diameter in fruit. All bracts with reddish-purple margins. Involucral bracts oblong, 4–6 × 2–3 mm, pubescent outside, ciliate margin, obtuse at apex; receptacular bracts lanceolate or oblong-lanceolate, 7–10 × 2 mm, pubescent outside, margin ciliate, acute or subacute at apex. Calyx cupuliform, 2–3 mm in diameter, with irregular teeth. Corolla 8–13 mm long, yellow or pale yellow, densely adpressed pilose outside. Involucel 5–8 mm long in fruit, narrowly ovate-oblong, 4-angled, brown, pilose, with 8 minute equal teeth at apex. *Fl.* 6–9, *Fr.* 8–9.

Habitat: Chalk hills; 900–950 m. *Distribution:* Endemic to Turkey (Central Anatolia). Irano-Turanian element. *IUCN category:* [CR B1ab(i,ii,iv): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location].

Specimens examined: Turkey. **B3** Eskişehir: Sivrihisar, near Aşağıkepen village, chalk hills, 900–950 m, 20.6.1993, *H.Duman* 5244 & *Aytaç* (GAZI); *ibid.*, 26.9.1994, *Z.Aytaç* 6756 (GAZI); *ibid.*, 13.8.1996, *R.S.Göktürk* 4010 (Akdeniz Univ. Herb.); *ibid.*, 14.8.2010, *R.S.Göktürk* 7483 (Akdeniz Univ. Herb.).

Cephalaria aytachii is similar to *C. uralensis* (Murray) Roem. & Schult., but differs from *C. uralensis* in its stem retorse-pilose hairy in lower part, sparsely puberulent in middle and upper parts, leaves' coriaceous margin revolute, densely puberulent and sparsely setose on both surfaces, simple leaves oblanceolate, acute, capitula 16–20 mm in diameter in flower, involucral bracts oblong, 4–6 × 2–3 mm and involucel 5–8 mm long in fruit pilose, with 8 minute equal teeth at apex.

25. *Cephalaria balansae* Raus, *Willdenowia* 35(1): 59 (2005) (Figure 8).

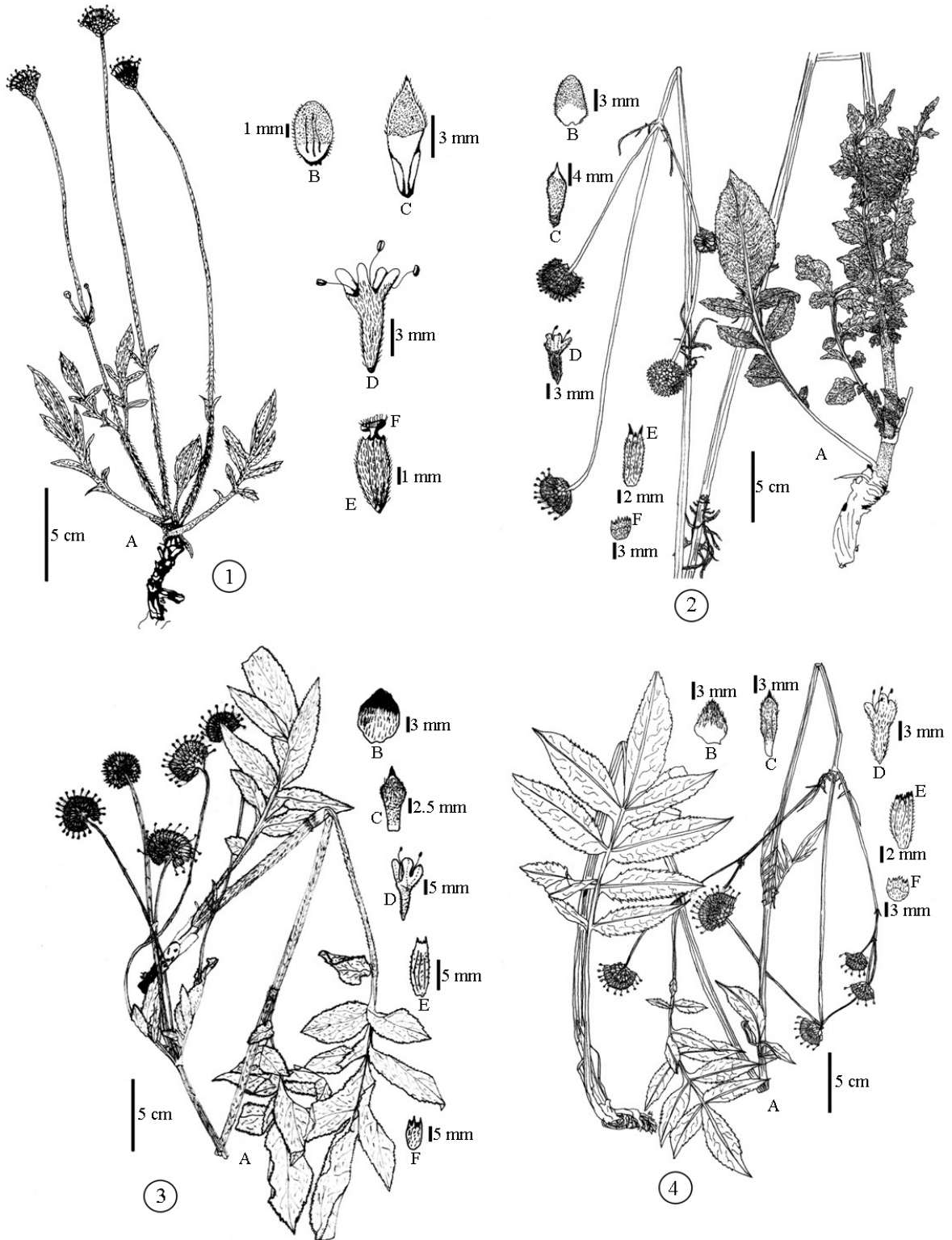


Figure 8. 1- *Cephalaria aytachii*, 2- *C. balansae*, 3- *C. gigantea*, 4- *C. procera*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucre, F- calyx.

≡ *Cephalaria dipsacoides* Boiss. & Balansa, Diagn. Pl. Orient., ser. 2(5): 107 (1856), non Kar. & Kir., Bull. Soc. Imp. Naturalistes Moscou 14: 434 (1841).

Type: [Turkey. C5 İçel] in regione montana Tauri cilicia circa Boghas, *Balansa* 787 (iso. E, K).

Stout, erect perennial herbs. Stem up to 3 m tall, striate, sometimes hollow, glabrous or puberulent and retrorse-pilose hairy in lower part. Leaves herbaceous, lyrate or pinnatisect, sparsely bipinnatisect, softly tomentose on both surfaces in young, glabrous in aged, oblong in outline; segments crenate or serrate, acute at apex; lower leaves 5–40 × 2–15 cm, with 2–12 decurrent segments, lateral segments ovate or elliptic, 0.4–9 × 0.2–3.5 cm, terminal segment larger than lateral ones, ovate to elliptic, 4–16 × 2–6 cm; cauline leaves similar to lower leaves, small, 5–25 × 3–8 cm, with 2–12 segments, lateral segments ovate to elliptic, 0.7–10 × 0.4–2.5 cm, terminal segment larger than lateral ones, ovate to elliptic, 3.5–10 × 1.2–2.5 cm; upper leaves sessile, 2–9 × 0.1–5 cm, lateral segments linear, 0.4–1.5 × 0.1–0.3 cm, terminal segment larger than lateral ones, linear-lanceolate or linear, 1.5–3 × 0.2–0.6 cm. Capitula squarrose, 2–3 cm in diameter in flower, 2–4 cm in diameter in fruit. Involucral bracts ovate to oblong-lanceolate, 4–9 × 3–5 mm, straw-coloured, sparsely pubescent outside, margin ciliate, subobtusate or acute at apex; receptacular bracts lanceolate, 7–15 × 3–3.5 mm, straw-coloured, pubescent and sparsely pilose outside, margin ciliate, acuminate at apex. Calyx cupuliform, 2–4 mm in diameter, with subirregular teeth. Corolla 8–13 mm long, pale yellow, sparsely white, densely adpressed pilose outside. Involucel 7–11 mm long in fruit, 4-angled, pilose, with 4 long and 4 short teeth at apex; long teeth 1–2 mm long, short teeth 0.5 mm long. *Fl.* 6–8, *Fr.* 7–9.

Habitat: Rocky places, calcareous slopes, roadsides, and clearings in *Pinus nigra*; 500–2000 m. *Distribution:* East Mediterranean element. Turkey (South Anatolia) and West Syria. *IUCN category:* LC.

Specimens examined: Turkey. **B5** Niğde: Melendiz mountain, Sultanpınar, Sırakayalar, 2000 m, 30.6.1982, *B.Eyce* 140 (KNYA). **C2** Antalya: 20–30 km from Elmalı to Finike, roadsides, rocky places, 1000–1250 m, 26.8.1996, *R.S.Göktürk* 4060 & *N.Adıgüzel* (Akdeniz Univ. Herb.); Elmalı, Cedar Research forest, Sarnıç alanı, rocky places, 1290 m, 28.9.2001, *İ.G.Deniz* 2043 (Akdeniz Univ. Herb.). **C3** Antalya: Kemer, Termessos, calcareous slopes, 6.7.1968, *Quezel* & *Pamukçuoğlu s.n.* (HUB); Antalya-Korkuteli, Termessos, Güllük mountain, roadsides, rocky places, 500–950 m, 6.7.1995, *R.S.Göktürk* 3390 (Akdeniz Univ. Herb.). **C4** Antalya: Alanya, between Çayarası-Gevne, clearings in *Pinus nigra*, 1200 m, 6.8.1996, *R.S.Göktürk* 3881 (Akdeniz Univ. Herb.); Alanya, between Türbelihisar-Taşatan, roadsides, 800 m, 12.8.1995, *R.S.Göktürk* 3489 & *M.R.Tunç* (Akdeniz Univ. Herb.). Konya: Seydişehir, 22 km

from Seydişehir to Akseki, roadsides, 1450 m, 1.8.2002, *R.S.Göktürk* 5041 & *M.Göktürk* (Akdeniz Univ. Herb.). Karaman: between Ermenek-Güneyyurt, roadsides, rocky places, 1300 m, 2.8.1995, *R.S.Göktürk* 3478 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ermenek, Göktepe district, between Göktepe-Gündel, roadsides, 1080 m, 2.8.1995, *R.S.Göktürk* 3480 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ermenek, Göktepe district, Dumlugöze village, Gavuralanı, roadsides, 1250 m, 2.8.1995, *R.S.Göktürk* 3486 & *M.R.Tunç* (Akdeniz Univ. Herb.). İçel: Anamur to Kazancı, Kızılalan, 1300 m, 19.7.1984, *H.Sümbül* 3234 (GAZI, HUB). **C5** Adana: Pozanti to Adana, under and clearings in *Pinus brutia*, 800 m, 28.7.2001, *R.S.Göktürk* 4682 & *M.Göktürk* (Akdeniz Univ. Herb.).

No close relatives.

26. *Cephalaria gigantea* (Ledeb.) Bobrov, Bot. Zhurn. S.S.S.R. 17: 490 (1932) (Figure 8).

≡ *S. gigantea* Ledeb., Ind. Sem. Horti Dorp. Suppl. 4 (1811); = *S. elata* Hornem., Hort. Bot. Hafn. 1: 126 (1813); = *Cephalaria elata* Schrad. ex Roem. & Schult., Syst. Veg. 3: 51 (1818); = *Cerionanthus tataricus* Schott ex Roem. & Schult., Syst. Veg. 3: 51 (1818).

Type: Described from cultivated specimens, in LE.

