

Taxonomic revision of *Silene* (Caryophyllaceae) sections *Siphonomorpha*, *Lasiostemon*, *Sclerocalycinae*, *Chloranthae*, *Tataricae*, and *Otites* in Turkey

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Abstract: Forty-four *Silene* L. taxa belonging to the sections *Siphonomorpha* Otth, *Lasiostemon* Boiss., *Sclerocalycinae* Boiss., *Chloranthae* Rohrb., *Tataricae* Chowdhuri, and *Otites* (Adams.) Otth were studied. The *Silene* specimens used in the study were collected from different localities between 2005 and 2007. Their conservation status, phytogeographical regions, and distribution in Turkey were determined. Detailed drawings of the general view and flower from each species were added to the study. As a result of these detailed investigations, the conditions of some species having taxonomic problems were re-examined, and suggestions were proposed. The results produced 3 taxa that are new to science and 2 taxa that are new records for the flora of Turkey. In addition, 5 species that were published as new species from Turkey were reduced to synonyms.

Key words: Turkey, revision, *Silene*, systematic

1. Introduction

Because of its geographical location, climate, and topographical and geological structure, Turkey's rich flora is one of the most significant in the world. The main research into the flora of Turkey is *Flora of Turkey and the East Aegean Islands*, which was published from 1965 to 1988 and in 2000. There are 135 taxa belonging to *Silene* L. in 31 sections in *Flora of Turkey*; this has increased to 165 with the addition of new taxa (Coope & Cullen, 1967; Davis et al., 1988; Özhatay et al., 1999; Tan & Vural, 2000; Özhatay & Kültür, 2006; Özhatay et al., 2009; Kaya & Ertekin, 2009; Budak & Koç, 2011; Hamzaoglu et al., 2011; Özhatay et al., 2011; Hamzaoglu, 2012; Yıldız, 2012).

The endemism ratio of *Silene* is 45% in Turkey. Moreover, there are errors and contradictions in the descriptions and identification keys of the species; a taxonomic revision of the *Silene* species was necessary. This study was conducted on species belonging to the 6 sections of the flora of Turkey: *Siphonomorpha* Otth, *Lasiostemon* Boiss., *Sclerocalycinae* Boiss., *Chloranthae* Rohrb., *Tataricae* Chowdhuri, and *Otites* (Adams.) Otth.

Some taxonomic, karyological, and palynological studies have been performed on *Silene* species. In his study of the *Silene* Chowdhuri (1957) examined a total of 443 species that have a worldwide distribution in 44 sections. The information presented regarding these

sections in addition to some problematic species was used as the main source by Coope and Cullen (1967) during the writing of the genus *Silene* for the *Flora of Turkey*. Melzheimer (1977) biosystemically revised the *Silene* taxa that are distributed in the Balkans. Wringley (1987), on the other hand, handled the *Otites* section and examined the species in this section according to their taxonomical, karyological, and palynological properties. In the palynological study conducted by Ghazanfar (1984) on 44 taxa represented in the sections *Siphonomorpha* and *Auriculatae*, *Silene italica* (L.) Pers. and *S. viridiflora* L., which were revised in our study, were also included. In their study of an endemic taxon, *S. cserei* Baumg. subsp. *aeoniopsis* (Bornm.) Chowdh., Vural and Adıgüzel (1996) showed the differences between this taxon and *S. vulgaris* (Moench.) Garcke, which shares similar features with the studied species. Yıldız and Çirpici (1992, 1996, 1998, 2000), Yıldız (1996, 2001a, 2001b, 2002, 2005, 2006a, 2006b), and Yıldız et al. (2008, 2009a, 2009b, 2011) emphasized the morphological, palynological, and karyological features of the taxa in their study of the *Silene* and proposed solutions for dealing with the problems. In the current study these suggestions were considered and solutions to the problems presented were studied.

As stated above, in the literature there are taxonomical, morphological, karyological, and palynological studies

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on the *Silene*, a significant genus in terms of biodiversity. Moreover, the majority of these studies are limited ones conducted on several species. Some of them are general and cover several families and genera, and these include a number of the *Silene* species; however, they are not specific. Because of the absence of a comprehensive and detailed study on the species growing in Turkey, a taxonomic revision of the genus *Silene* was undertaken. Considering the difficulty of examining all the taxa within a single project, in the current study the revision of the first 6 sections of the flora of Turkey was undertaken.

2. Materials and methods

The taxonomic revision of the genus depends on intensively collecting plants from the research area, evaluating them, examining previously collected specimens, and investigating the flora-systematic studies about *Silene*. With this in mind, distribution of the *Silene* taxa, inflorescence periods, and habitat were determined by using various studies in the *Flora of Turkey and the East Aegean Islands*, vol. 2 as well as herbaria and field observations. Then samples of *Silene* species were obtained from almost every region of Turkey during field work between the beginning of July 2005 and the end of August 2007. Some of the collected samples were dried according to standard procedures and saved as herbarium specimens, and others were placed in 70% alcohol for use in morphological investigations if needed.

The identified plants were kept in the Celal Bayar University Biology Department, Faculty of Arts and Sciences and the Marmara University Faculty of Arts and Sciences Herbarium (MUFE). Research about the genus

Silene in the European flora, the flora of neighbouring countries, and especially the Turkish flora, was used for identification (Hegi, 1959–1979; Chater & Walters, 1964; Zohary, 1966; Hayek, 1970; Meikle, 1977; Melzheimer, 1988; Greuter, 1997). *Silene* specimens primarily in the herbaria of ISTE, ISTF, ISTO, ANK, GAZI, HUB, and EGE along with AIBU, ATA, ANES, KNYA, VANE, GUL, Erciyes Univ. Herb., Akdeniz Univ. Herb., Çukurova Univ. Herb., and the Virtual Herb. of the Lake Van Basin were examined, and their photographs were taken. The significance of the type specimens in the taxonomic studies was considered; the images of type specimens of *Silene* species studied were obtained from the Berlin (B), Kew (K), Edinburgh (E), Geneva (G), Vienna (WU), and Cambridge (CGE) herbaria; and the images of 15 taxa were obtained. Furthermore, the images of the type specimens in the Linne Herbarium were viewed via the web site.

The identification keys of the studied species and descriptions of new species published after 2000 were presented in this study. Descriptions were realised based on the samples collected during the current research and evaluated in various herbaria by considering the related literature. World distribution of the species, phytogeographical regions, conservation status, chromosome numbers, and drawings of the species were presented in the study.

3. Taxonomic treatment

Silene Linnaeus, Sp. Pl. 1: 416 (1753). Gen. Pl. ed. 5, 193 (1754): nom. cons. prop. against *Lychnis* L.

Type: *Silene anglica* L.

Identification key of *Silene* of sections *Siphonomorpha*, *Lasiostemon*, *Sclerocalycinae*, *Chloranthae*, *Tataricae*, and *Otites* in Turkey:

1. Calyx glabrous or with scabrous or very short hairs on nerves
 2. Calyx up to 12 mm
 3. Filaments and petal claws pilose
 4. Pedicels (at least above the bracteoles) puberulose
 5. Calyx 6.5–11 mm 8. **marschallii**
 5. Calyx 3–3.5 mm 36. **densiflora**
 4. Pedicels glabrous
 6. Inflorescence branches many, wide angle 7. **longipetala**
 6. Inflorescence branches few, not wide angle, usually ascending or clusters on stem
 7. Gynophore glabrous
 8. Inflorescence lax paniculate, 1–3 flowered 8. **marschallii**
 8. Inflorescence raceme, many flowered 13. **lasiantha**
 7. Gynophore hairy
 9. Petal limbs entire to 1/3, sometimes 1/2 bifid
 10. Plant up to 30 cm, basal leaves oblanceolate to linear 12. **olympica**
 10. Plant 30–80 cm, basal leaves spatulate 34. **skorpilii**
 9. Petal limbs 1/2 or divided to the base
 11. Petal limbs 1/2 bifid, inflorescence lax paniculate 8. **marschallii**
 11. Petal limbs divided to the base; inflorescence a raceme or panicle with somewhat strict branches 9. **saxatilis**

3. Filaments glabrous; petal claws usually glabrous
 12. Plant glaucous and glabrous (except for leaf margin); leaves fleshy
 13. Petal limbs divided to 4/5, 2 coronal scales present 14. **manissadjianii**
 13. Petal limbs divided 1/4 to 1/2, coronal scales absent
 14. Cauline leaves oblong-elliptic to oblong-ovate; petal lobes 5–6 mm 32. **eremitica**
 14. Cauline leaves linear; petal lobes 2.5–3.5 mm 33. **demirizii**
 12. Plant not glaucous and generally hairy, sometimes glabrous (except for leaf margin); leaves not fleshy
 15. Flowers spreading, not in heads; petal limbs usually 4, sometimes 5, rarely 2 partite ... 6. **phrygia**
 15. Flowers in clusters, in heads; petal limbs entire or slightly emarginate
 16. Flowers unisexual; plants dioecious 35. **otites**
 16. Flowers hermaphrodite
 17. Flowers in heads, generally capitate; petals whitish, coronal scales absent; plant 10–30 cm 10. **capitellata**
 17. Inflorescence racemose or narrowly panicles, branches often compact or pseudo-verticils; petals pink, with 2 coronal scales; plant 60–150 cm 37. **confertiflora**
2. Calyx 12 mm or more
 18. Cauline leaves 6–25(–27) mm broad, up to 2–3 × longer than broad
 19. Plant rigid; subshrub
 20. Median stem leaves cordate-amplexicaul, suborbicular, fleshy 23. **chlorifolia**
 20. Median stem leaves cuneate, ovate to obovate, not fleshy 24. **swertiifolia**
 19. Plant not rigid; herbaceous
 21. Petal limb divided to 2/3, with 2 coronal scales 21. **laxa**
 21. Petal limb divided to 1/3, coronal scales absent, 2 minute callosities present 22. **caesarea**
 18. Cauline leaves 1–5(–15) mm broad, more than 3 × longer than broad
 22. Calyx up to 20 mm
 23. Leaves dimorphic 29. **lycaonica**
 23. Leaves monomorphic
 24. Inflorescence unbranched 28. **frivaldskyana**
 24. Inflorescence branched
 25. Stem leaves narrowly elliptic to oblanceolate, 5–11 mm broad, somewhat fleshy, cartilaginous-margined 26. **cartilaginea**
 25. Stem leaves linear, linear-lanceolate, less than 5 mm broad, neither fleshy nor cartilaginous-margined
 26. Basal and cauline leaves linear to lanceolate, 70–110 mm long 19. **peduncularis**
 26. Basal leaves linear to lanceolate, 24–27 mm, cauline leaves linear, 32–47 mm long 20. **armena**
 22. Calyx longer than 20 mm
 27. Bracts enclosing flower buds 17. **bupleuroides**
 27. Bracts not enclosing flower buds
 28. Cauline leaves lanceolate to oblanceolate; more than 5 mm broad 25. **sclerophylla**
 28. Cauline leaves linear-lanceolate, less than 5 mm broad
 29. Gynophore puberulent 27. **haradjianii**
 29. Gynophore glabrous
 30. Coronal scales absent, 2 small bulges present; basal leaves spatulate 17. **aydosensis**
 30. Two coronal scales present; basal leaves linear to lanceolate or oblanceolate
 31. Bracts, subulate, viscid; petals violet 18. **doganii**
 31. Bracts, linear lanceolate, not viscid; petals ivory white, pink nerved 16. **caramanica**

1. Calyx hairy
 32. Calyx up to 11 mm
 33. Flowers in cluster
 34. Plant 10–25 cm; basal and cauline leaves lanceolate..... 11. *isaurica*
 34. Plant 30–80 cm; basal leaves, narrowly oblanceolate-obovate or oblanceolate, spatulate; cauline leaves oblanceolate 35. *otites*
 33. Flowers not in clusters
 35. Filaments, petal claws pilose; inflorescence lax panicle; pedicel puberulent or glabrous 8. *marschallii*
 35. Filaments, petal claws glabrous; inflorescence with congested lateral cymules; pedicel densely glandular pubescent 3. *gigantea*
 32. Calyx longer than 11.5 mm
 36. Stem leaves nearly 2 × longer than broad
 37. Gynophore glabrous, 10–11 mm 4. *amana*
 37. Gynophore puberulose, 1–2 mm 5. *viridiflora*
 36. Stem leaves, more than 3 × longer than broad
 38. Inflorescence spreading panicle
 39. Stem leaves 1 nerved, linear-lanceolate, oblong lanceolate, obovate or spatulate; petal divided to 1/2; coronal scales absent 1. *italica*
 39. Stem leaves 3 nerved, broad elliptic; petal divided to 1/3; 2 coronal scales present 2. *splendens*
 38. Inflorescence racemose, dichasial racemose or narrow panicle
 40. Stem leaves lanceolate, 1 nerved; petal limbs divided to the base; coronal scales absent; gynophore 4–7 mm 30. *viscosa*
 40. Stem leaves oblong-elliptic to oblong-ovate, 3 nerved; petal limbs divided to 3/4; 2 coronal scales present; gynophore 7–10 mm 31. *paphlagonica*

Section Siphonomorpha Otth, Candolle, Prodr. 1: 377 (1824).

Syn.: ser. *Nutantes* Rohrb., Monogr. Sil. 76 (1868); sect. *Viridiflorae* Boiss., Fl.

Orient. 1: 574 (1867); sect. *Paniculatae* Boiss., Fl. Orient. 1: 574 (1867).

1. *Silene italica* (L.) Pers., subsp. *italica*, Syn. Pl. (Persoon) 1: 498 (1805).

subsp. *italica* (Figure 1) (Yıldız & Çırpıcı, 2000).

= *Cucubalus italicus* L. Syst. Nat., ed. 10, 2: 1030 (1759).

= *Silene pilosa* Spreng., Syst. Veg. 2: 411 (1825).

= *S. papillifolia* F.N. Williams, J. Linn. Soc., Bot. 32: 91 (1896).

Type: described from Italy (Hb. Linn. 582/13, photo!).

Turkey, Mediterranean region, Central Europe, Southern Russia, Crimea, Caucasus, Turkestan, North Iran. Mediterranean element. Widespread.

