

THE GENUS *EPILOBIUM* IN TURKEY

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INTRODUCTION

The following treatment of the genus *Epilobium* in Turkey was written in an attempt to clarify the limits of the Turkish species and to discover specific problems that might be investigated in the course of the preparation of a forthcoming *Flora of Turkey* by Dr. P. H. Davis.

Chamaenerion is here treated as a section of *Epilobium* because it is no more distinct from the majority of Eurasian species of the genus (comprising Section *Epilobium*) than are a number of small groups which have always been referred to *Epilobium* and which are found in other parts of the world. The distinctness of *Chamaenerion* as a group cannot be disputed, but to my mind it is more useful to emphasize its evident relationship with the remaining species of *Epilobium* than the relatively small gap between them. It may be significant that *Epilobium angustifolium*, the most advanced species of Sect. *Chamaenerion*, is also the one with which most of the botanists who recognise *Chamaenerion* as a genus are most familiar. Clearly, generic problems can only be evaluated properly when the genera involved are studied throughout their area.

Among the more important taxonomic characters in the genus *Epilobium* (*sensu lato*), the following may be mentioned. The method of vegetative propagation is variable but these structures are often inadequately preserved in herbarium specimens. Some species have elongated soboles arising from the underground stems, whereas others have globose fleshy turions which remain dormant during the winter and elongate the following year. A third group of species produces leafy rosettes from the underground parts, while in a fourth above-ground stolons occur. Finally, vegetative buds are frequently found in the leaf axils of *Epilobium gemmascens*. The spreading underground parts of *E. angustifolium* are rhizome-like but are anatomically roots, giving rise to adventitious shoots. It would be very helpful if collectors would see that propagation structures are preserved in their herbarium material—ideally from both the growing and resting stages of the plant.

Some species of *Epilobium* have raised lines on the stem decurrent from the margins of the petioles; in others these are lacking. Some have villous pubescence, others fine, white, appressed strigulose pubescence, and still others spreading short glandular pubescence. These three types may be mixed in various combinations and on different parts of the plant. Before anthesis, the main axis of the inflorescence in *Epilobium* may be erect or more or less nodding, and independently of this the buds may be erect or pendulous. The stigma may be deeply 4-lobed or entire and clavate or capitate, and may be held above and away from the anthers at anthesis or be surrounded by them. In many species of the last-mentioned group, the anthers shed pollen directly onto the stigma in bud, and a high degree of self-pollination doubtless occurs. Finally the seeds of *Epilobium*

may be obovoid or attenuate, and may or may not have a distinct beak at the chalazal end. In some, the testa is papillate, whereas in others it appears smooth, depending of course on the magnification. A $\times 20$ lens has been consistently used in my studies.

Our knowledge of *Epilobium* in Turkey and indeed in all of Eurasia at the present day is based largely on Haussknecht's *Monographie der Gattung Epilobium*, published at Jena in 1884 (i.e. later than Boissier's *Flora Orientalis*, which gives a very unsatisfactory account of the genus). Little systematic treatment of wide scope has been carried out on the Old World species of the genus since that date. With the much greater amount of material available at the present time, it is natural that there should be a few changes in Haussknecht's treatment. The fact that it remains to a large extent satisfactory today, at least for those regions from which relatively abundant material was available to Haussknecht, is a tribute to his perceptiveness and taxonomic judgment.

The great majority of the material studied has been cited in my account and the institutions where it is deposited are indicated by the standard symbols listed below. In the citation of type material, the herbarium where the holotype is kept is listed first, followed by isotypes in other herbaria. Unless otherwise indicated, all specimens cited have been examined. Material for the east Aegean islands (botanically related to Anatolia, not the Cyclades) has been included. Some specimens collected in Turkey by Aznavour, B. V. D. Post and Kühne have been added to my original manuscript after determination at Edinburgh by Dr. Davis and Mr. M. J. E. Coode.