Stout, erect perennial herbs. Stem up to 3.5 m tall, striate, hollow, sparsely or densely long pilose in lower part, short pilose in upper part. Leaves herbaceous; lower leaves lyrate-pinnatisect, lanceolate, oblong-lanceolate in outline, 5–50 × 9–23 cm, with 4–11 decurrent segments, lateral segments oblong-lanceolate to ovate, 1.2–9.5 × 0.7–3.5 cm, pilose, serrate, acute at apex, terminal segment larger than lateral ones, broadly lanceolate, 12–18 × 4–7 cm, glabrous or pilose, serrate, crenate-serrate, acuminate at apex; cauline leaves lyrate-pinnatisect, similar to lower leaves, small, lanceolate to oblong-lanceolate, pilose, 11–20 × 7–18 cm, with 8–10 segments; segments serrate, acuminate at apex, lateral segments oblong-lanceolate to ovate, 0.8–10 × 0.2–1.7 cm, terminal segment larger than lateral ones, lanceolate or broadly lanceolate, 6.5–13 × 1.7–4.4 cm; upper leaves pinnatisect to pinnate, lanceolate in outline, 1.5–7.5 × 1–3 cm, with 4–8 segments; segments lanceolate, sparsely hairy, entire, serrate, acuminate at apex, lateral segments 1.2–2.5 × 0.2–0.4 cm, terminal segment larger than lateral ones, 2–6 × 0.4–1.2 cm. Capitula globose, 4–6 cm in diameter in flower, 1.5–2.5 cm in diameter in fruit, radiant. Involucral bracts triangular-ovate or oblong, 6–13 × 3–7 mm, completely blackish or black at apex, pilose, margin adpressed and spiny hairy, obtuse or gradually acuminate at apex; receptacular bracts lanceolate to narrowly ovate, 8–12 × 2–3 mm, straw-coloured in dorsal and at base, blackish at apex, pubescent and margin sparsely ciliate, gradually acuminate at apex. Calyx cupuliform, 5–6 mm in diameter, with irregular teeth. Corolla 20–25 mm long in outer, 7–8 mm long inner,

pale yellow or cream, adpressed pilose outside. Involucel 10 mm long in fruit, 4-angled, sparsely pilose, 8 unequal teeth; teeth 1–2 mm. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Stream banks, wet meadows, rocky slopes, under and in clearings in forest; 1200–3000 m. *Distribution:* Euxine (mt.) element. Turkey (Middle and East Black Sea and North-East Anatolia) and Caucasia. *IUCN category:* LC.

Specimens examined: Turkey. **A7** Trabzon: Maçka, Hamsiköy, between Hamsiköy-Zigana, wet meadows, 1350 m, 11.8.2000, *R.S.Göktürk* 4492 & *F.Göktürk* (Akdeniz Univ. Herb.). **A8** Trabzon: Uzungöl, above Demirkapı village, 2100 m, 29.8.1994, *N.Tanker*, *M.Koyuncu*, *M.Coşkun*, *G.Yıldız* & *S.Kurucu s.n.* (ISTE 19046). Rize: Çamlıhemşin, Çat village, mixed forest and meadows, 1200 m, 6.9.1978, *A.Güner* 1829 (ANK, HUB); Çamlıhemşin, between Yukarı Amlakit-Kışyatağı, *Rhododendron caucasicum* shrub, 2200–2350 m, 20.9.1979, *A.Güner* 2182 (ANK, HUB); İkizdere, Ballıköy (Yukarı Anzer), meadows, 1900–2000 m, 7.8.1983, *A.Güner* 5176 & *M.Bilgin* (HUB); *ibid.*, 12.8.2000, *R.S.Göktürk* 4495 & *F.Göktürk* (Akdeniz Univ. Herb.); Çamlıhemşin, between Çat-Elevit, clearings in mixed forest, 1300–1400 m, 14.8.2000, *R.S.Göktürk* 4504 & *F.Göktürk* (Akdeniz Univ. Herb.); İkizdere to İspir, Çamlık village, roadsides and clearings in forest, 1450 m, 15.8.2000, *R.S.Göktürk* 4505 & *F.Göktürk* (Akdeniz Univ. Herb.). **A9** Artvin: Ardanuç, Kutul forest, 15.7.1947, *A.Heilb.* & *M.Baş s.n.* (ISTE); Çoruh, Şavval hill, above Murgul (igneous), 2500 m, rocky slopes of gully, 12.8.1957, *P.H.Davis* 32286 & *Hedge* (ISTE). Kars: Göle, Balçesme biçenekleri, 2200 m, 16.8.1984, *N.Demirkuş* 2712 (HUB).

Cephalaria gigantea is similar to *C. procera* but differs from *C. procera* in its stem up to 3.5 m, pilose hairy, lower leaves lanceolate in outline, capitula 4–6 cm in diameter in flower, radiant, receptacular bracts lanceolate to narrowly ovate, gradually acuminate at apex, calyx 5–6 mm in diameter, corolla 20–25 mm long in outer, involucel 10 mm long in fruit.

27. *Cephalaria procera* Fisch. & Avé-Lall., Index Seminum (LE) 7: 46 (1841) (Figure 8).

Lectotype: Anatolia. Juldis Dagh, *Wiedemann s.n.* (LE).

Stout, erect perennial herbs. Stem up to 2 m tall, striate, hollow, glabrous or sparsely pilose. Leaves herbaceous; lower leaves lyrate-pinnatisect, oblong-lanceolate in outline, 20–45 × 12–20 cm, with 4–14 decurrent segments; segments elliptic, glabrous, sparsely pilose, serrate, acuminate at apex, lateral segments 4–11 × 1–3.5 cm, terminal segment 8–14 × 2.5–4 cm; cauline leaves lyrate-pinnatisect, similar to lower leaves, small, oblong-lanceolate, 13–30 × 5–14 cm, with 6–12 segments; segments narrowly elliptic to lanceolate, glabrous, sparsely pilose, serrate, acuminate at apex, lateral segments 1.2–9 × 0.4–2.5 cm, terminal segment larger than lateral ones,

4.5–10 × 0.8–3.5 cm; upper leaves pinnatisect to pinnate, sessile, lanceolate in outline, 3–5 × 0.7–2.5 cm, with 6–12 segments; segments glabrous, sparsely pilose, lateral segments linear, 4–17 × 0.3–0.7 mm, entire, acuminate at apex, terminal segment larger than lateral ones, linear-lanceolate, 8–30 × 2–3 mm, entire or inconspicuously serrate, acuminate at apex. Capitula globose, 2–4 cm in diameter in flower, 1.5–3 cm in diameter in fruit, subradiant. Involucral bracts triangular-ovate or oblong, 3–10 × 2–6 mm, blackish at apex, straw-coloured at base, blackish or straw-coloured in dorsal, pilose, entire, ciliate and long pilose margin, obtuse or narrowly acuminate at apex; receptacular bracts lanceolate, 8–13 × 2–5 mm, straw-coloured in dorsal and at base, blackish at apex, long pilose, entire, suddenly acuminate at apex. Calyx cupuliform, 3–4 mm in diameter, with irregular teeth. Corolla 13–15 mm long in outer, 7–8 mm long inner, yellow, sulphur yellow or cream, adpressed pilose outside. Involucel 8 mm long in fruit, 4-angled, pilose, 8 unequal teeth; teeth 1–2 mm. *Fl.* 6–9, *Fr.* 7–9.

Habitat: Rocky slopes, meadows, steppe and roadsides; 900–2600 m. *Distribution:* Irano-Turanian element. Turkey (Black Sea, Central Anatolia, East Anatolia, and north-east of Mediterranean Region), North Iran, Armenia, Transcaucasia, and Caucasia. *IUCN category:* LC.

Specimens examined: Turkey. **A4** Ankara: Çubuk, Karagöl, steppe, 900 m, 18.7.1973, *S.Erik* 217 (HUB); Kızılcahamam, Hodular mountain, mixed forest, 1600 m, 1.8.1991, *M.Vural* 5884 (GAZI); Bağlum village, garden margins, 1100 m, 12.8.1994, *A.A.Dönmez* 4169 (HUB). Çankırı: Eldivan, Eldivan mountain, around Taşpınar, *Pinus* and *Quercus* forest, 1250–1300 m, 22.7.1984, *Ş.Yıldırım s.n.* (HUB); Ilgaz, Ilgaz pass, under *Abies*, 1900 m, 9.8.1996, *R.S.Göktürk* 3952 (Akdeniz Univ. Herb.); Çerkeş, 5 km from Işıklar pass to Çerkeş, roadsides, 1200–1300 m, 12.8.1996, *R.S.Göktürk* 4004 (Akdeniz Univ. Herb.). **A5** Yozgat: Çekerek, Devinci mountain, c. 1600–1700 m, 14.7.1979, *R.İlarslan* 482 (ANK). Amasya: Direkli village, Hıdır pınarı, steppe, 1000 m, 1.7.1987, *S.Peker* 1457 (GAZI). **A7** Bayburt: west of Kopdağı pass, steppe, 2300 m, 15.7.1958, *Markgraf* & *H.Brand* 10978. (KNYA). Trabzon: Zigana, under *Pinus sylvestris*, c. 1600 m, 26.6.1973, *Y.Akman* 7078 (ANK); Maçka, Maçka-Torul, rocky slopes, 11.8.2000, *R.S.Göktürk* 4483 & *F.Göktürk* (Akdeniz Univ. Herb.). Gümüşhane: Kelkit, between Köse-Gümüşhane, rocky places, 1650 m, 10.8.2000, *R.S.Göktürk* 4479 & *F.Göktürk* (Akdeniz Univ. Herb.); Bayburt, Soğanlı mountain, c. 700 m, 4.8.1957, *P.H.Davis* 32120 & *Hedge* (ANK). **A8** Rize: Çamlıhemşin, between Hisarcık-Sıraköy village, steppe, 1500–1800 m, 30.7.1980, *A.Güner* 2791 (ANK). Erzurum: between Tortum-Dumlu, Yeşildere, Ziyaret hill, steppe, 2050 m, 30.07.1969, *O.Özbay s.n.* (ATA); Tortum, from Azort village to Azort plateau, 1000–

2500 m, 28.7.1984, *N.Demirkuş* 2196 (HUB); between Erzurum-İspir, Köprübaşı village, Gülyurt pass, 2400 m, 15.8.2000, *R.S.Göktürk* 4514 & *F.Göktürk* (Akdeniz Univ. Herb.). Artvin: Alaca mountain, slopes, Natenglav forest, Yangın-tepe, c. 1560 m, 24.8.1997, *A.Düzenli* 880 (ANK). **A9** Kars: Posof, between Asmakonak-Çamyazı village, fields, 2000–2100 m, 25.7.1985, *N.Demirkuş* 2842 (HUB). **B4** Ankara: Beypazarı, Kargalı plateau, open places, very local, c. 1300 m, 3.07.1971, *Hub.-Mor.* 749 (ANK). **B5** Adana: Saimbeyli, between Hanyeri-Gezbeli, slopes, 1750–1900 m, 15.7.2002, *R.S.Göktürk* 2002 (Akdeniz Univ. Herb.). Kayseri: Erciyes mountain, west slopes, Gökdağı, above Köker, 2135 m, *R.Çetik* 4360 (KNYA); between Develi-Tufanbeyli, Gezbeli pass, slopes, 1990 m, 3.8.2001, *R.S.Göktürk* 4734 & *M.Göktürk* (Akdeniz Univ. Herb.). **B6** Kayseri: between Pınarbaşı-Aşağbeyçayır, roadsides, 1550 m, 14.7.2002, *R.S.Göktürk* 4930 (Akdeniz Univ. Herb.). Kahramanmaraş: Göksun, Binboğa mountain, east of Doğan Konak village, stony places, 1700–1850 m, 19.7.1992, *Z.Aytaç* 5327 & *H.Duman* (GAZI). Sivas: Yıldızeli, Kırkpınar, Bayat village, rocky steppe, c. 1700 m, 18.7.1979, *T.Ekim* 4084 & *A.Düzenli* (ANK); Ulaş, Ovacık village, Tecer mountains, north slopes, Zaar kayası, 1800–2000 m, 8.8.1984, *B.Yıldız* 4760 & *N.Çelik* (CUFH); Zara, Şerefiye, north-east Çamlıkale village, steppe, 1300 m, 11.7.1984, *B.Yıldız* 4875 & *N.Çelik* (CUFH); Hafik, Celalli, Aktaş village, above Çağlayan, stony and rocky places, 1500–1700 m, 7.7.1984, *N.Çelik* 2734 & *B.Yıldız* (CUFH); Demiryazı village, Yedigöz, mixed shrub, 1350 m, 17.7.1985, *B.Yıldız* 6390 (CUFH); Sivas, near cement factory, 1225 m, 15.7.1996, *R.S.Göktürk* 3859 (Akdeniz Univ. Herb.); between Sivas-Kayseri, Taşlıdere, rocky places, 1300 m, 15.7.1996, *R.S.Göktürk* 3863 & *E.Dönmez* (Akdeniz Univ. Herb.). Malatya: Arguvan, Çobandere village, Kavunluk, 1300 m, 22.7.1996, *B.Çıplak s.n.* (Akdeniz Univ. Herb.). **B7** Sivas: Sivas, 13 km from Zara to İmranlı, roadsides, 1600 m, 10.8.2000, *R.S.Göktürk* 4472 & *F.Göktürk* (Akdeniz Univ. Herb.). Erzincan: Yayla başı village, Kazankaya mountain, 1500–2300 m, 7.8.1980, *Ş.Yıldırım* 3862 (HUB); Refahiye to Sivas, Gemecik, rocky places, 1900 m, 10.8.2000, *R.S.Göktürk* 4478 & *F.Göktürk* (Akdeniz Univ. Herb.). Malatya: Doğanşehir, Eskiköy, Kurnoz, alpine steppe, 1800–2000 m, 25.7.1971, *H.Peşmen* 2691 & *M.Şahin* (HUB). Tunceli: Pülümür, damp bushy slope, c. 1900 m, 11.7.1957, *P.H.Davis* 30995 & *Hedge* (ANK). **B8** Erzincan: between Tercan-Aşkale, near tunnel, slopes, 1760 m, 17.8.2000, *R.S.Göktürk* 4526 & *F.Göktürk* (Akdeniz Univ. Herb.). Erzurum: 25–30 km from Erzurum to Çat, roadsides, 2100 m, 15.8.2000 m, *R.S.Göktürk* 4526 & *F.Göktürk* (Akdeniz Univ. Herb.). Muş: Varto, 12 km from Varto to Erzurum, Seferek pass, slopes, 1800–1950 m, 2.7.2001 m, *R.S.Göktürk* 4729 & *M.Göktürk* (Akdeniz Univ. Herb.). **B9** Bitlis: Tatvan, Karz mountain, above