Chromosome number: 2n = 24 (MUFE 12105) (Yıldız et al., 2008).

S. italica includes 3 subspecies [subsp. *italica*, subsp. *nemoralis* (Waldst. & Kit.) Nyman, and subsp. *peloponnesiaca* Greuter] in the *Flora of Europe* and *Flora of Greece*. Only subsp. *italica* displays a distribution in Turkey. *S. sieberi*, which is given as the synonym in the *Flora of Turkey*, is accepted as a separate species in the *Flora of Europe* and *Flora of Greece*. This species is endemic for Crete.

2. *S. splendens* Boiss., Fl. Orient. 1: 631 (1867). (Figure 1).

Type: [Turkey B2 Uşak] in valleculis Phrygiae prope Ouchak (Uşak), 910 m, 1857, *Balansa* 1312 (isotype: K!).

Endemic. East Mediterranean element. Threatened category: VU-B1ac (i).

Chromosome number: 2n = 24 (MUFE 12229) (Yıldız et al., 2008).

Although *S. splendens* is very similar to *S. italica* in *Flora of Turkey*, these 2 species are significantly different from each other as regards their leaf shape and leaf venation.

3. *S. gigantea* L., Sp. Pl. 1: 418 (1753) (Figure 1) (Yıldız, 2006a).

1. Lateral cymules congested; calyx eglandular or mixed hairy, rarely all glandular subsp. *gigantea*

1. Lateral cymules laxer; calyx with very sparse glandular hairs or glabrous subsp. *rhodopea*
subsp. *gigantea* (Figure 1) (Yıldız, 2006a).

= *Cucubalus giganteus* L., Sp. Pl. 1: 418 (1753).

Type: described from Portugal (Hb. Linn. 583/26, photo!).

Turkey, Balkans, Bulgaria, Lebanon, Cyprus. East Mediterranean element. Widespread. Chromosome number: 2n = 24 (MUFE 12294) (Yıldız et al., 2008).

subsp. *rhodopea* (Janka) Greuter, Willdenowia 25: 115 (1995) (Figure 1).

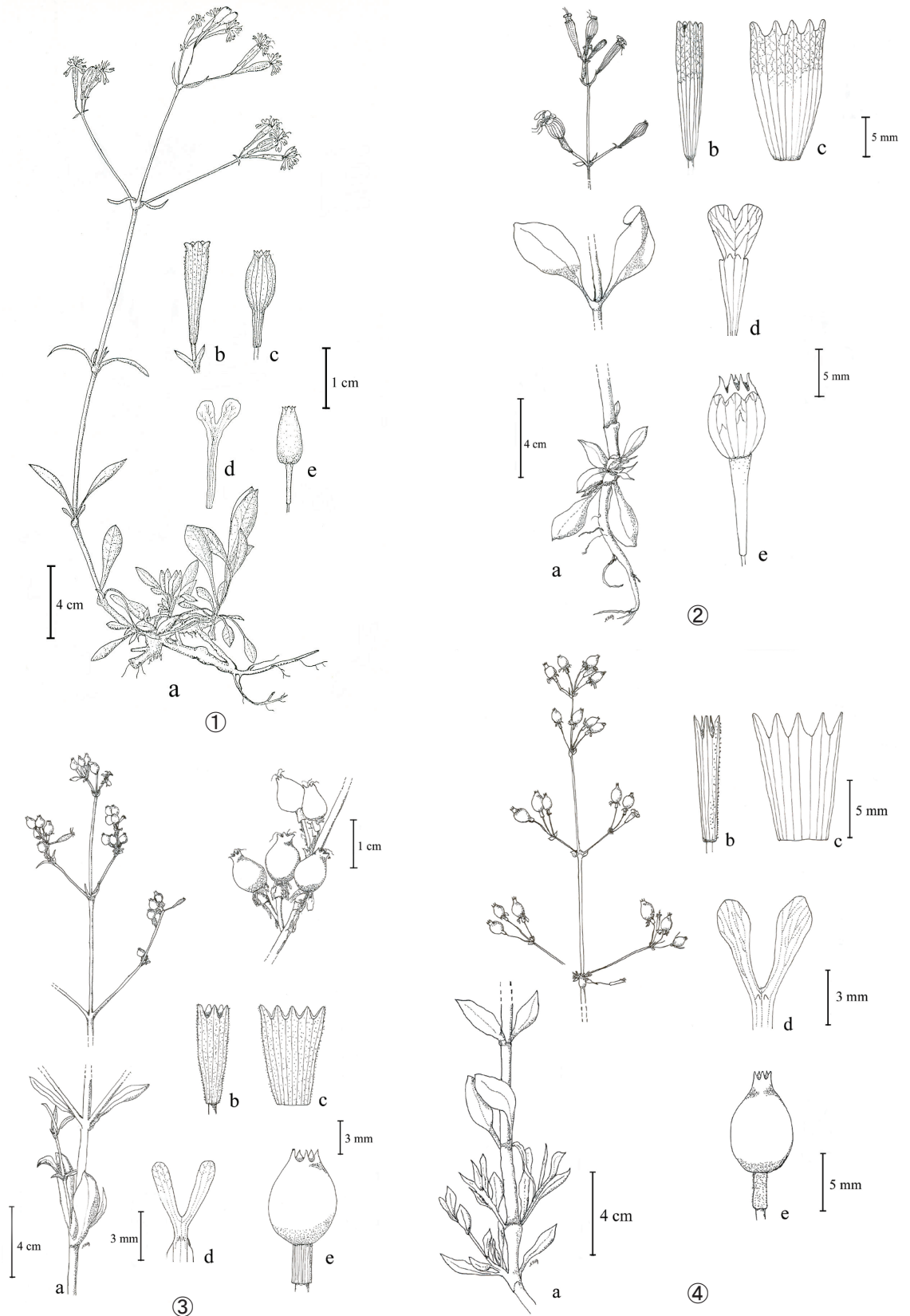


Figure 1. 1- *Silene italica* subsp. *italica*, 2- *S. splendens*, 3- *S. gigantea* subsp. *gigantea*, 4- *S. gigantea* subsp. *rhodopea*. a- habit, b and c- calyx, d- petal, e- capsule.

= *Silene italica* (L.) Pers. var. *incana* Griseb., Spic. Fl. Rumel. 1: 173 (1843).

= *S. gigantea* var. *viridescens* Boiss., Fl. Orient. 1: 646 (1867), nom. illeg.

= *S. gigantea* var. *incana* (Griseb.) Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 254 (1957).

= *S. pseudonutans* Pančić, Fl. Serbiae Addit.: 116 (1884).

Type: [Serbia] “ad Pirot Serb. Orient.”, July 1884, *Paneic s.n.* (WU, photo!).

Turkey, Greece, Aegean, Lebanon. East Mediterranean element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12089) (Yıldız et al., 2008).

In the *Flora of Turkey* there are 2 varieties of *S. gigantea*: var. *gigantea* and var. *incana*. Greuter evaluated these varieties in the *Flora of Greece (Flora of Hellenica)* as subspecies (Greuter, 1995). The evaluation in this study is based on Greuter.

4. *S. amana* Boiss., Fl. Orient. 1: 634 (1867) (Figure 2).

Type: [Turkey C6 Hatay] in umbrosis calcareis montis Amani Syriae bor. prope Beilan [Belen], *Kotschy* 281 (Holotype: G, photo!).

Endemic. East Mediterranean element. Threatened category: CR-B2b+D.

Chromosome number: $2n = 24$ (MUFE 12297) (Yıldız et al., 2008).

This species was only known from type gathering but was collected from the same region many times during this study. It needs to be protected since it has a limited distribution. It is similar to *S. viridiflora* L. and *S. italica*. Nonetheless, it can be very easily distinguished from the other 2 species according to its morphology. *S. italica*'s basal leaves obovate to lanceolate, cauline leaves linear to spatulate. Petal limbs bipartite to 1/2, coronal scales absent. Gynophore 7–15 mm. *S. viridiflora*'s basal leaves linear to triangular subulate; cauline leaves narrowly lanceolate or ovate-lanceolate. Petal limbs bipartite to 3/4, 2 coronal present. Gynophore 1.5–2 mm. But *S. amana*'s basal leaves \pm elliptic, spatulate, cauline leaves ovate-cordate. Petal limbs bipartite to 2/3, 2 coronal scales present. Gynophore 10–11 mm.

5. *S. viridiflora* L., Sp. Pl., (ed. 2) 1: 597 (1762), (Figure 2) (Yıldız & Çirpici, 2000).

Type: described from Portugal (Hb. Linn. 583/27, photo!).

Turkey; South, West, and Central Europe; Crimea-Siberia and East Asia. Widespread.

Chromosome number: $2n = 24$ (MUFE 12092) (Yıldız et al., 2008).

It is generally distributed in Northern Anatolia, in Mount Amanos, and shows a surprising split in the *Flora of Greece*. This is because the western section of Mount Amanos has a climate similar to that of Northern Anatolia.

S. lesbiaca P. Candargy is the synonym of *S. flavescent* Waldst. & Kit. subsp. *thessalonica* (Boiss. & Heldr.) Nyman in the *Flora of Greece*. In other words, *S. lesbiaca*, which is given as the synonym in the *Flora of Turkey*, is actually not the synonym of *S. viridiflora*.

6. *S. phrygia* Boiss., Fl. Orient. 1: 644 (1867) (Figure 2).

= *Silene ispartensis* Ghazanfar, Notes Roy. Bot. Gard. Edinburgh 41: 97 (1983) **syn. nov.**

Lectotype (designated here): [Turkey B2 Uşak] ad margines viarum c. Ouchak [Uşak] Phrygiae, *Balansa s.n.* (G, photo!).

Endemic. Mediterranean (mt) element. Threatened category: EN-B1a+D.

Chromosome number: $2n = 24$ (MUFE 12406) (Yıldız et al., 2008).

The petals divide into 4 lobes in the MUFE 12337, 12342, 12351, and 12405 specimens. Nonetheless, petals had 2, 4, and 5 lobes in the MUFE 12406 specimens collected from the same region and same habitat in this study. Therefore, the number of petal lobes is not enough to distinguish these 2 species; however, it was concluded that *S. ispartensis* and *S. phrygia* should be the same species since all other features coincide. Thus, *S. ispartensis* is reduced to a synonym of *S. phrygia*.

Section Lasiostemon Boiss., Fl. Orient. 1: 574 (1867).

7. *S. longipetala* Vent., Descr. Pl. Nouv. 83, t. 83 (1802) (Figure 3).

Type: [Syria] aux environs d'Alep, Bruguière & Olivier.

Turkey, Greece, West Syria, Cyprus, North Iraq, Syrian desert, North Iran, Cyrenaica, Egypt. In Turkey, almost to the Irano-Turanian region. Widespread.

Chromosome number: $2n = 24$ (MUFE 12037) (Yıldız et al., 2009b).

8. *S. marschallii* C.A.Mey., Verz. Pfl. Cauc. 214 (1831). (Figure 3) (Yıldız & Çirpici 2000; Yıldız et al., 2010).

1. Pedicel puberulent; petal has 2 coronal scales; gynophore puberulous subsp. **marschallii**

1. Pedicel glabrous; petal has no coronal scales; gynophore glabrous subsp. **anamasi**
subsp. **marschallii** (Figure 3) (Yıldız & Çirpici, 2000).

= *Silene puberula* sensu Boiss., Fl. Orient. 1: 636 (1867) non Bertol. Nov. Comm. Acad. Bonon. 6: 221 (1842).

= *S. guicciardii* Boiss. & Heldr., Diagn. Pl. Orient. Ser. 2(6): 32 (1859).

= *S. propinqua* Schischkin, Izv. Mus. Gruzii 1: 14 (1920–22).

Type: [Turkey] in collibus prope Baibut, Pl. East Anatolia, Borgeau No: 43 (GOET, photo!).

Turkey, Greece, Armenia, Azerbaijan, North and North-West Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12026) (Yıldız et al., 2009b).

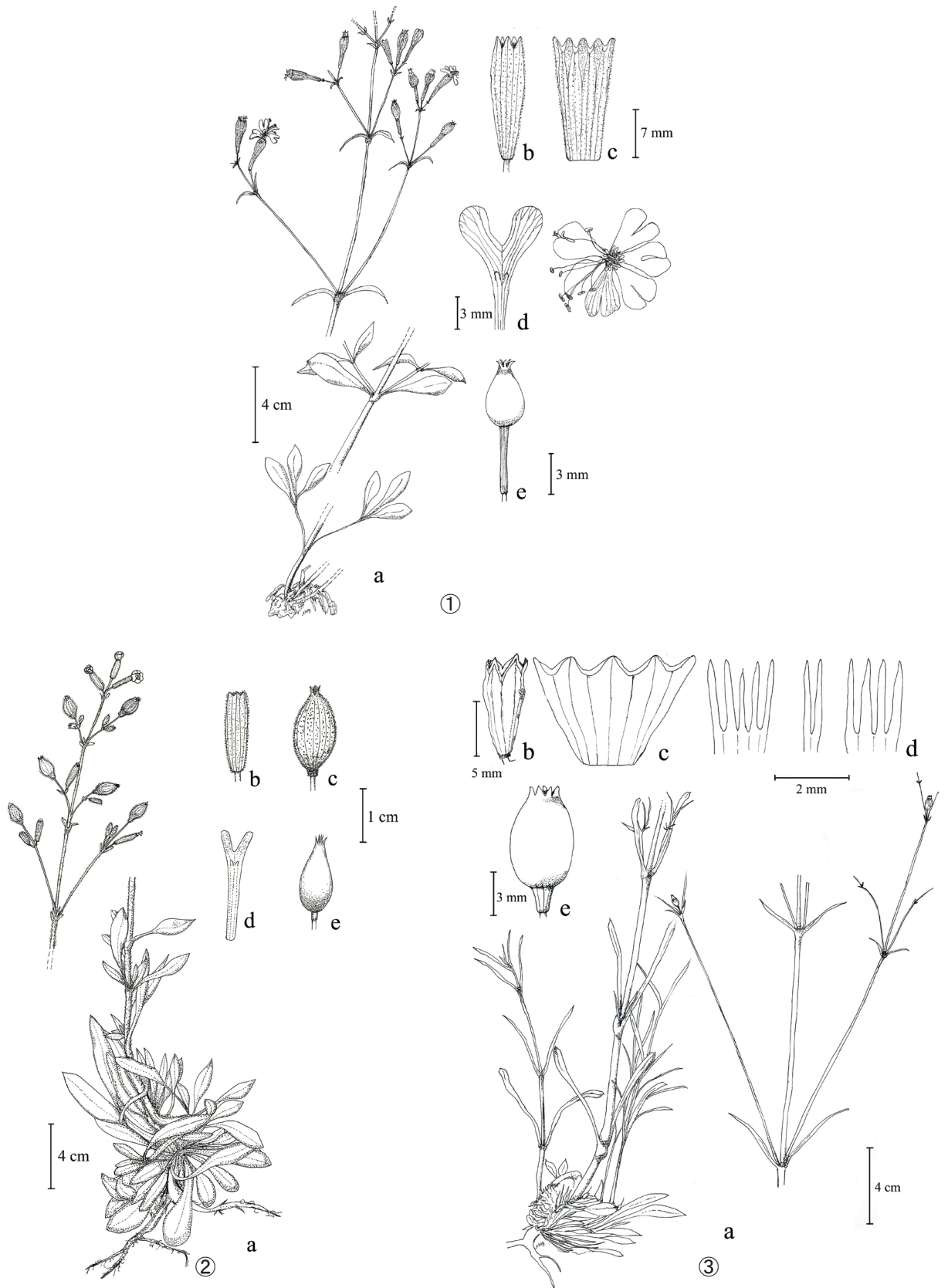


Figure 2. 1- *Silene amana*, 2- *S. viridiflora*, 3- *S. phrygia*. a- habit, b and c- calyx, d- petal, e- capsule.

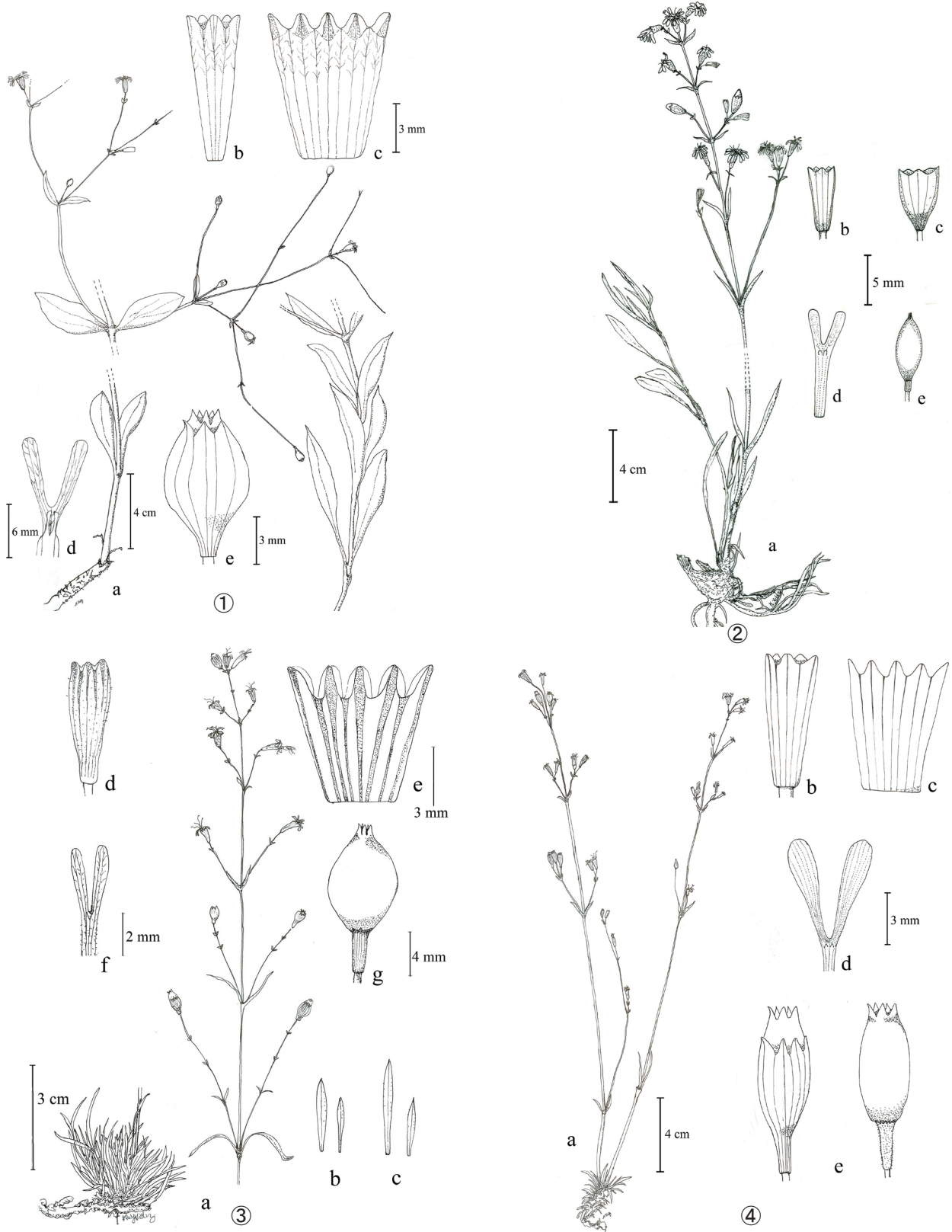


Figure 3. 1- *Silene longipetala*, 2- *S. marschallii* subsp. *marschallii*, 3- *S. marschallii* subsp. *anamasi*, 4- *S. saxatilis*. 1, 2, 4: a- habit, b and c- calyx, d- petal, e- capsule. 3: a- habit, b- cauline leaves, c- basal leaves, d and e- calyx, f- petal, g- capsule.

subsp. *anamasi* K.Yıldız & Dadandı, Nordic J. Bot. 28(3): 336 (2010) (Figure 3) (Yıldız et al., 2010).

Type: Turkey, C3 Konya: above Dedegöldağ (Anamas), 'forest observatory station'

(Isparta/Konya border), 2100–2250 m a.s.l., 16.07.2006, K.Yıldız 0165-1 & M.Y.Dadandı (holotype: MUFE 12360! isotypes: Celal Bayar Univ. Herb., Erciyes Univ. Herb.!). Paratype: Turkey, C3 Konya: Dedegöldağ, side of national park, rocks, 1800 m a.s.l., 13.07.1995, H.Özçelik 7186 (GAZI!).

Fl. & Fr. June–August, slopes, rocky and stony open places, 1800–2250 m.

Endemic. Mediterranean (mt) element. Threatened category: CR-B2b.

Chromosome number: $2n = 24$ (MUFE 12360) (Yıldız et al., 2009c).

S. lasiantha Koch was evaluated as the synonym of *S. marschallii* subsp. *marschallii* in the *Flora of Iran*. Nevertheless, there are distinctive differences as a result of the data obtained from this study, and it would be suitable to evaluate them as different species. The hairiness characteristic is used for distinguishing *S. marschallii* from *S. lasiantha*, but the main distinctive character is the flowers, which are more widely branched in the former.

9. *S. saxatilis* Sims, Bot. Mag. 18: t. 689 (1803) (Figure 3).

= *Silene ruprechtii* Schischkin, Grossh., Sosn. & Schischkin, Fl. Tifl. 204, t. 83 (1925).

= *S. woronowii* Grossh., Fl. Kavk. 3: 243 (1945).

Type: described from cultivated specimens.

Turkey, Caucasus, North Iran, usually Euro-Siberian region. Widespread.

Chromosome number: $2n = 24$ (MUFE 12140) (Yıldız et al., 2009b).

10. *S. capitellata* Boiss., Diagn. Pl. Orient. ser. 1(1): 25 (1843) (Figure 4).

Type: [Turkey] East Anatolia, Aucher 433 (BM, photo!).

Endemic. Irano-Turanian element. Threatened category: NT.

Chromosome number: $2n = 24$ (MUFE 12027) (Yıldız et al., 2009b).

11. *S. isaurica* Contandr. & Quézel, Bull. Soc. Bot. France 123(7–8): 415 (1976) (Figure 4).

Type: [Turkey C3 Antalya] pâturages calcaires de la région de Kuyu à l'est d'Akseki, 1800 m, 07.06.1970, P.Quézel & J.Contandriopoulos 70-77 (holotype: MARS, topotype: MUFE 2409!).

Endemic. East Mediterranean element. Threatened category: CR-B1a.

Chromosome number: $2n = 24$ (MUFE 12349) (Yıldız et al., 2009b).

S. isaurica was included in the section *Otites* (Adams.) Otth in the *Flora of Turkey*, indicating it was close to *S. otites* (L.) Wibel. Nonetheless, this species is significantly different from *S. otites* as regards plant height, leaf size, sexual condition, and inflorescence. On the other hand, it displays characters that are more similar to *S. capitellata*. Although the flowers in *S. capitellata* are capitate, they are usually clustered on the stem in *S. isaurica*. Furthermore, flowers in *S. isaurica* are either hermaphrodite or female; all of the flowers in *S. capitellata* are hermaphrodite. *S. isaurica* also exhibits similarities with *S. olympica* and *S. lasiantha* as regards plant size, inflorescence, branched stem, and leaf arrangement. *S. isaurica*, because of the aforementioned features, was included in the section *Lasiostemon*.

12. *S. olympica* Boiss., Diagn. Pl. Orient. ser. 1(1): 24 (1843) (Figure 4) (Yıldız & Çirpici, 2000).

1. Inflorescence a strict raceme, flowers usually contiguous and overlapping; petals usually emarginated, sometimes divided to 1/3 var. *olympica*

1. Inflorescence capitate or 2(–3) distant verticillasters; petals divided 1/2 to 1/3 var. *erciyesdaghensis* var. *olympica* (Figure 4) (Yıldız & Çirpici, 2000).

Type: [Turkey A2 Bursa] in Olympi Bithyni praeruptis herbidis, vii 1842, Aucher 485 (G, photo!).

Endemic. Irano-Turanian element. Threatened category: NT.

Chromosome number: $2n = 24$ (MUFE 12091) (Yıldız et al., 2009b).

var. *erciyesdaghensis* (Aksoy & Hamzaoglu) K.Yıldız & Çirpici, stat. nov.

= *Silene erciyesdaghensis* Aksoy & Hamzaoglu, Bot. J. Linn. Soc. 158: 730–733 (2008) syn. nov.

Type: Turkey. B5 Kayseri: Erciyes mountain, from Sarigöl high plateau towards summit, 2900–3200 m, igneous rocky slopes, 04.08.2006, Hamzaoglu 4435, Aksoy & Budak (holotype: Bozok Univ. Herb., isotypes: Bozok Univ. Herb., Erciyes Univ. herb., ANK! GAZI, HUB).

Fl. & Fr. June–August. Alpine steppe on igneous rocky slopes, 2650–3200 m.

Endemic. Irano-Turanian element. Threatened category: EN.

B5 Kayseri: Mount Erciyes, 01.08.1941, A.Heilbronn & M.Başarman s.n. (ISTF 1070!); ibid., 2600 m, 22.07.1990, K.Alpınar & H't Herit s.n. (ISTE 62309!). B5 Niğde: Ala dağ, Narpiz gorge, 10,000 ft (3048 m), scree, flowers cream, scented like whin, plentiful, 08.08.1964, P.W.Wood & W.B.Gibson 165 (E!).

S. olympica, *S. lasiantha*, and *S. capitellata* are very similar to each other. Because its petals occur 1/2 divided from the emarginate, *S. olympica* is easily distinguished from the other species, which have petals that are divided to the base (4/4).

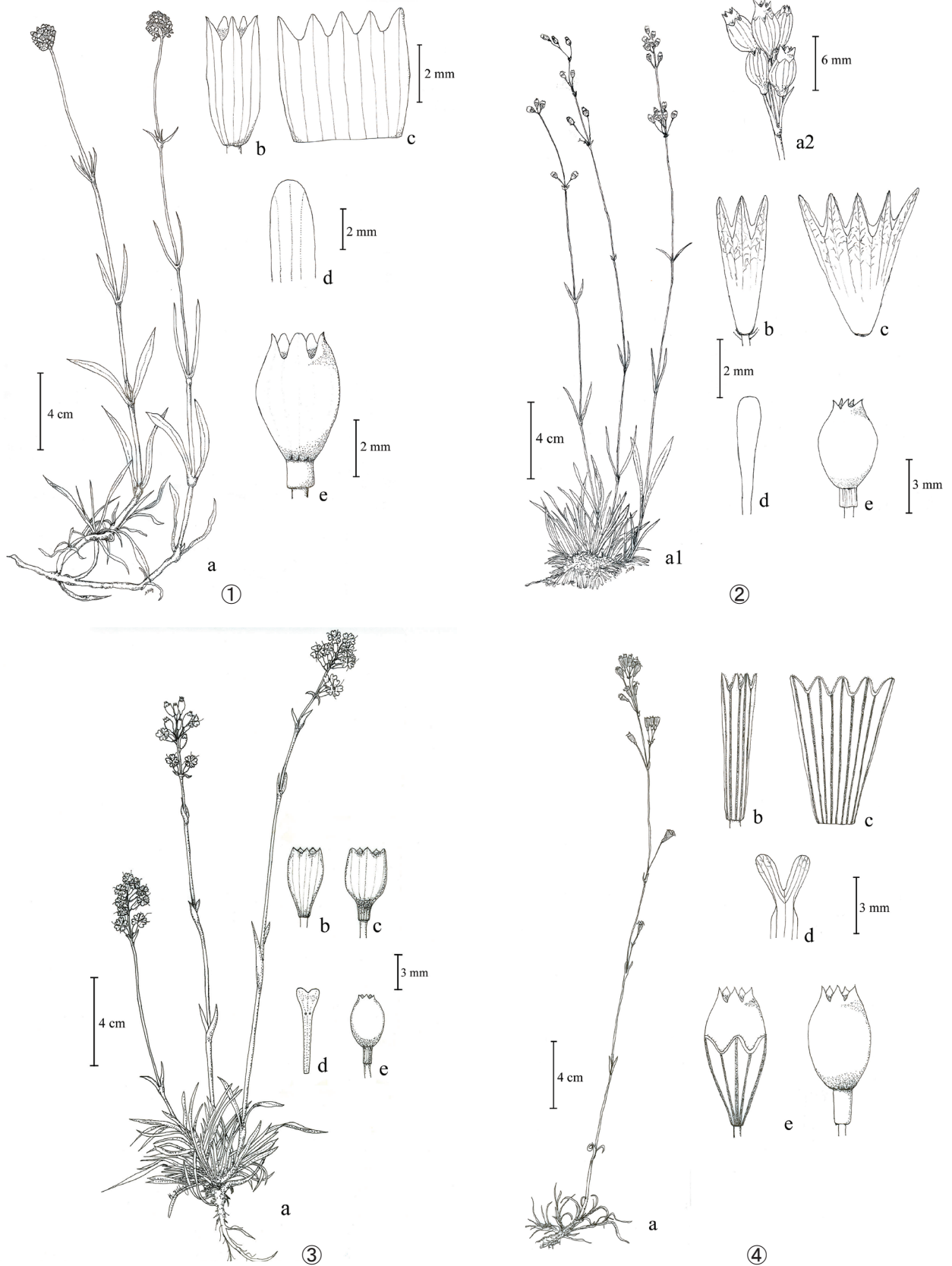


Figure 4. 1- *Silene capitellata*, 2- *S. isaurica*, 3- *S. olympica* subsp. *olympica*, 4- *S. lasiantha*. a- habit, b and c- calyx, d- petal, e- capsule.