Sapur village, mixed forest and alpine steppe, 1800–2600 m, 20.8.1972, *H.Peşmen*, 3283 (HUB). Van: Muradiye, around waterfall, 1900 m, 13.7.1986, *Ö.Seçmen* 3871 (EGE); between Tatvan-Van, roadsides, 1800 m, 31.7.2001, *R.S.Göktürk* 4707 & *M.Göktürk* (Akdeniz Univ. Herb.); Özalp, Yavuzlar village, Nabbasan, steppe, 26.6.1997, 2297 m, *F.Özçökçe* 8487 (VANF). **C5** Mersin: Tarsus, Arslanköy, Dümbelek pass, 1700–2300 m, 13.8.1988, *Y.Gemici* 4059 (EGE); Arslanköy, west of Arslanköy, fields, 1450, 25.9.2000, *R.S.Göktürk* 4544 & *M.Göktürk* (Akdeniz Univ. Herb.). **C6** Kahramanmaraş: Ahır mountain, Yedikuyular, near Bağlama, 1800–2000 m, steppe, 19.7.1992, *Z.Aytaç* 5327 & *H.Duman* (GAZI).

Cephalaria procera is similar to *C. gigantea* but differs from *C. gigantea* in its stem up to 2 m, glabrous or sparsely pilose, lower leaves oblong-lanceolate in outline, capitula 2–4 cm in diameter in flower, subradiant, receptacular bracts lanceolate, suddenly acuminate at apex, calyx 3–4 mm in diameter, corolla 13–15 mm long in outer, involucrel 8 mm long in fruit.

28. *Cephalaria tchihatchewii* Boiss., *Asie Min. Bot.* 2: 220 (1860) (Figure 9).

Type: [Turkey. B8 Erzurum] Armenia: inter origines fl. Araxis et radicem borealem jugi Bingoeldagh (mons Mille Lacuum) c. 2000 m, *Tchihatcheff s.n.*

Stout, erect perennial herbs. Stem up to 1.3 m tall, striate, sparsely retrorse setose-hispid in lower part, glabrous in upper part. Leaves herbaceous; lower leaves lyrate-pinnatisect, lanceolate to oblong-lanceolate in outline, 14–30 × 5–10 cm, with 9–13 decurrent segments; segments entire or irregular dentate, acute at apex, lateral segments lanceolate or oblong-lanceolate, 2–5 × 0.5–2.2 cm, completely dense long hispid, terminal segment larger than lateral ones, lanceolate or ovate-lanceolate 5.5–14 × 2–4.5 cm, completely sparse short hispid; cauline leaves pinnatisect, lanceolate to ovate-lanceolate, 5.5–15 × 2.3–8 cm, with 8–13 segments; segments lanceolate to linear-lanceolate, sparsely hairy above, densely hispid at margin, glabrous underside, lateral segments 1.3–5 × 0.2–1.8 cm, entire or dentate, acute or acuminate at apex, terminal segment larger than lateral ones, 0.7–6 × 0.2–2 cm, dentate, acute at apex; upper leaves simple, sessile, linear to linear-lanceolate, 4–10 × 1–3 mm, sparsely hairy, entire. Capitula globose, 2–3 cm in diameter in flower, 1–2 cm in diameter in fruit, radiant. Involucral bracts ovate or ovate-oblong, 4–9 × 2.5–6 mm, completely blackish or blackish in dorsal and at apex, puberulent in dorsal, long and short hairy at margin, obtuse at apex; receptacular bracts oblong, 8–12 × 2–3.5 mm, straw-coloured in dorsal and at base, blackish at apex, puberulent in dorsal, ciliate margin, short acuminate at apex. Calyx cupuliform, 3 mm in diameter, with numerous dichotomous irregular teeth. Corolla 9–18 mm long, yellow or sulphur yellow, adpressed pilose

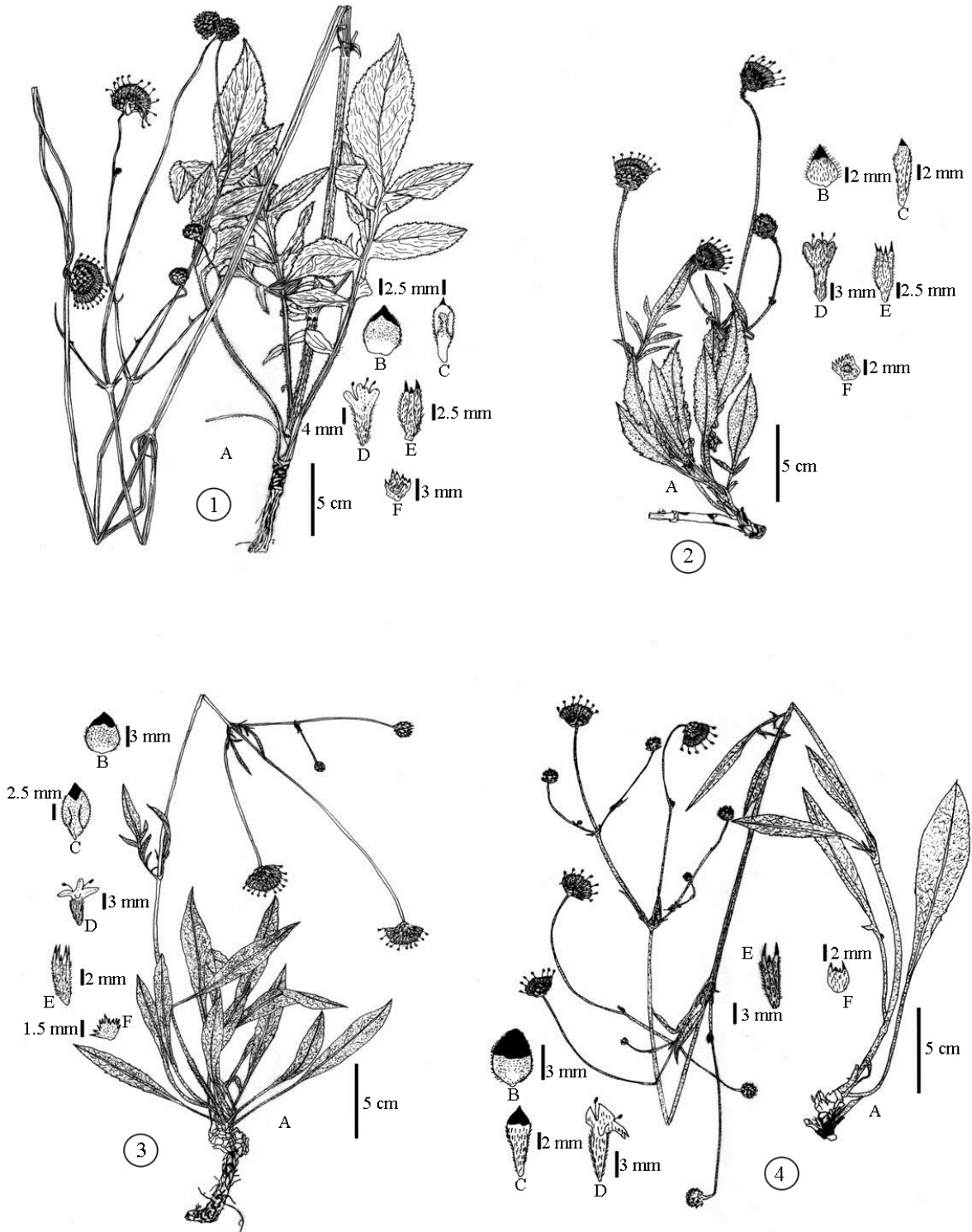


Figure 9. 1- *Cephalaria tchihatchewii*, 2- *C. kotschyi*, 3- *C. sparsipilosa*, 4- *C. microcephala*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucel, F- calyx.

outside. Involucel 8–12 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 2.5 mm long, short teeth 1 mm long. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Rocky slopes and stony river banks; 1500–2000 m. *Distribution:* Irano-Turanian element. Turkey (Central and East Anatolia), North-West Iran, Armenia,

and Caucasia. *IUCN category*: [VU B2ab(i,ii,iv): area of occupancy less than 20000 km², known at no more than 10 locations].

Specimens examined: Turkey. **B6** Kayseri: Akkışla, above Ganişeyh village, Hınzır mountain, stony stream, 1750 m, 15.8.1979, *N.Çelik* 747 (CUFH); *ibid.*, 20.8.1979, *N.Çelik* 774 (AEF, HUB); *ibid.*, 23.7.1980, *N.Çelik* 1523 (ANK); *ibid.*, 8.8.1995, *R.S.Göktürk* 3499 & *M.R.Tunç* (Akdeniz Univ. Herb.). **B8** Muş: Varto, 12 km from Varto to Erzurum, Seferek pass, opening slopes, 1800–2000 m, 2.8.2001, *R.S.Göktürk* 4731 & *M.Göktürk* (Akdeniz Univ. Herb.).

Cephalaria tchihatchewii is similar to *C. gigantea* but differs from *C. gigantea* in its stem up to 1.3 m, upper leaves simple, capitula 2–3 cm in diameter in flower, involucre bracts ovate or ovate-oblong, receptacular bracts oblong, involucre 4 long and 4 short teeth at apex. The threat category of this species was determined as DD by Ekim et al. (2000), but as it was found to grow only on the Bingöl mountains and in Akkışla (Kayseri) in Turkey, the status should be changed to VU.

29. *Cephalaria kotschy* Boiss. & Hohen., *Diagn. Pl. Orient. ser. (1)10*: 76 (1849) (Figure 9).

= *Cephalaria grossheimii* Bobrov, *Bot. Zhurn. S.S.S.R. 17*: 499 (1932).

Type: [N. Iran] in declivibus septentrionalibus facis Dudera montis Elbrus, *Kotschy* 422a (iso. W).

Slender, erect perennial herbs. Stem up to 80 cm tall, striate, simple or branched, densely pubescent hairy. Leaves herbaceous, lyrate or pinnatisect, densely pubescent hairy; segments serrate or dentate, acute at apex; lower leaves ovate-lanceolate in outline, 15–19 × 2.1–3.2 cm, with 4–6 segments, lateral segments narrowly lanceolate, 2–3.1 × 1.1–1.8 cm, terminal segment larger than lateral ones, lanceolate, 7–16 × 2–3.1 cm; cauline leaves similar to lower leaves, ovate-lanceolate in outline, 8–10 × 2–3.3 cm, with 6–8 segments, lateral segments narrowly lanceolate, 1.2–1.8 × 0.6–0.8 cm, terminal segment larger than lateral ones, lanceolate, 4.5–6.5 × 1.2–1.9 cm; upper leaves sessile, lanceolate to linear-lanceolate in outline, 3–4 × 0.8–1 cm, with 2–6 segments, lateral segments linear, 0.4–0.7 × 0.1–0.2 cm, terminal segment larger than lateral ones, linear-lanceolate, 3–3.5 × 0.4–0.5 cm. Capitula globose, 2–3 cm in diameter in flower, 1.5–2.5 cm in diameter in fruit. Involucre bracts triangular-ovate, 5–7 × 3–4 mm, blackish, densely sericeous or lanate, ciliate margin, subacuminate at apex; receptacular bracts lanceolate or oblong-ovate, 8–11 × 2–3 mm, straw-coloured in dorsal and at base, blackish at apex, sparsely sericeous, ciliate margin, acuminate at apex. Calyx cupuliform, 2–3 mm in diameter, with subregular teeth. Corolla 8–14 mm long, yellow or sulphur yellow, densely adpressed pilose outside. Involucre 10–11 mm long in fruit, 4-angled, pilose, 8 unequal teeth at apex. *Fl.* 6–8, *Fr.* 7–8.