13. *S. lasiantha* K.Koch, Linnaea 25: 712(1841) (Figure 4) (Yıldız & Çirpici, 2000).

= *Silene olympica* subsp. *lasiantha* (K.Koch) Chowdhuri, Notes Roy. Bot. Gard. Edinburgh, 22: 254 (1957).

= *S. asperifolia* Freyn, Bull. Herb. Boiss. 3: 97 (1895).

Type: [Turkey] East Anatolia, Koch s.n. (topotype: E!).

Turkey, North-West Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12149) (Yıldız et al., 2009b).

S. lasiantha was evaluated as the synonym of *S. marschallii* subsp. *marschallii* in the *Flora Iranica*. Nevertheless, findings obtained from this study show there are distinctive differences between these 2 species, and it is appropriate to evaluate them as separate species. The petal obtained from "A7 Sivas: Suşehri-Refahiye, 1800 m, Balls 1491, ANK!", which is recorded as *S. lasiantha* in the *Flora of Turkey*, has hairy leaves and, thus, shows characteristics of *S. lasiantha*. On the other hand, it was different as regards to its leaf form, branched, and inflorescence.

14. *S. manissadjianii* Freyn, Bull. Herb. Boiss. 3: 83 (1895) (Figure 5).

Type: [Turkey A5 Amasya] Pontus Galaticus, Amasia, in pascuis montanis montis Ak Dagħ, 10.09.1892, *Manissadjian* 942 (isotypes: ANK! K!, G, photo! ZT, photo!).

Endemic. Irano-Turanian element. Threatened category: NT.

Chromosome number: $2n = 24$ (MUFE 12100) (Yıldız et al., 2009b).

Section *Sclerocalycinae* Boiss., Fl. Orient. 1: 575 (1867).

15. *S. bupleuroides* L., Sp. Pl. 1: 421 (1753) (Figure 5) (Yıldız & Çirpici 2000).

1. Calyx 20–28 mm, upper part anastomosing, margin ciliate; bracts ovate, long acuminate, includes the buds in bracts; coronal scales obtuse subsp. *bupleuroides*

1. Calyx (26–) 30–35 (–37) mm, upper part not anastomosing, margin very small teeth; bracts elliptic-lanceolate, not including the buds in bracts; coronal scales acute subsp. *solenocalyx* subsp. *bupleuroides* (Figure 5) (Yıldız & Çirpici, 2000).

= *Silene longiflora* Ehrh, Beitr. 7: 144 (1792).

= *S. longiflora* var. *alpina* Boiss., Fl. Orient. 1: 639 (1867).

= *S. megalocalyx* Freyn., Bull. Herb. Boiss. 3: 82 (1895).

= *S. viscariaefolia* Boiss. Diagn. Pl. Orient. ser. 1(1): 30 (1843).

Type: described from Iran (Hb. Linn. 583/25, photo!).

Turkey, Balkans, Bulgaria, Romania, Central Europe, Crimea, South Russia, Armenia, North Iran. Widespread.

Chromosome number: $2n = 24$ (MUFE 12421) (Yıldız et al., 2009a).

subsp. *solenocalyx* (Boiss. & Huet) Melzh., Fl. Iranica [Rechinger] 163: 399 (1988) (Figure 5). **New record for Turkey.**

= *Silene bupleuroides* L. var. *solenocalyx* Boiss. & Huet, Boiss. Diagn. Pl. Orient. ser. 2(5): 57 (1856).

= *S. caramanica* Boiss. var. *solenocalyx* Boiss., Fl. Orient. 1: 642 (1867).

Type: Turkey [East Anatolia]: Ad Erzeroum [Erzurum], *Huet s.n.* (G-Boiss).

Fl. & Fr. July–August. Rocky places and meadows, 1500–2500 m. Turkey, Armenia, North Iran. Widespread.

Chromosome number: $2n = 24$ (MUFE 12128) (Yıldız et al., 2009a).

A8 Erzurum: Palandöken Da., around ski centre, 2465 m, 28.07.2005, K.Yıldız 054-1 & M.Y.Dadandı (MUFE 12128!); Erzurum: Erzurum to Tortum 38 km, 1950 m, 19.07.1990, N & E.Özhatay s.n. (ISTE 61949!); A9 Ardahan: Yalnızçam, around ski centre, N.E. slopes, 2045 m, 29.07.2005, K.Yıldız 058-1 & M.Y.Dadandı (MUFE 12139!); B9 Van: Özalp, between Şehittepe and Altınboğa, 2220 m, 30.07.2005, K.Yıldız 064-2 & M.Y.Dadandı (MUFE 12152!); C6 K.Maraş: Ahır Da., Çallıbaşı, 1750–1800 m, 10.06.1991, Z.Aytaç 4164 & H.Duman (GAZI!).

16. *S. caramanica* Boiss. & Heldr., Diagn. Pl. Orient. ser. 1, 8: 90 (1849) (Figures 5, 6) (Yıldız, 2006b).

1. Basal and cauline leaves more than 5 mm broad var. *ilarslanii*

1. Basal and cauline leaves less than 5 mm broad

2. Basal leaves linear to lanceolate, 20–67 mm long, cauline leaves to 5 mm broad; distance between bifid point of petal and coronal scales 4–6.5 mm var. *caramanica*

2. Basal leaves narrowly oblanceolate, 60–75 mm long, cauline leaves to 2 mm broad; distance between bifid point of petal and coronal scales 1–2 mm var. *idaea*

var. *caramanica* (Figure 5).

= *Silene porteri* Post ex Boiss., Fl. Orient. Suppl. 104 (1888).

= *S. kucukodukii* Bağcı & Uysal, Nordic J. Bot. 25: 306 (2007) **syn. nov.**

Type: [Turkey C4 Konya] in vineis prope Bounarpatschi inter Karaman et Ermenek Isauriae, 1846, *Heldreich s.n.* (holotype: G, photo!).

Endemic. East Mediterranean (mt) element. Threatened category: NT.

Chromosome number: $2n = 24$ (MUFE 12435) (Yıldız et al., 2009a).

var. *ilarslanii* Aytaç & Dural, Ann. Bot. Fenn. 41(3): 219 (2004) (Figure 6).

Type: C3 Antalya: Gündoğmuş, Geyik mountain, steppe, 2300–2500 m, R.İlarslan 3916 (holotype: GAZI!, isotype: GAZI!).

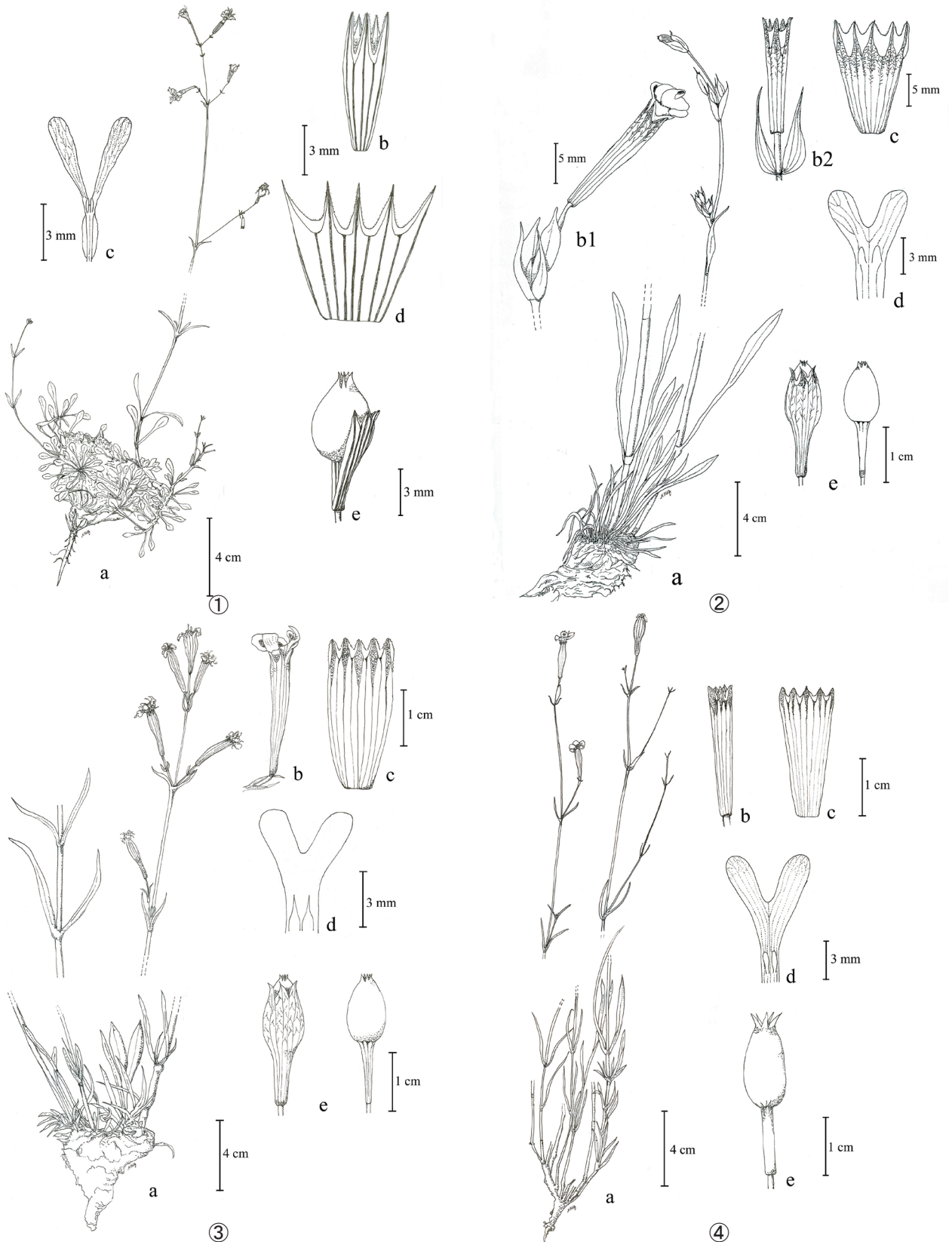


Figure 5. 1- *Silene manissadjianii*, 2- *S. bupleuroides* subsp. *bupleuroides*, 3- *S. bupleuroides* subsp. *solanocalyx*, 4- *S. caramanica* var. *caramanica*. a- habit, b and c- calyx, d- petal, e- capsule.

Fl. & Fr. July. Steppe, 2300–2500 m.

Endemic. Irano-Turanian. Threatened category: CR, B1a.

var. *idaea* (Hausskn.) K.Yıldız & Çırpıcı, **comb. & stat. nov.** (Figure 6) (Yıldız, 2006b).

= *Silene idaea* Hausskn., Mitth. Thüring. Bot. Vereins 5: 49 (1893). *S. sipylea* O.Schwarz, Feddes Rep. 36: 80 (1934) **syn. nov.**

Type: [Turkey BI Manisa] M. Sipylos Magnesiae [Manisa Da.] in fruticetis summi cacuminis, solo calcarea, ca. 1300–1400 m, 13.8.1933, O. Schwarz 1017 (holotype B, photo!).

Endemic. East Mediterranean (mt.) element. Threatened category: EN-B1a+C1+D.

Chromosome number: $2n = 24$ (MUFE 12430) (Yıldız et al., 2009a).

S. idaea displays a great similarity to *S. caramanica*. It was considered a new variety of *S. caramanica*. The hairlessness of the stem, with serrulate leaves or not, and the differences in calyx length were the distinguishing characteristics between the 2 species. Nonetheless, these characteristics did not show a correlation in this study; for example, MUFE 12298, 12299, and 12321 specimens display *S. caramanica* features as regards stem base hairiness and absence of serrulate basal leaf margin, while they show *S. idaea* features as regards calyx length. Likewise, the specimen numbered MUFE 12005 shows *S. caramanica* features as regards calyx length whereas it displays *S. idaea* features as regards presence of serrulate leaf margins. The other specimens studied display similar conditions. Therefore, *S. idaea* could not be a different species. The same conditions were also observed by Huber Morath, and he presented *S. idaea* as the synonym of *S. caramanica* (Candollea, no: 35, 1980). Since *S. idaea* is different from the other varieties of *S. caramanica*, it was considered a new variety of *S. caramanica*.

Plant specimens, along with *S. kucukodukii* Y.Bağcı & Uysal specimens, that were collected from regions where the type specimens display distribution were evaluated [Konya: Hadim to Bozkır 5 km, 1700–1750 m, 10.07.2005, K.Yıldız 027-1 & M.Y.Dadandı (MUFE 12069!); Konya: Hadim, nr. Bozkır, 1475 m, 10.07.2005, K.Yıldız 026-3 & M.Y.Dadandı (MUFE 12068!); Konya: Hadim, nr. Bozkır, 1475 m, 13.07.2006, K.Yıldız 0152-3 & M.Y.Dadandı (MUFE 12331!)] it was noted that they were not much different from *S. caramanica* var. *caramanica*. Therefore, *S. kucukodukii* is reduced to the synonym of *S. caramanica* var. *caramanica*.

17. *S. aydosensis* K.Yıldız & S.Erik, Ann. Bot. Fenn. 47: 152 (2010) (Figure 6) (Yıldız & Erik, 2010).

Perennials, stem erect, 18–30 cm, upper glabrous, below hairy or glabrous. Basal leaves spatulate, 28–65 mm, glabrous. Cauline leaves 5–25 mm, linear. Inflorescence racemose, frequently 2–3 flowers, sometimes solitary.

Pedicle erect, 20–67 mm. Calyx glabrous, 25–32 mm, inflated in fruit, veins prominent thick, reddish, with 5 long teeth, teeth margins hyaline. Petals glabrous, creamy, not auriculate, petal limbs bipartite to the middle (1/2) into oblong lobes, lobes c. 4 mm, no coronal scales, 2 small bulges present, exerted from calyx. Stamens 12–15 mm, pistil 9–10 mm, filaments and styles glabrous. Gynophore 15–20 mm, glabrous. Capsule 10–12 × 6–7 mm, ovoid, included in or exerted from calyx. Seeds reniform.

Holotype: Turkey. C5 Konya, Ereğli, Aydos mountain, Aktoprak, damaged *Quercus*, *Pinus* forest, 1700 m, 28.08.1973, S.Erik 2614 (HUB 3630!). Paratype: Turkey. C2 Muğla, between Köyceğiz and Ağa village, 1400 m, 03.09.1992, A.Güner 10890 (ANK!).

Fl. & Fr. July–August. Screen of *Quercus*, *Pinus* forest, limestone area, 1400–1700 m. Endemic. Mediterranean (mt) element. Threatened category: EN.

S. aydosensis is related to *S. caramanica* and *S. doganii* A.Duran & Y.Menemen. Coronal scales missing (only 2 small bulges). Basal leaves spatulate. Gynophore 15–20 mm at *S. aydosensis*. Distinct coronal scales present. Basal leaves linear to lanceolate or oblanceolate. Gynophore 7–23 mm in *S. doganii* and *S. caramanica*.

18. *S. doganii* A.Duran & Menemen, Bot. J. Linn. Soc. 143: 109 (2003) (Figure 6).

Stem 30–60 cm, glabrous, glaucous perennial, viscid above, tinged purple and densely leafy at the base, many branched from the base. Leaves dimorphic, basal leaves ± fleshy, oblanceolate, 10–15 mm, glabrous, with minutely ciliate margin, especially at the base, acuminate. Young leaves glaucous green, older ones dark purple. Cauline leaves 8–17 mm, gradually decrease towards flowering part, lower and middle cauline leaves narrowly oblanceolate to linear, narrowed into petiole, with green (not scarious) margin, acute to acuminate, glabrous, glaucous green; upper cauline leaves lanceolate to subulate. Inflorescence reduced to single flower or racemose, glabrous, viscid. Pedicels 5–30 mm, glabrous, viscid. Calyx 22–27 mm, glabrous, glaucous, partly green and purple, constricted around gynophore, sometimes nerves obscured. Petals longer than calyx, violet, divided to the base, spatulate lobes 5–11 mm, 2 coronal scales present. Stamen 22–25 mm, pistil 10–12 mm, filaments and styles glabrous. Capsule 12–15 × 6–9 mm, included in calyx. Gynophore glabrous, 8–11 mm. Seed 2.3–2.6 × 1.4–1.7 mm, reniform.

Type: Turkey. C6 Osmaniye: Amanos mountain, Zorkun plateau, Keldazi hill, 1750 m, 5.08.2001, A.Duran 5759 & Y.Menemen (Holotype: ADO, isotypes: ANK, GAZI! HUB!).

Fl. & Fr. June–August. In granite rocky places of forest-steppe ecotone, 1700–1950 m.

Endemic. East Mediterranean (mt) element. Threatened category: CR-D.

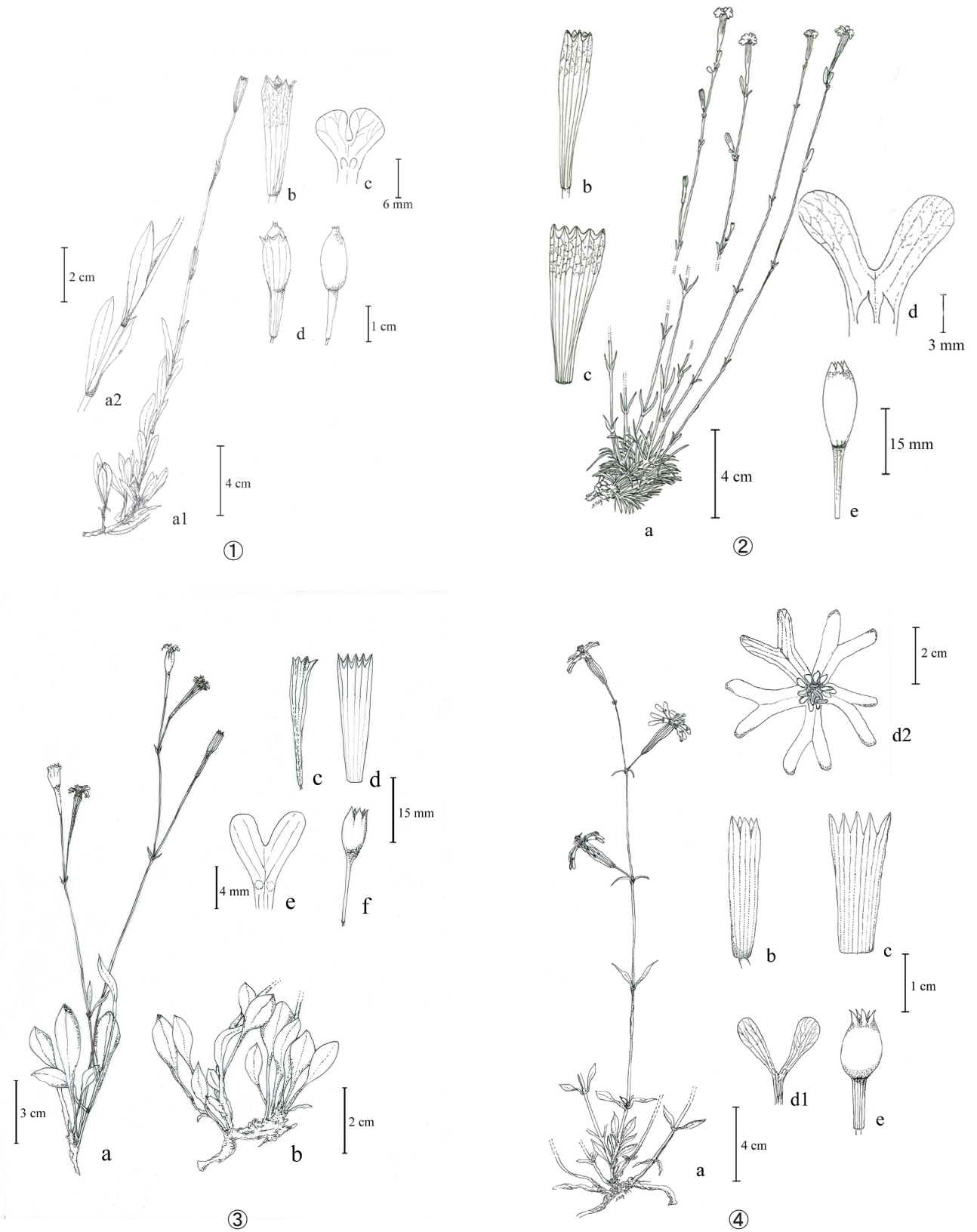


Figure 6. 1- *S. caramanica* var. *ilarslanii*. a1- habit, a2- cauline leaves, b- calyx, c- petal, d- capsule. 2- *S. caramanica* var. *idaea*, 3- *S. aydosensis*. 2, 3: a- habit, b- basal leaves, c and d- calyx, e- petal, f- capsule. 4- *S. doganii*. 2, 4: a- habit, b and c- calyx, d- petal, e- capsule.

Chromosome number: $2n = 24$ (MUFE 12378) (Yıldız et al., 2009a).

C6 Osmaniye: above Zorkun plateau, in valley, 1870–2000 m, 09.07.2006, *K.Yıldız* 0136 & *M.Y.Dadandı* (MUFE 12307!); Osmaniye: above Zorkun plateau, in valley, 1850–1950 m, 18.08.2006, *K.Yıldız* 0172-1 & *M.Y.Dadandı* (MUFE 12378!).

Silene doganii is similar to *S. caramanica*. It is differentiated from *S. caramanica* by its completely hairless stem, viscid above, 4–6 mm bracts (not 3–10 mm), violet petals and 8–11 mm gynophore (not 7–23 mm).

19. *S. peduncularis* Boiss, Diagn. Pl. Orient. ser. 1(1): 30 (1843) (Figure 7).

Type: [Iran] Seid Khodji, *Aucher* 4219 (holotype: G, photo!).

Turkey; North, North-West, and Central Iran; Khorassan. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12120) (Yıldız et al., 2009a).

It was presented in the *Flora of Turkey* without indicating any special locality, based on Chowdhuri's doctoral work. However, it was possible to collect them from Gümüşhane and Bayburt.

20. *S. armena* Boiss., Diagn. Pl. Orient. ser. 1(1): 29 (1843) (Figure 7).

1. Petals bipartite to the middle (1/2); coronal scales obtuse; calyx smooth between the nerves var. **armena**

1. Petals bifid, divided to the base; coronal scales acute; calyx punctuate-rugose between the nerves var. **serrulata** var. **armena** (Figure 7).

= *Silene dianthifolia* Gay, Asie Min. Bot. [Tchihat.] 1: 193 (1860).

= *S. scabridula* Boiss., Fl. Orient. 1: 643 (1867).

= *S. tenuicaulis* Freyn & Sint., Öst. Bot. Zeitschr. 40: 12 (1890).

= *S. filipes* Freyn & Sint., Bull. Herb. Boiss. 3: 98 (1895).

= *S. amasiensis* (Freyn) Bornm., Feddes Rep. Beih. 89(1): 116 (1936).

= *S. lycica* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 256 (1957).

Type: [Turkey B8 Erzurum] East Anatolia circa Erzurum, *Aucher* 427 (isotypes: BM, photo! LE, photo!).

Endemic. Threatened category: LC.

Chromosome number: $2n = 24$ (MUFE 12129) (Yıldız et al., 2009a).

var. **serrulata** (Boiss.) Coode & Cullen, Notes Roy. Bot. Gard. Edinburgh 28: 1 (1967). (Figure 7).

= *Silene serrulata* Boiss., Fl. Orient 1: 643 (1867).

Type: [Turkey C2 Antalya] in collibus Lyciae prope Elmali, *Bourgeau* 56 (isotype: E!).

Endemic. East Mediterranean element. Threatened category: NT.

Chromosome number: $2n = 24$ (MUFE 12081) (Yıldız et al., 2009a).

21. *S. laxa* Boiss. & Kotschy, Fl. Orient. Boiss. 1: 638 (1867) (Figure 7).

Type: [Turkey B8 Bingöl] in saxosis praeruptis ad radicem australes montis Bingöl Dag [Bingöl dağları] prope Goschkar East Anatolia, *Kotschy* 376 (isotypes: LE, photo! G).

Turkey, North Iraq. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12328) (Yıldız et al., 2009a).

S. laxa and *S. caesarea* are morphologically similar. However, *S. laxa* is distinguished from it by ovate stem leaves, its leaf height is 2–2.5 times greater than width, and its calyx is 16–27 mm in length.

22. *S. caesarea* Boiss. & Balansa, Diagn. Pl. Orient. ser. 2(6): 31 (1859) (Figure 8).

= *Silene idrisiaca* Bornm., Feddes Rep. Beih. 89(1): 114 (1936).

Type: [Turkey B5 Kayseri] in cacumine montis Ali Da. supra Caesaream [Kayseri] Cappadociae, alt. 1700 m, *Balansa s.n.* (isotype: K!).

Turkey, Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12060) (Yıldız et al., 2009a).

23. *S. chlorifolia* Sm., Pl. Icon. Ined. 1: 13, t. 13 (1789) (Figure 8) (Yıldız & Çirpici 2000).

Type: Amasia: in rupebilis (d vinelis) Verbatim Locality: Amasia: in rupebilis (d vinelis) *Bornmueller* J.F.N. Jun 15, 1889 (PH, photo!).

Turkey, Greece, Lebanon, Palestine, Caucasus, North Iraq, Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12056) (Yıldız et al., 2009a).

S. chlorifolia and *S. swertiifolia* are very similar to each other. Stem leaves are amplexicaul in *S. chlorifolia* but cuneate in *S. swertiifolia*.

24. *S. swertiifolia* Boiss., Diagn. Pl. Orient. ser. 1(1): 32 (1843) (Figure 8).

Type: [Turkey] in Cappadocia orientalis, *Aucher* 451 (LE, photo!); [Iran] in monte Demawend Persiae, *Aucher* 4215 (MO, photo!).

Turkey, Palestine, Syrian Desert, North Iraq, Iran, Turkestan. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12046) (Yıldız et al., 2009a).

25. *S. sclerophylla* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 261 (1957) (Figure 8).

= *Silene sclerophylloides* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 262 (1957).