Habitat: Steppe and slopes; 2000–3000 m. *Distribution*: Irano-Turanian element. Turkey (East Anatolia), North Iran, and Caucasia. *IUCN category*: [VU B2ab(i,ii,iv): area of occupancy less than 20000 km², known at no more than 10 locations].

Specimens examined: Turkey. **B9** Van: Başkale, between Hoşap-Başkale, Güzeldere pass, slopes, 2700 m, 23.7.2000, *M.Armağan* 1506 (Akdeniz Univ. Herb., VANF); Van, Bakraçlı village, Yedikilise, slopes at old cemetery, steppe, 2200 m, 1.8.2001, *R.S.Göktürk* 4716, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.); Bakraçlı village, Yedikilise, Warek mountain, 2000 m, 10.8.2001, *M.Armağan s.n.* (Akdeniz Univ. Herb.).

According to the *Flora of Iran*, *Cephalaria kotschy* is a synonym of *C. procera*, but these species were compared with numerous samples. As a result of the these evaluations, the species are different from each other. *C. kotschy* is similar to *C. procera* but differs from *C. procera* in its stem slender, up to 80 cm long, densely pubescent hairy, lateral segment of lower and cauline leaves narrowly lanceolate, upper leaves with 2–6 segments, involucre bracts densely sericeous or lanate, subacuminate at apex, involucre 10–11 mm long in fruit, 8 unequal teeth at apex. The threat category of this species was determined as DD by Ekim et al. (2000), but this should be changed to VU. When the geographical distribution of this species, of which the phytogeographical region remains unknown, is studied, it should be an Irano-Turanian element.

30. *Cephalaria sparsipilosa* V.A.Matthews, *Fl. Turkey 4*: 596 (1972) (Figure 9).

= *Cephalaria pilosa* Boiss. & A.Huet, *Diagn. Pl. Orient. ser. 2(2)*: 122 (1856) non Gren. & Gordon (1850).

Lectotype (here designated): [Turkey. B8 Erzurum] in incultis circa urbem Erzeroum, 1800–1900 m, 7.1853, *Huet du Pavillon s.n.* (K with barcode K000779007; isolectotype: K with barcode K000779008 seen as photo).

Stout, erect perennial herbs. Stem up to 80 cm tall, sparsely retrorse pilose and small puberulent in lower part, glabrous in upper part. Leaves coriaceous, pilose and puberulent; lower leaves simple or pinnatisect, simple leaves lanceolate, 6–20 × 1–4.5 cm, entire or serrate, acute at apex; pinnatisect leaves lanceolate to ovate-lanceolate in outline, 7–17 × 1.2–3.5 cm, with 2–6 segments, lateral segments linear-lanceolate, 1.3–2.7 × 0.2–0.4 cm, entire, acute at apex, terminal segment larger than lateral ones, linear-lanceolate or lanceolate, 5–10 × 1.5–2.9 cm, entire or serrate, acute at apex; cauline leaves pinnatisect, ovate-lanceolate in outline, 4–10 × 1.5–3 cm, with 4–8 segments, lateral segments linear-lanceolate or linear, 0.7–2 × 0.1–0.7 cm, entire, acute at apex, terminal segment larger than lateral ones, lanceolate, 2.5–6 × 0.5–1.5 cm, entire or serrate, acute at apex; upper leaves pinnatisect, ovate-lanceolate in outline, 2–5 × 0.2–0.4 cm, with 2–6 segments; segments

entire, acuminate at apex, lateral segments linear, 0.2–1 × 0.1 cm, terminal segment larger than lateral ones, linear-lanceolate or linear, 1.5–4 × 0.1–0.2 cm. Capitula globose, 1.5–2 cm in diameter in flower, 1–1.5 cm in diameter in fruit, subradiant. Involucral bracts ovate, 5–6 × 3–4 mm, straw-coloured in dorsal and at base, blackish at apex or completely blackish, puberulent, sparsely pilose, ciliate margin, obtuse at apex; receptacular bracts ovate-oblong to narrowly obovate, 8–10 × 2–3 mm, straw-coloured in dorsal and at base, blackish at apex or completely blackish, puberulent, sparsely pilose, ciliate margin, acute at apex. Calyx cupuliform, 2–3 mm in diameter, with irregular teeth. Corolla 8–11 mm long, pale yellow or cream, adpressed pilose outside. Involucel 6–8 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 2–3 mm long, short teeth 0.5–1 mm long. *Fl.* 6–9, *Fr.* 8–9.

Habitat: Meadows, slopes, high mountain steppe, and mixed forest; 1800–3050 m. *Distribution:* Irano-Turanian element. Turkey (East Anatolia), North-West Iran, Armenia, and Caucasia. *IUCN category:* NT.

Specimens examined: Turkey. **A8** Erzurum: between Erzurum-İspir, south of Aynalıkale village, Ziyaret mountain, 2450–2650 m, 11.8.1976, *A.Tatlı* 5355 (HUB, KNYA). **A9** Ağrı: Patnos, south of Ergeçli village, c. 2400–2500 m, 16.7.1987, *L.Behçet* (EGE); Posof, between Posof-Ardahan, 10 km south of Posof, roadsides, 1800 m, 9.7.1975, *R.Çetik* 5819 (KNYA). **B8** Erzurum: Palandöken mountains, 23.7.1964, *S.Güven s.n.* (ISTE). Muş: Varto, 12 km from Varto to Erzurum, Seferek pass, opening slopes, 1800–1950 m, 2.8.2001, *R.S.Göktürk* 4728 & *M.Göktürk* (Akdeniz Univ. Herb.). **B9** Bitlis: Tatvan, Kirkor mountain, mixed forest, volcanic places, 1900–2700 m, 18.7.1972, *H.Peşmen* 3078 (HUB). Van: Edremit, Van lake, *C.Koss* 1947 (ISTE); Hoşap, 30.07.1954, *P.H.Davis* 23298 & *Polunin* (ANK); Ereğ mountain, volcanic mountain slopes, c. 2286 m, 18.7.1954 *P.H.Davis* 22943 & *Polunin* (ANK); Van, Bakraçlı village, Yedikilise, slopes of old cemetery, 2200 m, 10.8.2001, *R.S.Göktürk* 4721, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.). **B10** Van: Özalp, north of Gündüzlü village, steppe, 2243 m, 5.7.1998, *F.Özgökçe* 7735 (VANF, Akdeniz Univ. Herb.). Kars: Iğdır, Ağrı mountain, Suveren village, above Korhan, 2000 m, 28.9.1984, *M.Koyuncu* 8335, *T.Ekim*, *B.Yıldız* & *M.Vural* (ISTE).

Cephalaria sparsipilosa is similar to *C. microcephala* but differs from *C. microcephala* in its stem glabrous in upper part, leaves pilose and puberulent, terminal segment of cauline leaves acute at apex.

31. *Cephalaria microcephala* Boiss., *Diagn. Pl. Orient.* ser. 2(2): 123 (1856). (Figure 9).

= *Cephalaria microcephala* var. *subindivisa* Boiss., *Fl. Orient.* 3: 125 (1875); = *C. axillaris* Hausskn. ex Bornm., *Beih. Bot. Centralbl.* 19(2): 269 (1906); = *C. microcephala* var. *sublanata* Bornm., *Beih. Bot. Centralbl.* 19(2): 269

(1906); = *C. microcephala* Boiss. var. *integerrima* Bornm., *Beih. Bot. Centralbl.* 28B: 244 (1911); = *C. sublanata* (Bornm.) Szabó, *Magyar Bot. Lapok* 24: 13 (1926); = *C. armoraciifolia* Bobrov, *Bot. Zhurn. S.S.S.R.* 17: 504 (1932); = *C. subindivisa* (Boiss.) Szabó, *Mat. Term. Közlem.* 28: 238 (1940).

Type: [N. Iran] in fauce Dudera montis Elbrus Persiae borealis, 1.7.1843, *Kotschy* 422 (holo. G-BOIS; iso G, W).

Stout, erect perennial herbs. Stem up to 1 m tall, completely puberulent. Leaves coriaceous, puberulent or glabrous; lower leaves simple or pinnatisect, simple leaves lanceolate, 6–22 × 1–5 cm, entire or serrate, acute at apex; pinnatisect leaves lanceolate to ovate-lanceolate in outline, 6–18 × 1.3–4 cm, with 2–6 segments, lateral segments linear-lanceolate, 1.4–3 × 0.2–0.4 cm, entire, acute at apex, terminal segment larger than lateral ones, lanceolate or linear-lanceolate, 5–11 × 1.3–3 cm, entire or serrate, acute at apex; cauline leaves pinnatisect, ovate-lanceolate in outline, 4–13 × 1.5–4 cm, with 4–8 segments, lateral segments linear-lanceolate or linear, 0.7–2.3 × 0.1–0.9 cm, entire, acute at apex, terminal segment larger than lateral ones, lanceolate, 2–9 × 0.5–1.7 cm, entire or serrate, acute or acuminate at apex; upper leaves pinnatisect, ovate-lanceolate in outline, 2–5.5 × 0.8–2.5 cm, with 2–6 segments; segments entire, acuminate at apex, lateral segments linear, 0.2–1.5 × 0.1 cm, terminal segment larger than lateral ones, linear-lanceolate or linear, 1.5–4.5 × 0.1–0.2 cm. Capitula globose or ovoid, 1.5–2.5 cm in diameter in flower, 1.5–1.9 cm in diameter in fruit, subradiant. Involucral bracts ovate, 4–6 × 2–4 mm, completely blackish or straw-coloured, sparsely straw-coloured at base, blackish in dorsal and at apex, puberulent, sparsely pilose, ciliate margin, obtuse at apex; receptacular bracts ovate-oblong to narrowly obovate, 6–8 × 2–3 mm, straw-coloured in dorsal and at base, blackish at apex or completely blackish, puberulent, pilose or sericeous, ciliate margin, acute at apex. Calyx cupuliform, 1.5–2.5 mm in diameter, with irregular teeth. Corolla 8–12 mm long, pale yellow or cream, adpressed pilose outside. Involucel 6–8 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 2–3 mm long, short teeth 0.5–1 mm long. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Steppe, calcareous rocky slopes, meadows, and slopes; 1750–3660 m. *Distribution:* Irano-Turanian element. Turkey (East and South-East Anatolia), North and West Iran, and Iraq. *IUCN category:* NT.

Specimens examined: Turkey. **A9** Kars: Arpaçay, between Tomarlı-Kırıkkale, Bala stream, steppe, c. 1750 m, 14.7.1984, *H.Ocakverdi* 2184 (GAZI). **B9** Bitlis: Tatvan, Pelli mountain, south slopes, alpine steppe, calcareous rocks, 2500–2800 m, 19.8.1972, *H.Peşmen* 3221 (HUB). Van: Başkale, İspiriz mountain, c. 2900 m, 31.7.1954, *P.H.Davis* 23648 & *Polunin* (ANK); between Van-Gürpınar, 2 km to

Kurubaş pass, slopes, 2100 m, 1.8.2001, *R.S.Göktürk* 4712, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.); Başkale, between Güzelsu (Hoşap)-Başkale, Güzeldere pass, slopes, 2700 m, 1.8.2001, *R.S.Göktürk* 4713, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.); Van, Bakraçlı village, Yedikilise, slopes of old cemetery, 2200 m, 10.8.2001, *R.S.Göktürk* 4721-A, *M.Göktürk* & *M.Armağan* (Akdeniz Univ. Herb.); Özalp, Eğribelen village, Göçertepe, steppe, 2199 m, 11.7.1996, *F.Özgökçe* 2622 (VANF). **C10** Hakkari: between Hakkari-Van, 16 km from Hakkari, Zap stream, 19.7.1956, *Hub.-Mor.* 428 (AEF, ANK); between Hakkari-Van, 113 km from Hakkari, dry mountain steppe, 2400 m, 19.7.1956, *Hub.-Mor.* 428 (AEF); Hakkari: Cilo mountain, 10 km west of Cilo hill, 3600 m, *P.H.Davis* 24217 (ANK).

Cephalaria microcephala is similar to *C. sparsipilosa* but differs from *C. sparsipilosa* in its stem completely puberulent, leaves puberulent or glabrous, terminal segment of cauline leaves acute or acuminate at apex.

32. *Cephalaria hakkiarica* V.A.Matthews, Notes Roy. Bot. Gard. Edinburgh 31: 326 (1972).