= *S. bitlisensis* Tugay & Ertuğrul, Bot. J. Linn. Soc. 156 (3): 463–466 (2008). **syn. nov.**

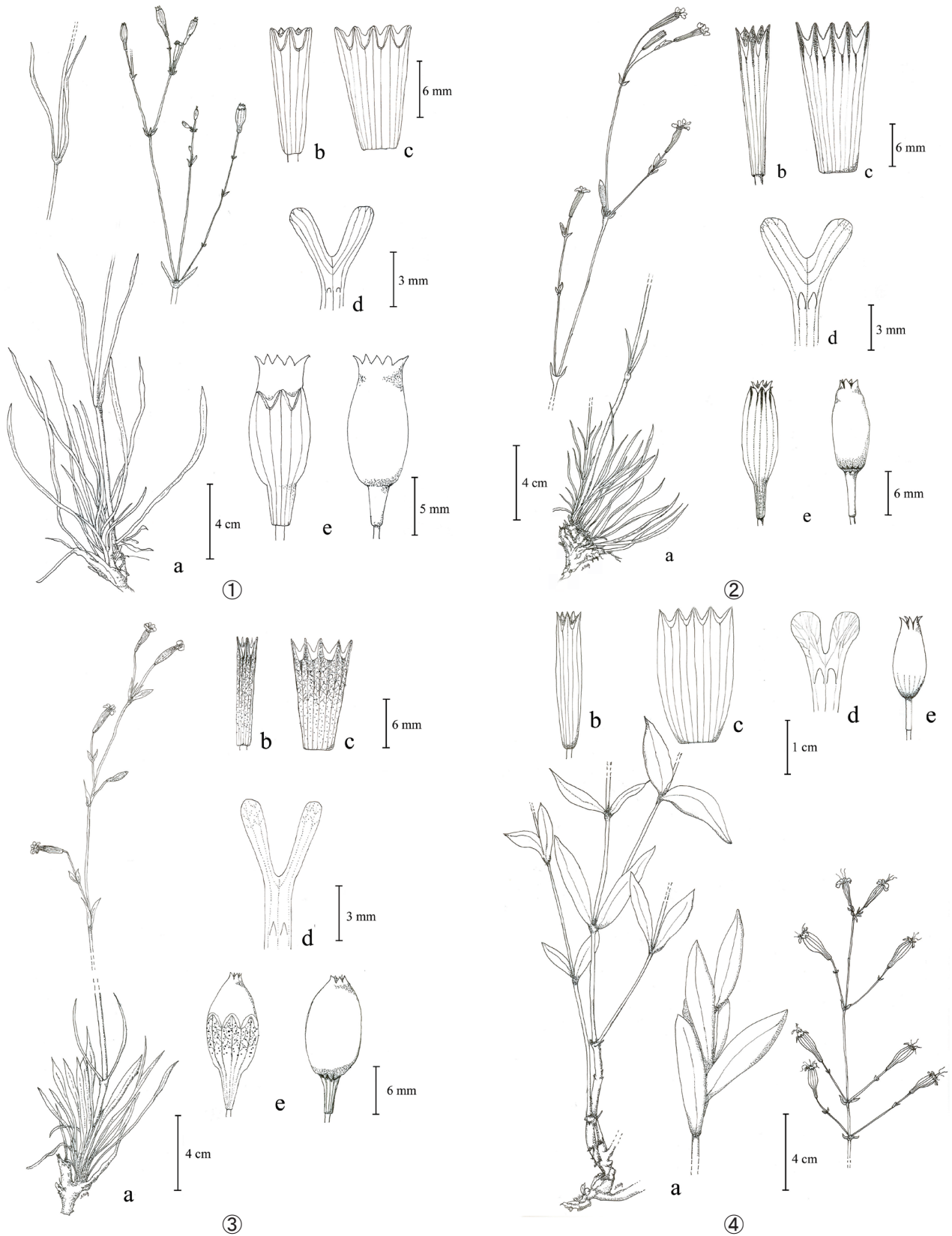


Figure 7. 1- *Silene peduncularis*, 2- *S. armena* var. *armena*, 3- *S. armena* var. *serrulata*, 4- *S. laxa*. a- habit, b and c- calyx, d- petal, e- capsule.

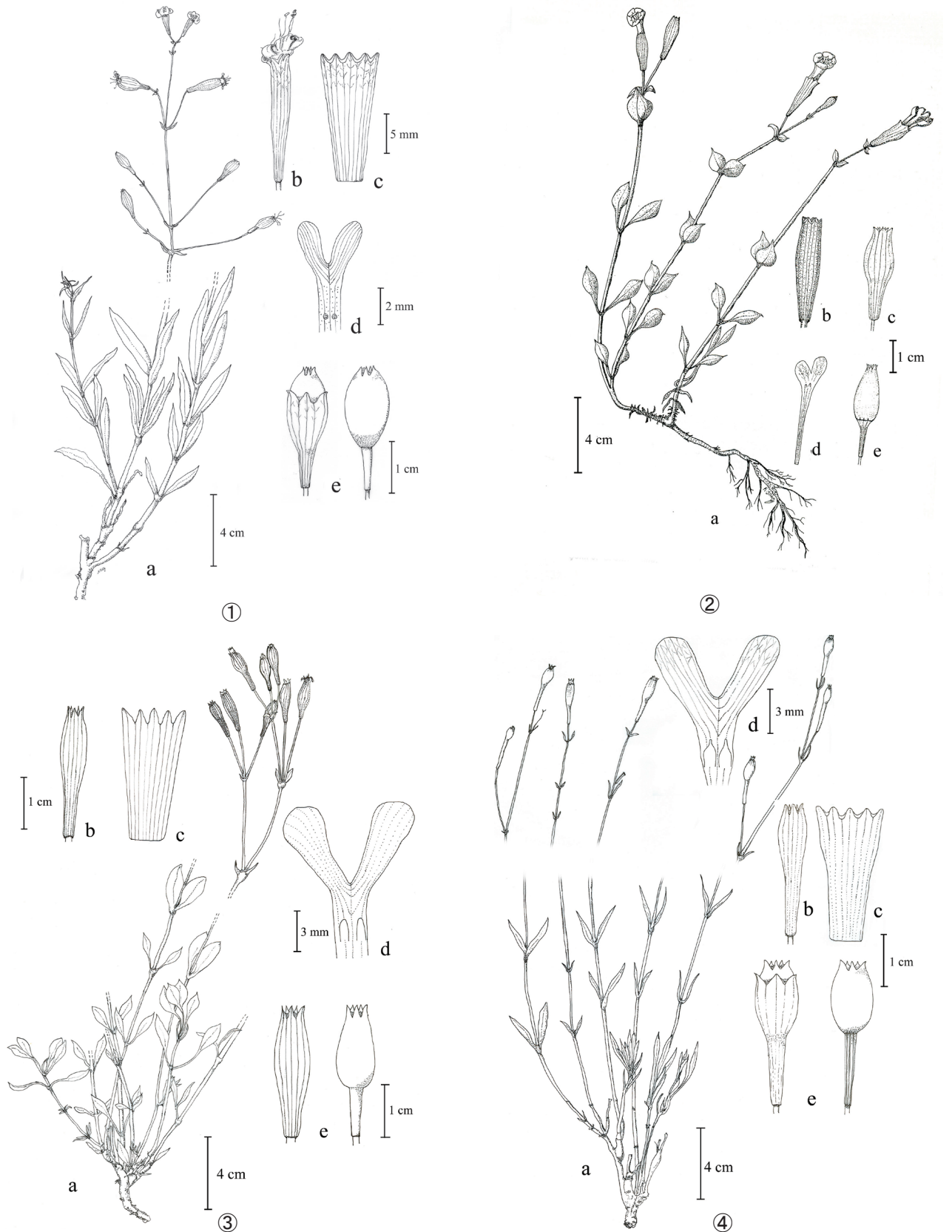


Figure 8. 1- *Silene caeserea*, 2- *S. chlorifolia*, 3- *S. swertiifolia*, 4- *S. sclerophylla*. a- habit, b and c- calyx, d- petal, e- capsule.

Type: Turkey C9 Hakkâri, Cilo dağ, in Diz deresi, 1700 m, gravel terraces, flowers pink, 6.08.1954, *Davis & Polunin*, D. 23921 (holotype: K! isotypes: E! ANK!).

Turkey, Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 12171) (Yıldız et al., 2009a).

Specimens of *Silene bitlisensis* collected from their type localities and various herbaria were examined [B9 Bitlis: Tatvan, Pelli mountain, south slopes, 2500–2800 m, alpine steppe, calcareous rocky places, 19.08.1972, *H. Peşmen s.n.* (HUB 3876!); Tatvan, Balaban to Tatvan 12 km, 2 km after Kuzgunkıran pass, 2060 m, 19.07.1976, *H. Demiriz, B. Tutel & A. Çırpıcı s.n.* (ISTF 29903!); Van: Van-Tatvan 40 km to Tatvan, S. slopes, 1750 m, 01.08.2005, *K. Yıldız 069-1 & M.Y. Dadandı* (MUFE 12171!); Ağrı: Eleşkirt, Tahir Da., 23.07.1962, *A. Pamukçuoğlu s.n.* (EGE 13277!); Ağrı: Eleşkirt-Horosan 19 km, E. of Tahir Da., 2400 m, 24.07.1966, *Davis 47169* (ISTO 11711!); B10 Ağrı: Doğubayazıt, around İshakpaşa Sarayı, hills, 1895 m, 30.07.2005, *K. Yıldız 063-1 & M.Y. Dadandı* (MUFE 12151!); C9 Hakkari: Cilo Da., Diz De., c. 1700 m. 06.08.1954, *Davis 23921 & O. Polunin*, (isotype: ANK!); C10 Hakkari: from Yüksekova to Şemdinli 47 km, Sapatan pass, 1830 m, 29.07.1987, *A. Baytop, E. Tuzlacı & A. Meriçli s.n.* (ISTE 41302!)] and identified as *S. sclerophylla*. The specimens of *S. bitlisensis* and *S. sclerophylla* were compared, and these 2 species are similar. Thus, *S. bitlisensis* is the synonym of *S. sclerophylla*.

26. *S. cartilaginea* Hub.-Mor., Notes Roy. Bot. Gard. Edinburgh 28: 1 (1967) (Figure 9).

Type: Turkey [C9] Van, distrikt Gürpınar, Çuh Gediği, Pass zwischen Hoşap und Başkale, *Artemisia* - steppe am Nordwesthang, Conglomerat, 2150–2200 m, 09.07.1951, *Huber-Morath 11169* (holotype: G, photo!).

Endemic. Irano-Turanian element. Threatened category: EN-D.

The species was not re-collected from the field. The distribution is based herbarium specimens.

27. *S. haradjianii* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 263 (1957) (Figure 9).

Type: [Turkey C6 Hatay] Mt. Amanus, 1200 m, viii 1906, *Haradjian 469* (holotype: K!).

Endemic. East Mediterranean (mt) element. Threatened category: CR-D.

Chromosome number: $2n = 24$ (MUFE 12383) (Yıldız et al., 2009a).

28. *S. frivaldszkyana* Hampe, Flora 20 (1): 227 (1837). (Figure 9).

Type: Turkey, *Frivaldszky*.

Turkey, Balkans, Bulgaria, Albania. Widespread.

Chromosome number: $2n = 24$ (MUFE 12389) (Yıldız et al., 2009a).

A1(E) Edirne: Keşan, Mecidiye coast, near military camp, s.l., 25.08.2006, *K. Yıldız 0180*, MUFE 12389!

29. *S. lycaonica* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 263 (1957) (Figure 9).

Type: Turkey C4 Konya, between Sanjak (Sancak) yayla and Üçpınar (S of Bozkır), 2.09.1947, *Davis 14586* (holotype: K!).

Endemic. Irano-Turanian element. Threatened category: LC.

Chromosome number: $2n = 24$ (MUFE 12357) (Yıldız et al., 2009a).

This species, which was only known from the type gathering, has been collected many times from West and South Anatolia recently.

Section *Chloranthae* Rohrb., Monogr. Sil. 74 (1867).

30. *S. viscosa* Pers., Syn. Pl. 1: 497 (1805) (Figure 10).

≡ *Cucubalus viscosus* L., Sp. Pl. 414 (1753).

≡ *Elisanthe viscosa* (L.) Rupr., Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7 15: (2) 200 (1869).

≡ *Melandrium viscosum* (L.) Čelak., Lotos 18: 118 (1868).

Type: described from Europe and Orient (Hb. Linn. 582/7).

Turkey, most of Europe, Caucasus, Syrian desert, Iran, Siberia, India. Widespread.

Chromosome number: $2n = 24$ (GAZI, A1999).

31. *S. paphlagonica* Bornm., Magyar Bot. Lapok 30: 60 (1931) (Figure 10) (Yıldız & Çırpıcı, 2000).

Type: [Turkey A4 Çankırı] in montis Ilgaz Dag. inter Çankris [Çankırı] et Kastamuni [Kastamonu], 2000–2100 m, 20 & 23 vi 1929, *Bornmüller s.n.*

Endemic. Black Sea element. Threatened category: EN-B2a.

Chromosome number: $2n = 24$ (MUFE 12093) (Yıldız & Çırpıcı, 1996).

This species is very similar to *S. viscosa*. The features that differ from *S. viscosa* are the calyx and gynophores, which are 13–19 mm and 4–10 mm, respectively.

Section *Tataricae* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 236 (1957).

Synonym: Sect. *Chloranthae* subsect. *Tataricae* Schischkin in Komarov, Fl. U.R.S.S. 06, 619 (1936), descr. russ.

32. *S. eremitica* Boiss., Fl. Orient. Boiss. 1: 644 (1867) (Figure 10).

Type: [Iran] in eremo arenoso subsalso prov. Aderbidjan Persise inter Khoi et Seidkhodji, *Szowits s.n.* (holotype: G, photo!).

Turkey, Iran. Irano-Turanian element. Widespread.

Chromosome number: $2n = 24$ (MUFE 16076).

33. *S. demirizii* K.Yıldız & Çırpıcı, Nordic J. Bot. 28(3): 332–336 (2010) (Figure 10) (Yıldız et al., 2010).

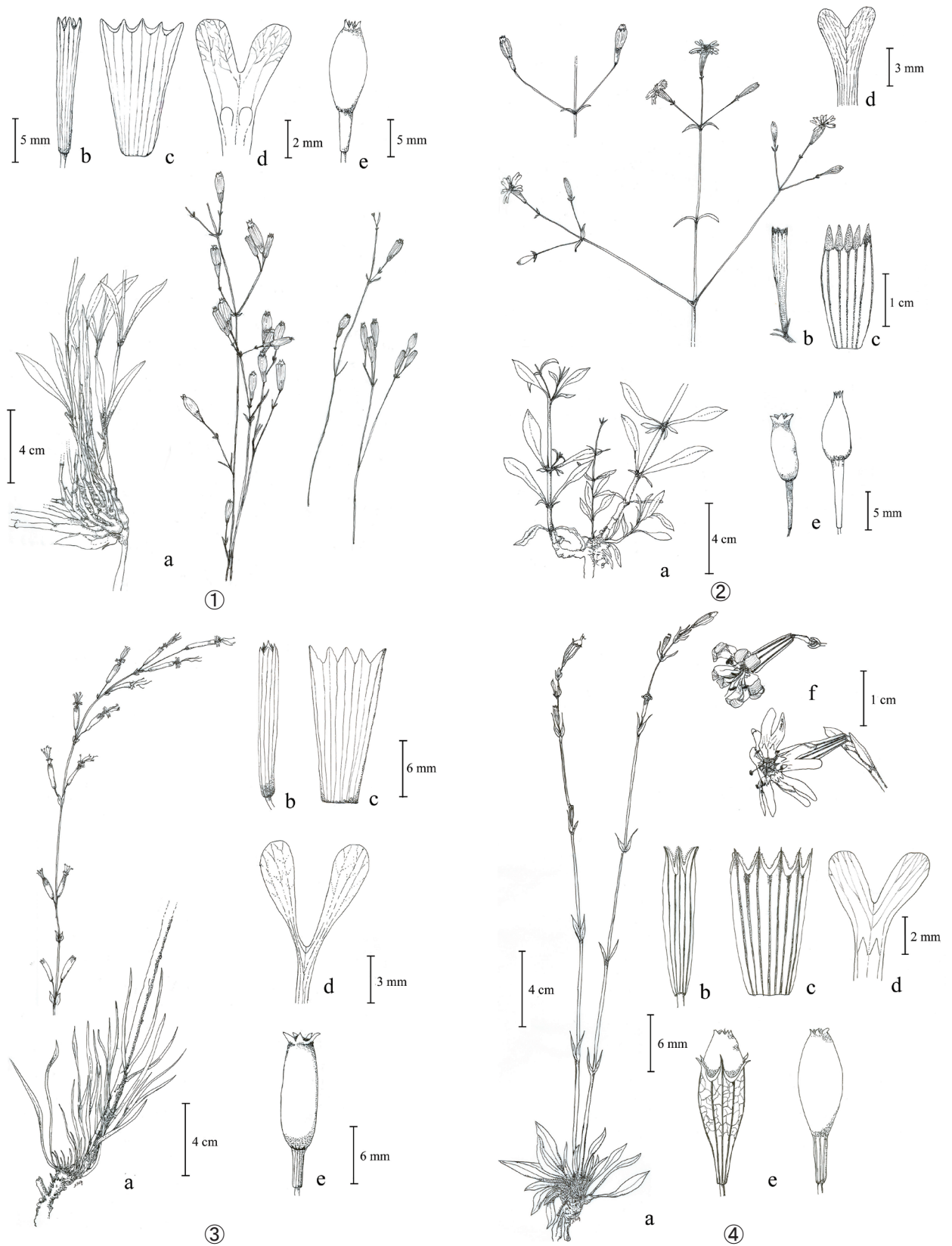


Figure 9. 1- *Silene cartilaginea*, 2- *S. haradjianii*, 3- *S. frivaldszkyana*, 4- *S. lycaonica*. 1, 2, 3, 4: a- habit, b and c- calyx, d- petal, e- capsule. 4: f- flowers.



Figure 10. 1- *Silene viscosa*, 2- *S. paphlagonica*, 3- *S. eremitica*, 4- *S. demirizii*. 1, 2, 3, 4: a- habit, b and c- calyx, d- petal, e- capsule. 3: b1- calyx, b2- flowers. 4: b- basal leaf, c- cauline leaf, d and e- calyx, f- capsule, g- petal.

Perennial. Stem erect, glaucous, glabrous, 42–65 cm. Middle and upper stem viscous, blackish in anthesis. Basal leaves in rosette, linear to oblanceolate, 32–65 mm, acute, flat, glabrous, prominent nerve. Cauline leaves linear, glabrous, 25–40 mm, on prominent node. All leaves sessile and margins hyaline and papillate. Inflorescence panicle, with an alar flower. Pedicel erect, 7–10 mm. Calyx glabrous, 9–12 mm, inflated in fruit, with 5 teeth, teeth hyaline margins. Petals glabrous, creamy, not auriculate, exerted from calyx. Limbs bipartite to the middle (1/2) into oblong lobes, lobes 2.5–3.5 mm, coronal scales not present but small bulge present. Stamens 12–13 mm, pistil 7–9 mm, filaments and styles glabrous. Gynophore 2–4 mm, glabrous. Capsule 7–14 × 2.5–5 mm, oblong-ovoid, more exerted from calyx. Seed 1.6–1.9 × 1.1–1.3 mm, reniform.

Type: Turkey. B7 Erzincan: Refahiye to Erzincan 21 km, steppe, between natural gas pipe line and road, south slopes, 1850–2200 m, 27.07.2005, *K.Yıldız* 049-4 & *M.Y.Dadandı* (holotype: MUFE 12110! isotypes: Celal Bayar Univ. Herb.!, Erciyes Univ. Herb.!).

Fl. & Fr. July–August. Roadsides and slopes, 1850–2200 m.

Endemic. Irano-Turanian element. Threatened category: VU-B1ab (iii).

Chromosome number: $2n = 24$ (MUFE 12110) (Yıldız et al., 2010).

S. demirizii is distinguished from *S. eremitica* by its linear stem leaves, 2.5–3.5 mm long petal lobes, and capsule, which is more extended from calyx. Petal lobes 5–6 mm in *S. eremitica*.

34. *S. skorpii* Velen, Sitz.-Ber. Böhm. Ges. Wiss. 1: 39 (1890) (Figure 11).

Type: [W Bulgaria] “Kistendly [Kjustendil]”, Aug.1887, *Vandas & Velenovsky s.n.* (PR).

Balkans, Bulgaria, Thrace (Turkey in Europe). Threatened category: LC.

Chromosome number: $2n = 24$ (MUFE 12387).

Section *Otites* (Adams.) Otth, Candollea, Prodr. 1: 369 (1824).

Synonyms: Sect. *Otiteae* Boiss., Fl. Orient. 1: 571 (1867).

Sect. *Otites* Otth, Subsect. *Sibiricae* Schischkin ex Chowdhuri.

35. *S. otites* (L.) Wibel, Prodr. Fl. Werthem. 241 (1799) (Figure 11) (Yıldız & Çırpıcı, 2000).

= *Cucubalus otites* L., Sp. Pl. 415 (1753).

= *Silene trichocalycina* (Boiss.) Bornm., Feddes Rep. Beih. 89(1): 108 (1936).

= *S. roopiana* Kleopow, Zhurn. Inst. Bot. Vseukraïns’k. Akad. Nauk 9: 115 (1936).

Turkey, most of Europe, Caucasia, North Iran, Siberia. Widespread.

Chromosome number: $2n = 24$ (MUFE 12001) (Yıldız & Çırpıcı, 1996).

S. otites (Figure 11) is a rather polymorphic species and, thus, has numerous synonyms. *S. densiflora* d’Urv. (Figure 11) and *S. exaltata*, which are displayed as the synonyms of *S. otites* in the *Flora of Turkey*, rank as valid species in the *Flora of Europe*, *Flora of Greece*, and *Flora of the U.S.S.R.* (Komarov, 1936). *S. densiflora* is a new record for the *Flora of Turkey*.

36. *S. densiflora* d’Urv., Mém. Soc. Linn. Paris 1: 303 (1822) (Figure 11).

= *Silene otites* subsp. *densiflora* (d’Urv.) Asch. & Graebn., Syn. Mitteleur. Fl. 5: (2) 197 (1921).

= *Otites densiflorus* (d’Urv.) Grossh., Fl. Kavkaza, ed. 2(3): 255 (1945).

= *Otites dolichocarpus* Klokov, Ukraïns’k. Bot. Žurn. 5(1): 23 (1948).

= *S. exaltata* Friv., Flora 28: 333 (1835).

= *S. macroclada* Boiss., Diagn. Pl. Or. 8: 84 (1849).

Biennial, stem 80–150 cm long, stem and leaves with dense, long-villose eglandular indumentum, somewhat crisp soft hairs, sometimes viscid above, branched in inflorescence. Basal leaves numerous, obovate to elliptic or oblanceolate. Lower cauline leaves 30–45 mm, lanceolate-oblong, acute, gradually tapering to a short broad petiole, both surfaces covered with patulous slightly crisped hairs. Leaves of axillary fascicles smaller, narrow. Flowers in clusters on stem and on ascending inflorescence branches. Pedicels 2–7 mm, filiform. Bracts crowded at the base of pedicels, broad-ovate, acute, membranous, with long-ciliate margin. Calyx 3–3.5 mm, glabrous, membranous-margined, fruiting calyx tightly enclosing capsule. Petals whitish, entire limb 1–2 mm, petal claw sparsely ciliate, coronal scales absent. Gynophore absent or c. 1 mm. Capsule 5–6.5 × 3–4 mm. Seeds reniform, 1.1–1.4 × 0.7–0.9 mm.

Type: [Bulgaria] “Rumelia”. 1834 [Hinke & Manolesko in] *Frivaldszky s.n.* (isotypes: K!, LE, WU, MW, photo!).

Fl. & Fr. May–June. Stony slopes, and sandy or stony steppes. Peninsula, Bulgaria, Romania, Russia, Thrace; 0–900 m. Widespread.

Chromosome number: $2n = 24$ (MUFE 12388).

A1(E) Edirne: Edirne–Lalapaşa road, 500 m–1 km, near road and hill ridges, 100–150 m, 8.07.2006, *K.Yıldız* 0143 (MUFE 12317!) *ibid.* 25.08.2006, *K.Yıldız* 0179 (MUFE 12388!).

37. *S. confertiflora* Chowdhuri, Notes Roy. Bot. Gard. Edinburgh 22: 264 (1957) (Figure 11).

Type: [Syria] Phurunluq nr. Massiab, 450 m, in forest of *Platanus*, *Alnus* & *Quercus*, 09.09.1952, *Mooney* 4580 (holotype: K!).

Turkey, Syrian desert. East Mediterranean element. Threatened category: NT

Chromosome number: $2n = 24$ (MUFE 12381).



Figure 11. 1- *Silene skorpilii*, 2- *S. otites*, 3- *S. densiflora*, 4- *S. confertiflora*. 1, 2, 3, 4: a- habit, b and c- calyx, d- petal, e- capsule. 4: b1- calyx, b2- flower, d1 and d2- petal.

4. Discussion

The revision of the sections *Siphonomorpha*, *Lasiostemon*, *Sclerocalycinae*, *Chloranthae*, *Tataricae*, and *Otites* of the genus *Silene*, which is represented by 164 taxa in the *Flora of Turkey*, was conducted in this study. The images of type specimens belonging to 16 species were obtained from various herbaria, photographs from the *Flora of Iran* belonging to 5 species were used, and 13 species were collected from their type localities.

Although *S. phrygia* was only known from its type specimens it was collected during this study. The presence of *S. viridiflora*, usually distributed in Mount Amanos, northern Anatolia, was interpreted as a surprising split in the *Flora of Greece*. This may be due to the fact that the western sections of Mount Amanos have a climate similar to the climate in northern Anatolia. It was noted that *S. caesarea* and *S. sclerophylla*, which are recorded as endemic in the *Flora of Turkey*, also appear in the *Flora of Iran* (Melzheimer, 1988). Therefore, *S. caesarea* and *S. sclerophylla* were not endemic for the *Flora of Turkey*. *S. ruprechtii* Schischkin, the synonym of *S. saxatilis*, was presented as a valid species in the *Flora Iranica* (Melzheimer, 1988). *S. saxatilis* M.B. (not *S. saxatilis* Sims) was regarded as the synonym of *S. ruprechtii* in that *Flora*. *S. peduncularis* was presented without specifying localities in the *Flora of Turkey*, based on the doctoral research by Chowdhuri (1957). Nonetheless, this species was obtained from localities within Gümüşhane and Bayburt provinces in this study; thus, its existence in Turkey was proven conclusively. *S. lycaonica*, which was known only from type specimens and was considered endangered (EN) in the *Red Book of Turkish Plants* (Ekim et al., 2000). It was collected from West and South Anatolia many times and was determined LR (cd) in Turkey. *S. cartileginea* was recorded from Van, Gürpınar, Çuh Gedigi, Hakkâri, and Cilo mountain in the *Flora of Turkey*. It was not possible to collect these species during field work for this study. Thus, the investigation of this species was based on the previously collected herbarium specimens.

When the studies on *Silene* were examined, it was observed that Chowdhuri (1957) arranged the *Silene* species into 44 sections and determined the features of the sections, whereas Melzheimer (1977) biosystemically revised the *Silene* taxa in the Balkans. Although pollen features in this study showed some differences among species, they did not reach a level appropriate for distinguishing among species; however, seed testa features included diagnostic characteristics that could be used for distinguishing species and subspecies.

During our studies we observed that great similarities between some species and variation among the species do exist. *S. italica*, which is not separated into subspecies in the *Flora of Turkey*, was separated into subspecies in the *Flora*

of Europe and the *Flora of Greece* [subsp. *italica*, subsp. *nemoralis* (Waldst. & Kit.) Nyman, subsp. *peloponnesiaca* Greuter] and into varieties in the *Flora of Bulgaria*. From the examinations conducted it became clear that all of the samples in Turkey were *S. italica* subsp. *italica*. Moreover, *S. sieberi*, which was presented as the synonym of *S. italica* in the *Flora of Turkey*, is actually not the synonym of this species; it was an endemic species growing in Crete and was not distributed in Turkey.

Although the *Flora of Turkey* considered *S. splendens* very similar to *S. italica*, these 2 species are easily distinguished from each other by the differences in their leaf forms and veins (Figure 1). Signifying that it had not been available for collection for a long period of time, *S. amana* was put into the category of DD (deficient data) in the *Red Book of Turkish Plants* (Ekim et al., 2000). Nonetheless, this species was collected from its type locality and surrounding localities by the researchers. It was concluded that the species, which has a rather limited distribution, should be categorised CR-B2b+D.