Type: Turkey. C9 Hakkari: Cilo mountain, above Diz stream, 2440 m, 7.8.1954, *P.H.Davis* 23941 & *Polunin* (holo. E; iso. K, ANK).

Stout, erect perennial herbs. Stem up to 80 cm tall, striate, completely puberulent. Leaves coriaceous, densely puberulent in lower part, sparsely puberulent in upper part; lower leaves simple, lanceolate, entire or serrate, acute at apex; cauline leaves pinnatisect, ovate-lanceolate in outline, 7–20 × 2–4 cm, with 2–6 segments, lateral segments linear-lanceolate or linear, 5–10 × 1–1.5 mm, entire, acute at apex, terminal segment larger than lateral ones, broadly lanceolate, 5–13 × 2–4 cm, serrate, acute at apex; upper leaves pinnatisect, lanceolate in outline, 1.2–2.5 × 0.1–0.3 cm, with 2–4 segments; segments linear, entire, acuminate at apex, lateral segments 2–3 × 0.7–0.9 mm, terminal segment larger than lateral ones, 0.7–2 × 0.1 cm. Capitula globose, 1–2 cm in diameter in flower, 1.5–2.3 cm in diameter in fruit, subradiant. Involucral bracts broadly ovate, 4–6 × 3–5 mm, completely blackish or straw-coloured in dorsal and at base, blackish at apex, puberulent, sparsely glabrous, ciliate margin, obtuse at apex; receptacular bracts broadly obovate to broadly spatulate, 7–10 × 3–4 mm, straw-coloured in dorsal and at base, blackish at apex, puberulent, sparsely glabrous, ciliate margin, acute at apex. Calyx cupuliform, 2–3 mm in diameter, with irregular teeth. Corolla 7–12 mm long, cream, adpressed pilose outside. Involucel 5–8 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 2–3 mm long, short teeth 0.5–1 mm long. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Steppe and slopes; 2440 m. *Distribution:* Endemic to Turkey (South-East Anatolia-Hakkari). Irano-Turanian element. *IUCN category:* [CR B1ab(i,ii,iv): extant

of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location].

Specimens examined: Turkey. **C9** Hakkari: Cilo mountain, above Diz stream, 2440 m, 7.8.1954, *P.H.Davis* 23941 & *Polunin* (ANK).

Cephalaria hakkiarica is similar to *C. microcephala* but differs from *C. microcephala* in its involucral bracts broadly ovate, receptacular bracts broadly obovate to broadly spatulate, corolla cream.

33. *Cephalaria lycica* V.A.Matthews, Notes Roy. Bot. Gard. Edinburgh 31: 327 (1972) (Figure 10).

Type: Turkey. C2 Muğla: South side of Girdev mountain, 1700–2200 m, 5.8.1947, *P.H.Davis* 13857 (holo. E; iso. K, ANK).

Slender, procumbent perennial herbs. Stem up to 40 cm tall, branched and short woody in lower part, completely glabrous, puberulent in lower part, or both small puberulent and densely retrorsely pilose in lower part, glabrous or puberulent in upper part. Leaves coriaceous, reticulate-rugose; lower leaves simple or pinnatisect, puberulent, pubescent or densely adpressed subpilose hairy; simple leaves and segments serrate, crenate or entire, acute or obtuse at apex; simple leaves lanceolate, oblanceolate or obovate, 3–8 × 0.7–1.5 cm; pinnatisect leaves lanceolate or oblong in outline, 5–8 × 0.7–1.6 cm, 4–6 segments, lateral segments oblong or oblong-lanceolate, 0.4–1 × 0.2–0.4 cm, terminal segment larger than lateral ones, elliptic to obovate, 1.2–3.5 × 0.5–0.9 cm; cauline leaves simple or pinnatisect; simple leaves oblanceolate or obovate, 2.5–4.5 × 0.4–0.7 cm, adpressed subpilose hairy, weakly serrate or entire, acute at apex; pinnatisect leaves oblong or lanceolate in outline, 3–4.5 × 0.5–1.3 cm, with 4–6 segments; segments puberulent or adpressed subpilose hairy, weakly serrate or entire, acute at apex; lateral segments oblong, lanceolate or linear-lanceolate, 0.4–0.6 × 0.1–0.3 cm, terminal segment larger than lateral ones, elliptic-lanceolate 2–4 × 0.6–1 cm; upper leaves simple, sparsely pinnatisect, sessile, glabrous or puberulent; simple leaves linear, 5–30 × 0.5–1.3 mm, entire, acuminate at apex; pinnatisect leaves linear-lanceolate in outline, 5–30 × 0.8–1.5 mm, 2 segments; segments linear, entire, acuminate at apex, lateral segments 0.8–1.2 × 0.1–0.3 mm, terminal segment larger than lateral ones, 3–20 × 0.7–1 mm. Capitula ovoid, 0.5–1.5 cm in diameter in flower, 0.5–1 cm in diameter in fruit, radiant. Involucral bracts broadly ovate, 4–6 × 3–4 mm, straw-coloured or purple-brown to violet, puberulent, ciliate margin, obtuse at apex; receptacular bracts oblong-spatulate, 5–8 × 3–4 mm, straw-coloured or purple-violet in dorsal and at apex, straw-coloured at base, puberulent, ciliate margin, acute at apex. Calyx cupuliform, 1–1.5 mm in diameter, with subirregular teeth. Corolla 9–13 mm long, pale purple, purple-pinkish or white, densely adpressed pilose outside.

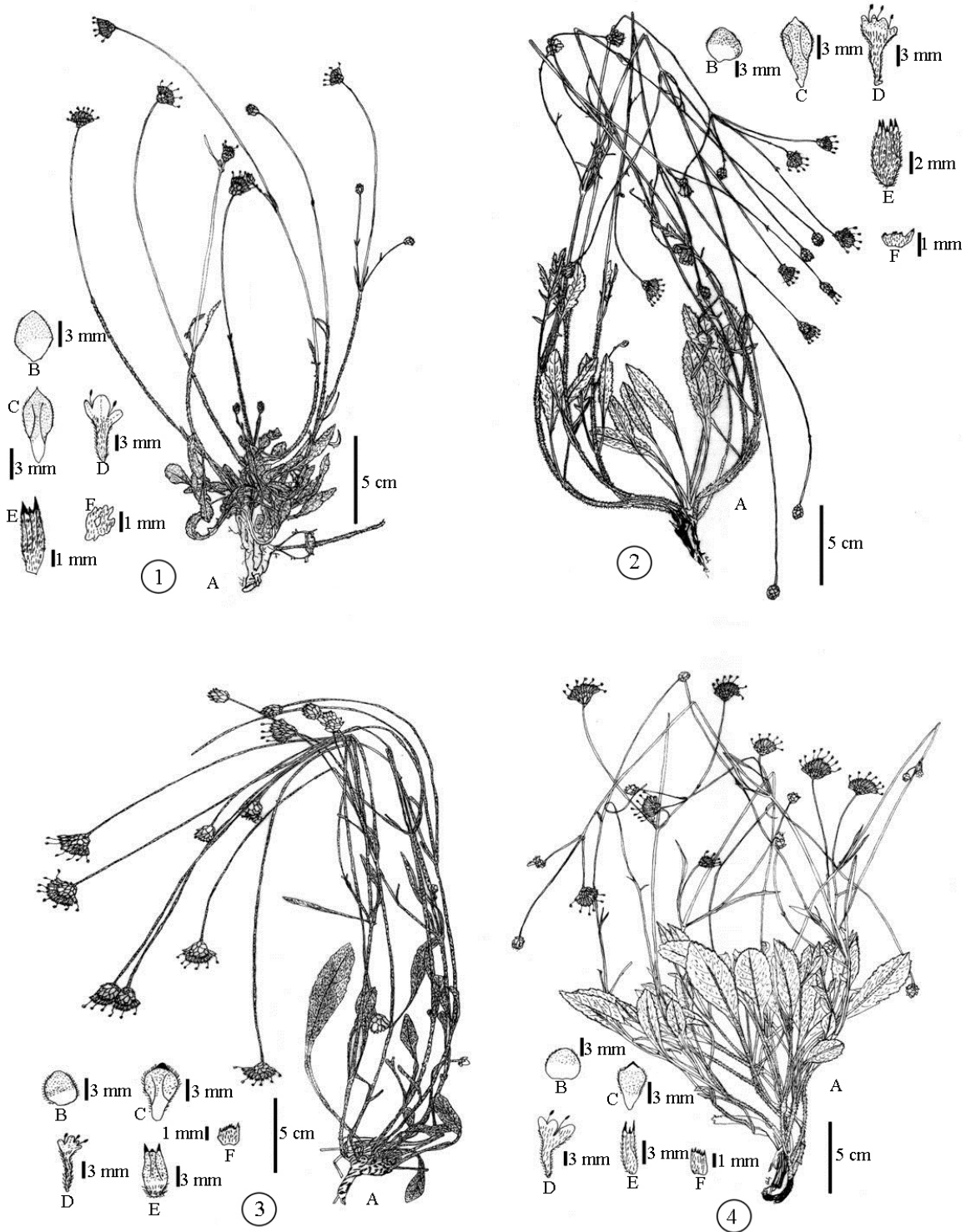


Figure 10. 1- *Cephalaria lycica*, 2- *C. scoparia*, 3- *C. dirmilensis*, 4- *C. gazipashensis* subsp. *gazipashensis*. A- habit, B- involucral bract, C- receptacular bract, D- corolla, E- involucel, F- calyx.

Involucel 4–6 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 1 mm long, short teeth 0.5 mm long. *Fl.* 6–9, *Fr.* 8–10.

Habitat: Alpine steppe, steppe, calcareous rocky, rocky places, clearings in *Cedrus libani*; 1100–2200 m. *Distribution:* Endemic to Turkey (South-West and South

Anatolia). East Mediterranean element. *IUCN category*: NT.

Specimens examined: Turkey. **C2** Muğla: south side of Girdev mountain, 1700–2200, 5.8.1947, *P.H.Davis* 13857 (ANK); Gömbe, Girdev plateau, north-east Girdev mountain, rocky places, 1700–1900 m, 20.8.2002, *R.S.Göktürk* 5051 & *B.Yalım* (Akdeniz Univ. Herb.); Sandras mountain, above Dikencik plateau, 1710 m, 3.8.1978, *Ö.Seçmen* 1627 & *E.Leblebici* (HUB, EGE). Antalya: Elmalı, Çamkuyu, Cedar Research Forest, clearings in *Cedrus libani*, rocky places, 1740 m, 28.8.2001, *İ.G.Deniz* 2013 (Akdeniz Univ. Herb.). **C3** Isparta: Eğirdir, Anamas, above Oruçgazi gediği, south slopes calcareous and metamorphic, alpine steppe, 1650–2170 m, 17.8.1974, *H.Peşmen* 1942 & *A.Güner* (HUB). Antalya: Kemer, TV tower on hill, under and in clearings of *Cedrus libani* forest, calcareous places, 1200–1700 m, 21.7.1978, *H.Peşmen* 3914 & *A.Güner* (HUB); Kemer, Yukarı Beycik village, west of Tahtalıdağ, rocky places, 1830–2100 m, 22.7.1995, *R.S.Göktürk* 3428, *M.R.Tunç* & *O.Ünal* (Akdeniz Univ. Herb.); Kumluca, west of Tahtalıdağ, steppe, 1500–1800 m, 26.8.1993, *H.Duman* 5381, *Z.Aytaç* & *A.A.Dönmez* (GAZI). **C4** Antalya: Gazipaşa, plateau of Çobanlar village, Sıra inler, calcareous rocky, 2100 m, 8.8.1991, *H.Sümbül* 3917 (Akdeniz Univ. Herb., HUB); Alanya, south of Gökbel plateau, steppe, 1500–1900 m, 1.9.1993, *H.Duman* 5495b & *Z.Aytaç* (GAZI, Akdeniz Univ. Herb.).

Cephalaria lycica is similar to *C. microcephala* but differs from *C. microcephala* in its stem procumbent, lower simple leaves 3–8 cm, terminal segment of lower leaves elliptic to obovate, upper leaves entire margin, capitula ovoid, radiant, involucre bracts brown to violet, puberulent, corolla 9–13 mm long, pale purple, purple-pinkish or white.

34. *Cephalaria scoparia* Contandr. & Quézel, Bull. Soc. Bot. France 123: 430 (1976) (Figure 10).

Type: [Turkey. C2 Antalya] versant septentrional du Bey dag d' El Mali au sud-est de l'Avlan lake, 2300 m, 24.6.1973, *P.Quézel* & *J.Contandriopoulos* 73–439 (holo. MARS).

Slender, erect or ascending perennial herbs, forming tufts, 30–60 cm in diameter; branches very numerous, intricate at base, virgate. Stem up to 80 cm tall, puberulent in lower part, glabrous in upper part. Leaves coriaceous, reticulate-rugose; lower leaves simple or lyrate; simple leaves and segments sparsely hispid, serrate, acute at apex; simple leaves linear-oblong, 8–18 × 0.6–1 cm; lyrate leaves similar to lower leaves, linear-oblong in outline, 6–18 × 1–2 cm, 2–6 segments, lateral segments oblong, 0.7–1.5 × 0.2–0.6 cm, terminal segment larger than lateral ones, oblong-lanceolate, 2.5–7 × 1–1.5 cm; cauline leaves lyrate, linear-oblong in outline, 4.5–8 × 0.4–1.5 cm, with 2–6 segments, lateral segments oblong-lanceolate to linear,

6–11 × 1–3 mm, entire, weakly serrate, acute at apex, terminal segment larger than lateral ones, linear-oblong, narrowly lanceolate or linear, 1.5–4.5 × 0.3–1.2 cm, serrate, acute at apex; upper leaves simple or pinnatisect, glabrous or sparsely hispid; simple leaves linear to filiform, 3–23 × 0.4–0.6 mm, entire, weakly spinule at apex; pinnatisect leaves sessile, linear in outline, 2–4 × 0.5–0.7 mm, 2 segments; segments entire, acuminate at apex, lateral segments linear, 2–3 × 0.1–0.4 mm, terminal segment larger than lateral ones, linear to filiform, 15–35 × 0.8–1 mm. Capitula ovoid, 1–1.5 cm in diameter in flower, 0.6–0.9 cm in diameter in fruit. Involucral bracts orbicular, 3–6 × 3–5 mm, pale purple to violet, glabrous or pubescent, with hyaline, shortly fimbriate margin, obtuse at apex; receptacular bracts lanceolate-cuneate, 7–9 × 2–4 mm, straw-coloured at base, pale purple to violet in dorsal and at apex, glabrous or pubescent, ciliate margin, acute or subacute at apex. Calyx cupuliform, 1 mm in diameter, with irregular teeth. Corolla 9–12 mm long, pale blue, pinkish-purple, adpressed pilose outside. Involucel 4–7 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 1 mm long, short teeth 0.5 mm long. *Fl.* 6–8, *Fr.* 7–9.

Habitat: Rocky slopes, clearings in *Pinus nigra* and *Cedrus libani*; 1400–2300 m. *Distribution*: Endemic to Turkey (South-West Anatolia). East Mediterranean element. *IUCN category*: [EN B2ab(i,ii,iv): area of occupancy less than 500 km²; known at no more than 5 locations].

Specimens examined: Turkey. **C2** Antalya: Elmalı, between Tekke village-Çıglıkara, clearings in *Pinus nigra*, 1500–1700 m, 25.8.1993, *H.Duman* 5335 (GAZI, Akdeniz Univ. Herb.); *ibid.*, 12.8.1995, *R.S.Göktürk* 3535 (Akdeniz Univ. Herb.); Elmalı, Çıglıkara, near security building, rocky places, 1600 m, 12.8.1995, *R.S.Göktürk* 3531 (Akdeniz Univ. Herb.); Elmalı, Çıglıkara, between Ayıngediği-Kaşgediği, rocky places, 1750 m, 17.8.2007, *R.S.Göktürk* 6112 (Akdeniz Univ. Herb.); Elmalı, Cedar Research Forest, roadsides, 1215 m, 29.9.2001, *İ.G.Deniz* 2032 (Akdeniz Univ. Herb.). **C3** Antalya: Kemer, Yaylakuzdere, Çalbalı mountain, clearings in *Cedrus libani*, 18.7.1991, *H.Sümbül* 3800 (Akdeniz Univ. Herb.); *ibid.*, 25.7.1996, *R.S.Göktürk* 3871 & *H.Sümbül* (Akdeniz Univ. Herb.).

Cephalaria scoparia is similar to *C. lycica* but differs from *C. lycica* in its stem forming tufts, erect or ascending, 30–60 cm in diameter; branches very numerous, intricate at base, virgate, lower simple leaves linear-oblong, lower lyrate leaves linear-oblong in outline, cauline leaves lyrate, linear-oblong in outline, involucre bracts orbicular, with hyaline, shortly fimbriate margin, receptacular bracts lanceolate-cuneate.

35. *Cephalaria dirmilensis* Hub.-Mor., *Bauhinia* 6: 369 (1979) (Figure 10).

Type: Turkey. C2 Burdur: Passhöhe südlich ob Dirmil (Altunyayla), silikatgras im *Pinus pallasiana*-Bestand, 1560 m, 12.7.1978, *M.Nydegger* 13181 (holo. Hb Nydegger, in Basel).

Slender, erect or ascending perennial herbs. Stem up to 75 cm tall, completely minute puberulent, longitudinally striate. Leaves coriaceous, reticulate-rugose, minute puberulent; lower leaves simple or lyrate; simple leaves and segments entire or denticulate, acute or narrowly acute at apex; simple leaves narrowly lanceolate or spatulate, 2.5–7 × 0.3–1 cm; lyrate leaves lanceolate in outline, 3–10 × 0.4–0.7 cm, 2–4 segments, lateral segments oblong-lanceolate, 5–6 × 2–3 cm, terminal segment larger than lateral ones, lanceolate, 5–7 × 0.7–1 cm; cauline leaves simple, narrowly lanceolate to linear, 3–6 × 0.2–1 cm; upper leaves simple, sessile, linear, 7–25 × 0.3–0.6 mm. Capitula broadly ovoid, 1.2–1.7 cm in diameter in flower, 0.5–0.9 cm in diameter in fruit. Involucral bracts ovate-lanceolate or suborbicular, 3–6 × 2–4 mm, straw-coloured, glabrous or minute puberulent, ciliate or pilose margin, obtuse at apex; receptacular bracts lanceolate-cuneate, 8–11 × 3–4 mm, straw-coloured at base, purple-brown to violet in dorsal and at apex, glabrous or sparsely hairy, ciliate or pilose margin, acute at apex. Calyx cupuliform, 1 mm in diameter, with irregular teeth. Corolla 10–13 mm long, pale blue, pinkish-purple or white, densely adpressed pilose outside. Involucel 6–8 mm long in fruit, 4-angled, pilose at base, 4 long and 4 short teeth at apex; long teeth 1 mm long, short teeth 0.5 mm long. *Fl.* 6–8, *Fr.* 8–9.

Habitat: Under and in clearings in *Pinus nigra* forest, rocky slopes; 1500–1800 m. *Distribution:* Endemic to Turkey (South-West Anatolia). East Mediterranean element. *IUCN category:* [CR B1ab(i,ii,iv); C2a(ii): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location; all mature individuals placed in 1 population and estimated mature individuals fewer than 100].

Specimens examined: Turkey. C2 Burdur: from Dirmil pass to plateau, rocky slopes, 1800 m, 8.9.1993, *L.Bekat* 3255 (EGE); Dirmil, pass, under *Pinus nigra* forest, 1500–1600 m, 13.8.1995, *R.S.Göktürk* 3526 (Akdeniz Univ. Herb.); *ibid.*, 26.8.1996, *R.S.Göktürk* 4045 & *N.Adıgüzel* (Akdeniz Univ. Herb.).

Cephalaria dirmilensis is similar to *C. lycica* but differs from *C. lycica* in its stem erect or ascending, up to 75 cm, completely minute puberulent, simple leaves and segments entire or denticulate, capitula broadly 1.2–1.7 cm in diameter in flower, involucral bracts ovate-lanceolate or suborbicular, receptacular bracts lanceolate-cuneate.

36. *Cephalaria gazipashensis* Sümbül, Edinburgh J. Bot. 48(1): 33 (1991).

Slender, ascending perennial herbs. Stem up to 100 cm tall, branched in lower part, short woody, glabrous,

minute puberulent or retrorsely pilose in lower part, glabrous in upper part. Leaves coriaceous, reticulate-rugose, soft-textured to subcoriaceous; lower leaves simple or pinnatisect; simple leaves and segments completely sparsely pilose hairy, especially densely pilose hairy on mid-vein and on margin, heterotrichous indumentum consisting of soft spreading hairs on both surfaces and longer setae along midvein and margin, entire or serrate, acute or obtuse at apex; simple leaves lanceolate, oblanceolate or obovate, 3–15 × 0.7–2.5 cm; pinnatisect leaves oblong or oblong-lanceolate in outline, 5–13 × 1–3 cm, 2–4 segments, lateral segments oblong or lanceolate, 0.3–1.5 × 0.2–0.8 cm, terminal segment larger than lateral ones, lanceolate, elliptic or oblong-obovate, 1.8–6 × 1–2.6 cm; cauline leaves simple or pinnatisect; simple leaves and segments glabrous, sparsely or densely pilose hairy only on midvein and on margin, entire or serrate, acuminate or acute at apex; simple leaves lanceolate, 2.2–8 × 0.2–1 cm; pinnatisect leaves oblong or lanceolate in outline, 4.5–6.5 × 0.5–2 cm, with 2–4 segments; lateral segments oblong or lanceolate, 0.3–1 × 0.1–0.4 cm, terminal segment larger than lateral ones, lanceolate, 2–4.5 × 0.3–1.5 cm; upper leaves simple, linear or narrowly lanceolate, 4–45 × 1–2 mm, entire, acute or subacuminate at apex. Peduncle glabrous or densely pilose below the capitula. Capitula ovoid, 0.7–1.7 cm in diameter in flower, 0.5–1 cm in diameter in fruit. Involucral bracts broadly ovate or suborbicular, 3–6 × 2–4 mm, straw-coloured, sparsely purple-violet, glabrous or sparsely pubescent, densely pilose, ciliate margin, obtuse at apex; receptacular bracts ovate-oblong, 5–7 × 2–3 mm, straw-coloured, sparsely purple-violet at apex, sparsely puberulent, ciliate margin, acute at apex. Calyx cupuliform, 1 mm in diameter, with irregular teeth. Corolla 6–15 mm long, lilac, sparsely white, densely subadpressed pilose outside. Involucel 5–8 mm long in fruit, 4-angled, sparsely pilose, 4 long and 4 short teeth at apex; long teeth 2 mm long, short teeth 1 mm long. *Fl.* 6–9, *Fr.* 8–10.

C. gazipashensis includes 2 subspecies:

1. Peduncle glabrous below the capitula; involucral bracts glabrous or sparsely pubescent subsp. **gazipashensis**

1. Peduncle densely pilose below the capitula; involucral bracts densely pilose subsp. **pilifera**
subsp. **gazipashensis** Edinburgh J. Bot. 48(1): 33 (1991) (Figure 10).

Type: Turkey. C4 Antalya: Gazipaşa, Sugözü village, Maha plateau, 1450 m, 5.7.1983, *H.Sümbül* 2373 (holo. HUB; iso. E).

Habitat: Rocky and stony places, in clearings in *Pinus nigra* forest; 1000–1900 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* NT.