There are 2 different varieties of *S. gigantea*, var. *gigantea* and var. *incana*. Greuter (1997) evaluated these species as subspecies in the *Flora of Greece*; and also changed var. *incana* to subsp. *rhodopea*, and took into consideration their distribution in Turkey while accepting these subspecies. The evaluation in the current study was based on Greuter. The most important difference between these 2 subspecies is that lateral cymes are closely spaced, and their calyxes are generally simple and infrequently glandular haired while lateral cymes are loose and calyxes are very infrequently glandular haired or hairless in subsp. *rhodopea* (Figure 1).

S. phrygia (Figure 2) is a species that was first published in *Flora Orientalis* (Boissier, 1867). Its type specimens were collected from B2 Usak and C2 Antalya. *S. ispartensis* was represented as a new species by Ghazanfar in 1983. Ghazanfar signifies that *S. ispartensis* displays great similarity with *S. phrygia*; it was reduced to a synonym of *S. phrygia*.

A new subspecies of *S. marschallii* was identified for Turkey during this study (Figure 3) and presented to the scientific world as *S. marschallii* subsp. *anamasi* (Yıldız et al., 2010). *S. lasiantha* was given as the synonym of *S. marschallii* subsp. *marschallii* in the *Flora Iranica* (Melzheimer, 1988). In this study, however, distinctive differences between these 2 species were observed, and they were evaluated as different species. The most significant morphological difference was that the flowers of *S. marschallii* were more widely divaricated.

Silene erciyesdaghensis (Aksoy et al., 2008), which was recently made a new species, was distinguished from *S. olympica* (Figure 4). In the evaluation conducted on *S. erciyesdaghensis* no distinctive difference was observed

between these 2 species. *S. erciyesdagghensis* differed from *S. olympica* in that the lower flowers are capitate or 2(–3) distant verticillasters, and the flowers are pedicillate in a strict raceme or paniculate and petal divided 1/3 to 1/2. The characteristics mentioned in the paper are shown in the table below (Table 1). Detailed studies conclude that *S. erciyesdagghensis* is not a different species but a variety of *S. olympica*.

Silene isaurica was presented as a new species by Contandr. and Quézel in 1976. In the *Flora of Turkey* *S. isaurica* was similar to *S. otites*, and was therefore included in the *Otites* sections. On the other hand, it was observed that plant height of *S. isaurica* was shorter than *S. otites* and its features are different from those species as regards leaf size, sexual condition, and inflorescence. This species also displays similarities with *S. capitellata*, *S. olympica*, and *S. lasiantha*. *S. isaurica*, because of the aforementioned features, was included in the section *Lasiostemon*. Although the flowers capitate at the top of the stem in *S. capitellata*, they are usually clustered in *S. isaurica*. Likewise, flowers in *S. isaurica* are either hermaphrodite or female; all of the flowers in *S. capitellata* are hermaphrodite (Figure 4).

S. bupleuroides, which is not separated into subspecies in the *Flora of Turkey*, is separated into subspecies in the Floras of Europe, Iran, and Greece. In the examinations conducted on this species it was determined that *S. bupleuroides* had 2 subspecies in Turkey: subsp. *bupleroides* and subsp. *solanocalyx*. The most significant difference between subsp. *solanocalyx* and subsp. *bupleuroides* was that bracts of the former subspecies were elliptic-lanceolate and flower buds were not included (Figure 5).

S. caramanica and *S. idaea* display great similarities according to their morphological characteristics. The

distinctive characters of these 2 species, such as their hairiness condition, shape and size of basal leaves, and length of calyx, were evaluated; and it was found that the aforementioned characteristics did not show any correlation. It was determined that MUFE 12298, 12299, and 12321 specimens displayed both *S. caramanica* and *S. idaea* characters regarding basal stem hairiness, absence of serrulate basal leaf margin, and calyx length, respectively. Likewise, the specimen MUFE 12321 displayed features of *S. caramanica* regarding calyx length, whereas it displayed features of *S. idaea* when its serrulate leaf margin is considered. Similar conditions were observed for the other specimens evaluated in this study. Huber-Morath (1980) did not find the diagnostic characteristics adequate to distinguish between the 2 species and presented *S. idaea* as the synonym of *S. caramanica*. Since the observations in this study show similarities with the findings of Huber-Morath, it was concluded that *S. idaea* should be a variety of *S. caramanica*. The final condition of *S. idaea* is displayed as *S. caramanica* Boiss. & Heldr. var. *idaea* (Hausskn.) K.Yıldız & Çirpici (Figures 5, 6).

One of the new species that was presented to the scientific world by this study is *S. aydosensis* (Yıldız & Erik, 2010) (Figure 6). This species is distributed in south and south-western Anatolia. *S. aydosensis* shows a similarity with *S. caramanica* and *S. doganii* (Figures 5,6). Their most distinguishing features of the species are the morphological structures of their basal leaves.

Silene bitlisensis is a new species that was introduced to the scientific world by Tugay and Ertuğrul (2008). While *S. bitlisensis* was presented as a new species, samples of *S. caramanica*, *S. bupleroides*, and *S. idaea*, which are close species, were evaluated. *S. bitlisensis* was not compared

Table 1. Comparison between *Silene erciyesdagghensis* and *S. olympica*.

| | <i>Silene erciyesdagghensis</i> (Aksoy et al., 2008) | <i>Silene olympica</i> |
|---------------|--|---|
| Habitat | igneous rocky slopes, 2650–3200 m | calcareous rocky slopes, 400–3000 m |
| Habit | distinctly caespitose | ± caespitose |
| Stem | (8–)10–15 (–18) cm | 10–30 cm |
| Inflorescence | capitate or 2(–3) distant, verticillasters, the flowers pedicillate in a strict raceme or paniculate | a strict raceme, the lower flowers usually contiguous and overlapping |
| Pedicel | 1–2 mm | (1–)2–4 mm |
| Calyx | 4–6 mm, glabrous to viscid, deeply purple especially towards the apex | 5–9 mm, glabrous, whitish to pale purple |
| Petal limb | divided 1/3 to 1/2 | usually emarginated, sometimes divided to 1/3 |
| Capsule | 4–5 mm | 4–7 mm |

with *S. sclerophylla*, which displayed more similarities than the others. Instead, it was compared with the more distant species. Therefore, significant differences were determined in the species that were alleged to be close to the new species. In the current study, specimens of *S. bitlisensis* collected from their type localities and various herbaria were examined and identified as *S. sclerophylla*. When the specimens of *S. bitlisensis* and *S. sclerophylla* were compared (Table 2) these 2 species were observed to be the same. Thus, *S. bitlisensis* is the synonym of *S. sclerophylla* (Figure 8).

Silene kucukodukii, which was introduced to the scientific world as a new species by Bağcı et al. (2007), show a great similarity with *S. sipylea* (*S. caramanica* var. *idaea*); and it can be distinguished from the species with regards to hairiness, leaves, and flower characteristics. The type specimen (K.Ertuğrul 2927 & O.Tugay, KNYA!) was compared with the numerous samples obtained from its type locality and its surroundings (MUFE 12068, 12069, and 12331). As a result of these evaluations, it was concluded that *S. kucukodukii* should be the synonym of *S. caramanica*, as indicated in Table 3.

Table 2. Comparison between *Silene bitlisensis* and *S. sclerophylla*.

| Characters | <i>Silene bitlisensis</i> (Tugay & Ertuğrul, 2008) | <i>Silene bitlisensis</i> (type specimen, KNYA!) | <i>Silene sclerophylla</i> |
|------------------------------------|---|--|--|
| Stem length | 20–45 cm | 35–40 cm | 37–53 cm |
| Basal leaves | 10–18 cm, spathulate-ob lanceolate | 10–18 cm, spathulate-ob lanceolate | 22–37 cm, ob lanceolate to linear- ob lanceolate |
| Middle and lower cauline leaves | 18–30 mm, ob lanceolate-elliptic, acuminate | 18–30 mm, ob lanceolate-elliptic, acuminate | 23–50 mm, lanceolate-ob lanceolate, acute |
| Calyx | 33–40 mm | 26–37 mm | 21–37 mm |
| Gynophore | 25–28 mm | 18–25 mm | (10–) 14–20 (–24) mm |
| Petal limbs | limbs 7–8 mm, ± oblong, deeply bifid, coronal scales present | limbs 7–10 mm, divided 1/2 to 1/3, 2 coronal scales present | limbs 9–11 mm, divided 1/2 to 1/3, 2 scales present |

Table 3. Comparison of *Silene kucukodukii*, *S. caramanica* var. *caramanica*, and *S. caramanica* var. *idaea*.

| Characters | <i>Silene kucukodukii</i> (Bağcı et al., 2007) | <i>Silene kucukodukii</i> (KNYA, MUFE) | <i>Silene caramanica</i> var. <i>caramanica</i> | <i>Silene caramanica</i> var. <i>idaea</i> |
|----------------|--|--|--|--|
| Stem length | 45–75 cm | 45–75 cm | 30–50 cm | up to 50 cm |
| Basal leaves | 40–80 mm, linear-lanceolate | 40–80 mm, linear - lanceolate | 20–67 mm, linear-lanceolate | 60–75 mm, narrow ob lanceolate |
| Cauline leaves | 30–60 × 1–3 mm, linear-lanceolate | 30– 60 × 1–3 mm, linear- lanceolate | 15–60 × 1–5 mm, linear-lanceolate | 30–40 × 1–2 mm, linear- lanceolate |
| Inflorescence | racemose, reduced to a single or 2 flowers | racemose, solitary in the apex | racemose, solitary in the apex | racemose, solitary in the apex |
| Calyx | 25–37 mm | 25–37 mm | 22–35 mm | 25–36 mm |
| Petal | 4–5 mm, divided to 1/2, coronal scales 1.5–2 mm | 4–5 mm, divided to 1/2, coronal scales 1.5–2 mm | 5–7.5 mm, divided to 1/2, coronal scales 1.5–2 mm | 5–6 mm, divided to 1/2, coronal scales 1–1.5 mm |
| Gynophore | 10–16 mm, glabrous | 10–16 mm, glabrous | 7–17 mm, glabrous | 9–23 mm, glabrous |
| Filament | hairy | glabrous | glabrous | glabrous |
| Pistil | hairy | glabrous | glabrous | glabrous |

The existence of a new species, distinguished from *S. eremitica*, was discovered during the current study. The species was introduced to the scientific world as *Silene demirizii* (Yıldız et al., 2010). *S. demirizii* can be distinguished from *S. eremitica* because its basal and stem leaves are thinner, more linear, hyaline, papillose; inflorescence panicle, petal lobes shorter, and seeds bigger.

Silene densiflora d'Urv. and *S. exaltata* are synonyms of *S. otites* in the *Flora of Turkey*; however, *S. densiflora* is a valid species for the *Flora of Turkey* and it is a new record for the *Flora of Turkey*.

As a result of the research performed in this study according to the criteria of the IUCN conservation status (IUCN, 2001), there were changes made to the data of the *Red Book of Turkish Plants* (Ekim et al., 2000). These changes are given in the table below (Table 4).

In conclusion, *Silene gigantea* var. *gigantea* and var. *incana* taxa were changed to subspecies *S. gigantea* subsp. *gigantea* and subsp. *rhodopea*, respectively. *S. isaurica* was transferred from the section *Otites* to the section *Lasiostemon*. *S. bupleuroides* was separated into 2 subspecies, subsp. *bupleuroides* and *S. bupleuroides* subsp.

Table 4. Comparison of threatened categories for the studied endemic *Silene* taxa from *Red Data Book of Turkish Plants* (Ekim et al., 2000) and our detection (version 3.1).

| Taxa | Red Data Book (Ekim et al., 2000) | Our detection (version 3.1) |
|---|-----------------------------------|-----------------------------|
| <i>Silene amana</i> | EN | CR-B2b+D |
| <i>S. armena</i> var. <i>armena</i> | LR (lc) | LC |
| <i>S. armena</i> var. <i>serrulata</i> | LR (cd) | NT |
| <i>S. aydosensis</i> | - | EN |
| <i>S. capitellata</i> | LR (lc) | NT |
| <i>S. caramanica</i> var. <i>caramanica</i> | LR (lc) | NT |
| <i>S. caramanica</i> var. <i>ilarslanii</i> | CR | CR-B1a |
| <i>S. caramanica</i> var. <i>idaea</i> | VU | EN-B1a+C1+D |
| <i>S. cartilaginea</i> | LR (cd) | EN-D |
| <i>S. demirizii</i> | - | VU-B1ab (iii) |
| <i>S. doganii</i> | CR | CR-D |
| <i>S. haradjianii</i> | DD | CR-D |
| <i>S. isaurica</i> | EN | CR-B1a |
| <i>S. lycaonica</i> | EN | LC |
| <i>S. manissadjianii</i> | EN | NT |
| <i>S. marschallii</i> subsp. <i>anamasi</i> | - | CR-B2b |
| <i>S. olympica</i> var. <i>olympica</i> | LR (lc) | NT |
| <i>S. olympica</i> var. <i>erciyesdaghensis</i> | - | EN |
| <i>S. paphlagonica</i> | VU | EN-B2a |
| <i>S. phrygia</i> | VU | EN-B1a+D |
| <i>S. sclerophylla</i> | LR (lc) | widespread |
| <i>S. splendens</i> | LR (cd) | VU-B1ac(i) |

solanocalyx. *S. caesarea* and *S. sclerophylla* species were determined to be nonendemic for Turkey. *S. idaea* was evaluated as a variety of *S. caramanica*. The current study presented 2 new species, *S. aydosensis* and *S. demirizii*, and a subspecies, *S. marschallii* subsp. *anamasii*, to the scientific world. *S. ispartensis* was determined to be the synonym of *S. phrygia*. It was concluded that *S. erciyesdaghensis* is a variety of *S. olympica*. *S. bitlisensis* is the synonym of *S. sclerophylla*, and *S. kukukodukii* is the synonym of *S. caramanica*. *S. densiflora* is a new record for the *Flora of Turkey*.

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