Specimens examined: Turkey. C3 Antalya: Gebiz, Bozburun mountain, Pangözü village, between Merdivenli-Acarca, rocky places, 1400–1500 m, 7.8.1997, *R.S.Göktürk* 4236 (Akdeniz Univ. Herb.); Feslikan plateau, Çağlarca, Körler district, Sakarpınar, 1800 m, calcareous rocky, 21.9.1997, *R.S.Göktürk* 4252 (Akdeniz Univ. Herb.). C4 Antalya: Akseki, Seydişehir-Beyşehir crossroad, roadsides, 1150 m, 8.8.2000, *R.S.Göktürk* 4465. (Akdeniz Univ. Herb.); Gündoğmuş, Kahveler, valley, rocky places, 1450 m, 30.7.1999, *R.S.Göktürk* 4388, *O.Ünal, M.Gökçeoğlu & F.Topçuoğlu* (Akdeniz Univ. Herb.); Alanya, Türbelihisar, between Taşatan-Yerköprü, clearings in *Pinus nigra*, stony places, 1000–1200 m, 31.8.1993, *H.Duman* 5474 & *Z.Aytaç* (GAZI, Akdeniz Univ. Herb.); *ibid.*, 3.8.1995, *R.S.Göktürk* 3490 & *M.R.Tunç* (Akdeniz Univ. Herb.); Alanya, between Çayarası-Gerne, clearings in *Pinus nigra*, 1200–1300 m, 2.9.1993, *H.Duman* 5505 & *Z.Aytaç* (GAZI, Akdeniz Univ. Herb.); *ibid.*, 5.8.1996, *R.S.Göktürk* 3880 (Akdeniz Univ. Herb.); Gazipaşa, Sugözü village, Maha plateau, 1450 m, 5.7.1983, *H.Sümbül* 2373 (HUB); Gazipaşa, Sugözü village, Akçal, rocky places, 1550 m, 5.8.1996, *R.S.Göktürk* 3873 (Akdeniz Univ. Herb.); Gazipaşa, Sugözü village, between Maha plateau-Verem, clearings in *Pinus nigra*, 1200 m, 5.8.1996, *R.S.Göktürk* 3878 (Akdeniz Univ. Herb.); Gazipaşa, Sugözü village, Söğüt plateau, rocky places, clearings in *Pinus nigra*, 1400 m, 5.8.1996, *R.S.Göktürk* 3879 (Akdeniz Univ. Herb.). Karaman: Ermenek, Kazancı plateau, Kırkkuyular, rocky places, 1800 m, 2.8.1995, *R.S.Göktürk* 3473 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ermenek, Göktepe, Dumlugöze village, Gavuralanı, 1800 m, 16.7.1984, *H.Sümbül* 3177 (HUB); *ibid.*, 2.8.1995, *R.S.Göktürk* 3485 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ermenek, Göktepe, Dumlugöze village, Dikenli, rocky places, 1500 m, 2.8.1995, *R.S.Göktürk* 3487 & *M.R.Tunç* (Akdeniz Univ. Herb.); Ermenek, Göktepe district, east of Günder village, roadsides, 1150 m, 2.8.1995, *R.S.Göktürk* 3482 & *M.R.Tunç* (Akdeniz Univ. Herb.). Konya: between Taşkent-Çayarası, Oğlanboğuldu mountain, rocky places, 1850 m, 6.8.1996, *R.S.Göktürk* 3890 (Akdeniz Univ. Herb.); Taşkent, Fesekan plateau, stony places, 1675 m, 6.8.1996, *R.S.Göktürk* 3891 (Akdeniz Univ. Herb.).

subsp. **pilifera** Parolly, Kürschner & Eren, *Willdenowia* 37: 247 (2007).

Type: Turkey. C4 Antalya: Alanya, slopes of Akdağ (2461 m), between Şekerkahve-Gökbel plateau, 1100–1300 m, oak forest, limestone and dolomite, 12.7.2000, *Eren & Parolly* 7947 (holo. B; iso. AYDN, E, Hb. Parolly).

Habitat: Oak forest, limestone and dolomite; 1050–1400 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* [CR B1ab(i,ii,iv): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location] (recommended).

Cephalaria gazipashensis is similar to *C. lycica* but differs from *C. lycica* in its stem ascending, up to 100 cm, simple cauline leaves lanceolate, upper leaves only linear, capitula up to 1.7 cm in diameter in flower, pilose on the peduncles below the capitula, involucre bracts broadly ovate or suborbicular, densely pilose, receptacular bracts ovate-oblong, corolla up to 15 mm long, lilac. In the specimens collected from both the type locality and any other localities (*R.S.Göktürk* 3490, 3873, 3878, 3879, and 4236), the description of the holotype also included the facts that the leaves were not all simple, but also contained pinnatisect leaves on the base and stem leaves; that the base leaves were also oblanceolate and obovate as well as being lanceolate; and that the involucre bracts were suborbicular as well as being ovate.

37. *Cephalaria ekimiana* Göktürk & Sümbül, *Ann. Bot. Fenn.* 34(3): 153 (1997) (Figure 11).

Type: Turkey. C4 Karaman: Ermenek, Tepebaşı village, roadside, on disturbed ground, 1100 m, 2.8.1995, *R.S.Göktürk* 3479 (holo. Akdeniz Univ. Herb.; iso. E, ANK, HUB, GAZI).

Slender, ascending-erect perennial, 70–130 cm tall, branched from base, with short woody caudices. Stem pubescent to 2/3; densely pilose and puberulent in lower part, sparsely pilose and densely puberulent in middle, glabrous above. Leaves coriaceous, reticulate-rugose, sparsely pilose especially on the midvein and margin or completely glabrous; lower leaves 8–11 × 0.2–2 cm, lyrate, with (1–)2–4 pairs, of entire, oblong-lanceolate or ovate lateral segments, terminal segment 3–4 × 0.5–2 cm elliptic or oblanceolate, usually entire, rarely subcrenate; cauline leaves 2–5 × 0.1–0.4 cm, simple or with 1 or 2 pairs of lateral segments, lateral and terminal segments linear, rarely linear-lanceolate; upper leaves 0.5–1.5 × 0.05–0.1 cm, always simple narrowly linear. Capitula 6–12 × 4–8 mm, ovoid or ovoid-orbicular, 0.4–0.8 cm in diameter in flower, 0.6–1 mm in diameter in fruit. All of bracts dark brown margined. Involucre bracts orbicular, 3–5 × 4–6 mm, completely glabrous or rarely ciliate margined, obtuse at apex; receptacular bracts oblong, 6–7 × 2–4 mm, puberulent outside, margin ciliate, obtuse or subacute at apex. Calyx cupuliform, 1 mm in diameter, with densely irregular teeth. Corolla 6–9 mm long, mauve (yellowish or bright blue when dry), densely adpressed pilose outside. Involucre 5–8 mm long in fruit, ovoid, 4-angled, brown, sparsely pilose, involucre with 8 equal or subequal teeth. *Fl.* 7–8, *Fr.* 8–9.

Habitat: Disturbed ground; 1100 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* [CR B1ab(i,ii,iv); C2a(ii): extent of occurrence less than 100 km²; area of occupancy less than 10 km²; known to exist at only a single location; all mature individuals placed in 1 population and estimated mature individuals fewer than 100].



Figure 11. 1- *Cephalaria ekimiana*, 2- *C. taurica*. A- habit, B- involucrel bract, C- receptacular bract, D- corolla, E- involucrel, F- calyx, G- capitula.

Specimens examined: Turkey. C4 Karaman: Ermenek, Tepebaşı village, roadside, on disturbed ground, 1100 m, 6.8.1996, R.S.Göktürk 3892 (Akdeniz Univ. Herb.).

Cephalaria ekimiana is similar to *C. lycica* but differs from *C. lycica* in its stem ascending-erect and long, terminal segment of lower leaves elliptic or oblanceolate usually entire, rarely subrenate, involucrel and receptacular bracts brown at apex; involucrel bracts orbicular, completely glabrous, receptacular bracts oblong, obtuse or subacute at apex, involucrel with 8 equal or subequal teeth.

38. *Cephalaria salicifolia* Post, Bull. Soc. Vaud. Sci. Nat. 25: 59 (1889).

Type: [Turkey. C6 Gaziantep] prope Aintab [Gaziantep], G.E.Post s.n.

Perennial with slender velutinous stems up to 45 cm. Leaves oblanceolate to linear, glabrous, coriaceous, reticulate-wrinkled, lower petiolate, upper sessile. Capitula 1–1.5 cm in diameter; flower colour unknown. Involucrel bracts broadly ovate, obtuse; receptacular bracts oblong, abruptly mucronate. Involucrel quadrangular, hirsute, with 4 equal apical teeth. *Fl. 6, Fr. unknown.*

Habitat: Unknown. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* DD.

No close relatives. The species *Cephalaria salicifolia* is exclusively known from the type specimen and was collected by GE Post in Gaziantep during the 1880s. It could not be found although we searched for it in and around Gaziantep in July for 3 years. Therefore, the information presented above is from the *Cephalaria* monograph and the *Flora of Turkey* (Szabó, 1940; Matthews, 1972).

39. *Cephalaria taurica* Szabó, Bot. Jahrb. Syst. 57(5): 642 (1922) (Figure 11).

= *Cephalaria amana* Rech.f., Ann. Naturhist Mus. Wien 57: 95 (1950).

Lectotype (here designated): [Turkey. C4/5] Kleinasen [Anatolia] auf dem Taurus [Torus Mountains], summer 1836, Kotschy 250, as *C. centauroides* Coulter (K with barcode K000779003 seen as photo; isolectotype W).

Slender, erect perennial, up to 2 m tall. Stem striate, glabrous or densely setose in lower part, sparsely setose in middle, glabrous above. Leaves herbaceous, glabrous,

setose at margin; lower leaves simple or pinnatisect; simple leaves lanceolate or ovate-lanceolate, 6–25 × 2–3.5 cm, entire and/or serrate, acute at apex; pinnatisect leaves oblong or ovate-lanceolate in outline, 5–20 × 2–5 cm, with 2–10 segments; segments linear, lanceolate or lanceolate-ovate, entire or serrate, acuminate or subacuminate at apex, lateral segments 1–4 × 0.2–2.5 cm, terminal segment same size or larger than lateral ones, 1.2–8 × 0.3–3.5 cm; cauline leaves pinnatisect, oblong or ovate-lanceolate in outline, 4–20 × 1–4 cm, with 2–8 segments; segments linear or lanceolate entire or weakly serrate, acuminate at apex, lateral segments 2–4.5 × 0.2–0.7 cm, terminal segment same size or larger than lateral ones, 2–7 × 0.3–1 cm; upper leaves 1–2 pinnatisect, oblong or ovate-lanceolate in outline, 1–14 × 0.5–6 cm, with 2–7 segments; segments linear, entire, acuminate or subpungent at apex, lateral segments 2–14 × 1–1.5 mm, terminal segment 1.5–3 × 1–1.75 mm. Capitula globose, 2–4 cm in diameter in flower, 1–3 cm in diameter in fruit, radiant or subradiant. Involucral bracts broadly ovate or obovate-spathulate, 4–7 × 3–5 mm, straw-coloured at base, violet or blackish-violet in dorsal and at apex, puberulent, ciliate margin, obtuse, acuminate or subacuminate at apex; receptacular bracts ovate-oblong or obovate-spathulate, 7–13 × 1.5–3.5 mm, straw-coloured in dorsal and at base, violet-purple at apex, puberulent, sparsely ciliate margin, acuminate or attenuate-cuspidate at apex. Calyx cupuliform, 1–2 mm in diameter, with teeth. Corolla 2–2.5 cm long in outer, 1–2 cm long in inner, yellow or cream, adpressed pilose outside. Involucel 6–9 mm long in fruit, 4-angled, pilose, 4 long and 4 short teeth at apex; long teeth 1–2 mm long, short teeth 0.5 mm long. *Fl.* 8–10, *Fr.* 9–11.

Habitat: Under and clearings in *P. brutia* forest, rocky places, *Q. cerris* forest; 500–2000 m. *Distribution:* Endemic to Turkey (South Anatolia). East Mediterranean element. *IUCN category:* NT.

Specimens examined: Turkey. **B5** Kayseri: Kapuzbaşı, Kapuzbaşı waterfall, rocky places, 670 m, 4.9.1995, *Z. Aytaç* 7328 (GAZI). **C5** Mersin: Tarsus, Çamlıyayla (Namrun), Cehennemdere, under *Pinus brutia* and roadsides, 1000 m, 26.9.2000, *R.S. Göktürk* 4545 & *M. Göktürk* (Akdeniz Univ. Herb.). Adana: Aladağ (Karsantı), Hızar, between Pizgeçmez bridge-Ortaca bridge, rocky places, 900 m, 29.10.1995, *R.S. Göktürk* 3589 (Akdeniz Univ. Herb.); Pozantı, Kamışlı, under *Pinus brutia*, 900 m, 23.9.2000, *R.S. Göktürk* 4535 (Akdeniz Univ. Herb.). Osmaniye: Zorkun plateau, Amanos mountains, near Bağrıaçık plateau crossroad, 1400 m, 24.9.2000, *R.S. Göktürk* 4537 (Akdeniz Univ. Herb.). **C6** Adana: Osmaniye, 800 m, *Akman* 3050 (ANK). Hatay: Dört Yol, Kapanlı, Amanos mountains, *Quercus cerris* forest, c. 900 m, *P.H. Davis* 3050A (ANK); İskenderun, Soğukoluk, Amanos mountains, under *Pinus brutia* forest, 500 m, 27.10.1967, *Akman s.n.* (ANK);

İskenderun, Belen, Güzelyayla (Soğukoluk), between Güzelyayla-Arsuz, Güzelli village, under and in clearings of *Pinus brutia* forest, 600 m, 24.9.2000, *R.S. Göktürk* 4540 (Akdeniz Univ. Herb.).

No close relatives. *Cephalaria amana* is regarded as a synonym of *C. taurica*. According to *Flora of Turkey*, *C. amana* is similar to *C. taurica* but differs from *C. taurica* in its stem being setose below (not glabrous), capitula radiant (not subradiant), involucral bracts obovate (not broadly ovate), and receptacular bracts obovate-spathulate (not ovate-oblong) (Matthews, 1972). However, it was determined by an examination of samples of both species that these characters are transitive. In addition to this, the distribution of the 2 species was studied. Taking into account all these data, it was decided that the characters represent intraspecific variation of *C. amana*.

4. Discussion

As a result of this study, the number of taxa *Cephalaria* was found to be 41 (39 species, 1 subspecies, and 1 variety) in Turkey, 25 of which are endemic (endemism rate of 60.9%). The phytogeographical regional distributions of *Cephalaria* taxa were analysed, showing that 22 of them are Irano-Turanian, 16 of them East Mediterranean, 2 of them in Euxine, and 1 of them multiregional. The phytogeographical distributions of endemic *Cephalaria* taxa were analysed, showing that 15 of them are East Mediterranean, 9 of them Irano-Turanian, and 1 of them Euxine. Endemic Mediterranean *Cephalaria* taxa were concentrated in the Toros mountains. Endemic Irano-Turanian *Cephalaria* taxa were concentrated in the mountains of Central and East Anatolia. *C. squamiflora*, known from Ikaria, an eastern Aegean Island, was not included in the numbering since it was not collected from Anatolia as a result of the field studies carried out in the Aegean region. *C. demirizii* is given as a species new to science in this study. *C. amana* was treated as a synonym of *C. taurica*. Lectotypes are designated for *C. transylvanica*, *C. cilicica*, *C. setosa*, *C. sparsipilosa*, and *C. taurica*. The updated key for species identification has been modified to suit a large scale. Examination of the threat categories of the *Cephalaria* taxa showed that 11 of them are CR, 5 of them EN, 7 of them VU, 8 of them NT, 8 of them LC, and 2 of them in DD. The IUCN threat categories of *C. tchihatchewii* and *C. kotschyi* were changed from DD to VU. The threatened species are concentrated in 6 regions in Turkey. The first region covers Antalya, Elmali, Korkuteli, and Dirmil. The second region covers Alanya and Ermenek. The third region covers Adana, Kahramanmaraş, and Hatay. The fourth region covers Erzurum, Erzincan, and Muş. The fifth region covers Kastamonu, Çankırı, and Sivrihisar. The sixth region covers İstanbul and Düzce. The important threats in this areas are overgrazing, urbanisation, fire, land

clearing, and road construction. In particular, *C. tuteliana* is restricted to Bahçeşehir in İstanbul, where urbanisation and road construction are the major threats to the species. This species must be protected with in situ and ex situ conservation approaches.

Acknowledgements

We wish to thank TÜBİTAK (Project No. TBAG-2074) and the Akdeniz University Research Fund (Project No. 21.01.0121.24) for financial support; Dr O Ünal (Akdeniz

University), Dr ZK Elinç (Akdeniz University), Dr D Şirin (Namık Kemal University), and I Güner (for *C. duzceënsis*) for preparing the illustrations; Dr R Tekoğlu (Dokuz Eylül University) for help with the Latin diagnosis for *C. demirizii*; Dr Brian Mathew for checking the English; the anonymous reviewers for their constructive comments on the manuscript; and the curators of the herbaria ANK, AEF, BULU, CUF, EGE, GAZI, HUB, ISTE, ISTE, KNYA, OMUB, and VANE, who allowed us to study their *Cephalaria* specimens.

References

- Akan H, Aytaç Z (2014). The revision of the section *Alopecuroidei* of the genus *Astragalus* (Fabaceae) in Turkey. *Turk J Bot* 38: 37–59.
- Aksoy N, Göktürk RS, Açık L, Çelebi A (2007). *Cephalaria duzceënsis* (Dipsacaceae), a new species from the western Black Sea Region, Turkey. *Nordic J Bot* 25: 64–69.
- Backlund, AA (1996). *Phylogeny of Dipsacales*. PhD, Uppsala University, Uppsala, Sweden.
- Baytop T (1994). *Türkçe Bitki Adları Sözlüğü*. Ankara, Turkey: Türk Tarih Kurumu Basımevi (in Turkish).
- Bobrov EG (1957). Dipsacaceae. In: Shishkin, BK, editor. *Flora of the USSR*, Vol. 24. Moscow, USSR: Akademiya Nauk SSSR, pp. 20–37.
- Boissier E (1875). *Flora Orientalis*, Vol. 3. Geneva and Basel, Switzerland: H. Georg, pp. 117–126.
- Brummitt RK, Powell CE (1992). *Authors of Plant Names*. Kew, UK: Royal Botanic Gardens.
- Caputo P, Cozzolino S (1994). A cladistic analysis of Dipsacaceae (Dipsacales). *Plant Syst Evol* 189: 41–61.
- Carlson SE, Mayer V, Donoghue MJ (2009). Phylogenetic relationships, taxonomy, and morphological evolution in Dipsacaceae (Dipsacales) inferred by DNA sequence data. *Taxon* 58: 1075–1091.
- Coulter T (1823). *Mémoire sur les Dipsacées*. Geneva, Switzerland: J. Paschoud (in French).
- Davis PH, Mill RR, Tan K (1988). *Cephalaria* Schrad. ex Roem. & Schult. In: Davis PH, Mill RR, Tan K, editors. *Flora of Turkey and the East Aegean Islands*, Vol. 10 (Suppl. 1). Edinburgh, UK: Edinburgh University Press, p. 156.
- De Candolle AP (1830). *Prodromus systematis naturalis regni vegetabilis* 4. Paris, France: Treuttel & Wurtz (in Latin).
- Donoghue MJ, Eriksson T, Reeves PA, Olmstead RG (2001). Phylogeny and phylogenetic taxonomy of Dipsacales, with special reference to *Sinadoca* and *Tetradoxa* (Adoxaceae). *Harvard Pap Bot* 6: 459–479.
- Duman H (2000). *Cephalaria* Schrad. ex Roem. & Schult. In: Güner A, Özhatay N, Ekim T, Başer KHC, editors. *Flora of Turkey and the East Aegean Islands*, Vol. 11 (Suppl. 2). Edinburgh, UK: Edinburgh University Press, pp. 147–149.
- Ehrendorfer F (1965). Evolution and karyotype differentiation in a family of flowering plants: Dipsacaceae. *Genetics Today* 2: 399–407.
- Ekim T, Koyuncu M, Vural M, Duman H, Aytaç Z, Adıgüzel N (2000). *Türkiye Bitkileri Kırmızı Kitabı*. Ankara, Turkey: TTKD ve Yüzcüncü Yıl Üniversitesi Yayınları (in Turkish).
- Feinbrun-Dothan N (1978). *Cephalaria* Schrad. ex Roem. & Schult. In: Feinbrun-Dothan N, editor. *Flora Palaestina*, Vol. 3. Jerusalem, Israel: The Israel Academy of Sciences Press, pp. 263–266.
- Ferguson IK (1976). *Cephalaria* Schrad. ex Roem. & Schult. In: Tutin GT, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM, Webb DA, editors. *Flora Europaea*, Vol. 4. Cambridge, UK: Cambridge University Press, pp. 57–58.
- Göktürk RS, Sümbül H (1997). A new species of *Cephalaria* (Dipsacaceae) from South Anatolia, Turkey. *Ann Bot Fenn* 34: 153–155.
- Göktürk RS, Sümbül H (2003). *Cephalaria aytachii* (Dipsacaceae), a new species from Central Anatolia, Turkey. *Ann Bot Fenn* 40: 123–127.
- Göktürk RS, Sümbül H, Açık L (2003). A new species of *Cephalaria* Schrad. ex Roem. & Schult. (Dipsacaceae), including a new variety from East Anatolia, Turkey. *Israel J Pl Sci* 51: 59–65.
- Göktürk RS, Sümbül H, Çelebi A, Açık L (2012). Two new species of *Cephalaria* (Caprifoliaceae) from Turkey. *Turk J Bot* 36: 311–321.
- Güneş F, Özhatay N (2011). An ethnobotanical study from Kars (Eastern) Turkey. *Biodicon* 4: 30–41.
- Halacsy ED (1968). *Cephalaria* Schrad. ex Roem. & Schult. In: Halacsy ED, editor. *Florae Graecae*, Vol. 1. New York, NY, USA: Wheldon Wesley Press, pp. 758–759.
- Hayek A, Markgraf F (1970). *Prodromus Florae Peninsulae Balcanicae*, Vol. 2. Berlin, Germany: Verlag des Repertoriums, pp. 495–497 (in Latin).
- IUCN (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. Gland, Switzerland and Cambridge, UK: IUCN.
- Karaman Erkul S, Aytaç Z (2013a). *Astragalus yukselii* (Leguminosae), a new species from Turkey. *Turk J Bot* 37: 836–840.

- Karaman Erkul S, Aytaç Z (2013b). The revision of the genus *Oxytropis* (Leguminosae) in Turkey. Turk J Bot 37: 24–38.
- Kırmızıgül S, Böke N, Sümbül H, Göktürk RS, Arda N (2007). Essential fatty acid components and antioxidant activities of eight *Cephalaria* species from southwestern Anatolia. Pure Appl Chem 79: 2297–2304.
- Kırmızıgül S, Sarıkahya NB, Sümbül H, Göktürk RS, Yavaşoğlu NUK, Pekmez M, Arda N (2012). Fatty acid profile and biological data of four endemic *Cephalaria* species grown in Turkey. Rec Nat Prod 6: 151–155.
- Koç M, Aksoy A (2013). *Minuartia hamzaoglui* (Caryophyllaceae), a new species from Turkey. Turk J Bot 37: 428–433.
- Kuş S, Göktürk RS (2005). A new *Cephalaria* (Dipsacaceae) species from the European part of Turkey. Nordic J Bot 23: 427–430.
- Lack HW (1991). *Cephalaria* Schrad. ex Roem. & Schult. In: Rechinger KH, editor. Flora Iranica. Number 168. Graz, Austria: Akademische Druck-u Verlagsanstalt, pp. 8–18.
- Matthews VA (1972). *Cephalaria* Schrad. ex Roem. & Schult. In: Davis PH, editor. Flora of Turkey and the East Aegean Islands, Vol. 4. Edinburgh, UK: Edinburgh University Press, pp. 585–597.
- Meikle RD (1985). *Cephalaria* Schrad. ex Roem. & Schult. In: Meikle RD, editor. Flora of Cyprus, Vol. 1. Kew, UK: The Bentham-Moxon Trust Press, pp. 848–849.
- Öztürk M, Çetin Ö (2013). *Inula tuzgoluensis* (Asteraceae), a new species from Central Anatolia, Turkey. Turk J Bot 37: 825–835.
- Parolly G, Eren Ö (2007). Contributions to the flora of Turkey, 2. Willdenowia 37: 243–271.
- Pignatti S (1982). *Cephalaria* Schrad. ex Roem. & Schult. In: Pignatti S, editor. Flora d'Italia. Rome, Italy: Edagricole Press, pp. 660–661.
- Reveal JL, Chase MW (2011). APG III: Bibliographical information and synonymy of Magnoliidae. Phytotaxa 19: 71–134.
- Sağıroğlu M, Akgül G (2014). *Gladiolus osmaniyensis* (Iridaceae), a new species from South Anatolia, Turkey. Turk J Bot 38: 31–36.
- Sarıkahya NB, Kayce P, Halay E, Göktürk RS, Sümbül H, Kırmızıgül S (2013). Phytochemical analysis of the essential oils of ten endemic *Cephalaria* species from Turkey. Nat Prod Res 27: 830–833.
- Sümbül H (1991). Ten new species from Anatolia and two new records for the flora of Turkey. Edinburgh J Bot 48: 27–40.
- Szabó Z (1940). *Cephalaria*-genusz monografiája. Budapest, Hungary: Kiadja A Magyar Tudományos Akademia Press (in Hungarian).
- Temsch EM, Greilhuber J (2010). Genome size in Dipsacaceae and *Morina longifolia* (Morinaceae). Plant Syst Evol 289: 45–56.
- Uzunhisarcıklı ME, Duman H, Yılmaz S (2013). A new species of *Bellevalia* (Hyacinthaceae) from Turkey. Turk J Bot 37: 651–655.
- Verlâque R (1977). Rapports entre les Valerianaceae, les Morinaceae et les Dipsacaceae. Bull Soc Bot 124: 475–482 (in French).
- Verlâque R (1986). Etude biosystématique et phylogénétique des Dipsacaceae. Rev Cytol Biol Veg Le Botaniste 9: 5–72 (in French).
- Yıldız K, Çırpıcı AH (2013). Taxonomic revision of *Silene* (Caryophyllaceae) sections *Siphonomorpha*, *Lasiostemones*, *Sclerocalycinae*, *Chloranthae*, *Tataricae*, and *Otites* in Turkey. Turk J Bot 37: 191–218.