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Key to the species of Epilobium in Turkey

1. Lower leaves spirally arranged; flowers more or less zygomorphic. Stigma deeply 4-lobed (Sect. *Chamaenerion*):
 2. Inflorescence spicate, the rachis erect with the buds sharply reflexed; seeds smooth. Leaves glabrous or minutely puberulent
 1. *angustifolium*
 2. Inflorescence not spicate, the buds erect or suberect; seeds finely papillate:

3. Leaves glabrous, narrowly elliptical and evenly serrulate, mostly 4-8 mm. wide. Inflorescence corymbiform. Stigma usually much exceeding the anthers in length 2. *colchicum*
3. Leaves pubescent, usually conspicuously so, or if glabrous then lanceolate and entire:
 4. Leaves canescent with finely appressed pubescence covering the entire plant (rarely glabrous); leaves lanceolate, entire, sharp-pointed 3. *stevenii*
 4. Leaves green or rarely grey-pubescent, the pubescence usually spreading; leaves linear 4. *dodonaei*
1. Lower leaves opposite; flowers actinomorphic or nearly so (Sect. *Epilobium*):
 5. Stigma deeply 4-lobed:
 6. Stems covered with long spreading hairs:
 7. Leaves distinctly clasping; flowers 8-12 mm. long 5. *hirsutum*
 7. Leaves sessile but not clasping; flowers 6-8 mm. long 6. *parviflorum*
 6. Stems finely pubescent or glabrous:
 8. Leaves ovate or broadly lanceolate, with a broadly rounded base, sessile 7. *montanum*
 8. Leaves lanceolate, with a narrowly cuneate base, distinctly petiolate, the petiole 3-10 mm. long 8. *lanceolatum*
 5. Stigma entire or very shallowly 4-lobed:
 9. Seeds smooth or nearly so ($\times 20$ lens):
 10. Seeds acuminate, with a pellucid beak; plants low, usually about 10 cm. tall, the leaves entire or nearly so; inflorescence strongly nodding in bud 21. *anagallidifolium*
 10. Seeds obovoid, rounded; plants often taller, the leaves serrulate; inflorescence nodding in bud:
 11. Petals pinkish purple, the flowers 6-10 mm. long 17. *ponticum*
 11. Petals white or very pale pink, the flowers 4.5-6(-8) mm. long 18. *frigidum*
 9. Seeds papillate, sometimes finely so:
 12. Leaves entire or nearly so, sharp-pointed; seeds 1.5-2 mm. long, with a conspicuous beak at chalazal end 14. *palustre*
 12. Leaves serrulate, not sharp-pointed; seeds less than 1.5 mm. long:
 13. Stems densely covered with glandular hairs below the inflorescence; bulbils or short vegetative shoots often present in leaf axils. Inflorescence strigulose 20. *gemmascens*
 13. Stems lacking glandular hairs below the inflorescence; bulbils lacking in the leaf axils:
 14. Flowers pale, 3-4.5 mm. long, erect; seeds with a short pellucid beak. Ovaries and inflorescence usually densely cinereous 15. *minutiflorum*
 14. Flowers larger or seeds lacking a pellucid beak:

15. Seeds attenuate, with a short pellucid beak. Plants usually strict, the leaves often shorter than the internodes they subtend, sparsely serrulate, sessile; petals pale pink 16. *confusum*
15. Seeds mostly obovoid, rounded:
16. Pubescence or inflorescence entirely strigulose, dense, or sometimes with a few glandular hairs on the calyx:
17. Leaves ovate, subcordate or truncate at base; stems often with 2 raised decurrent lines. Capsules 4-5.5 cm. long; flowers 4-6 mm. long 11. *warakense*
17. Leaves elliptical or parallel-sided, often cuneate at base; stems usually strongly 4-angled:
18. Capsules (5-) 7-11 cm. long; plants propagating by subsessile rosettes at base of stem; inflorescence entirely strigulose 9. *tetragonum*
18. Capsules 4-6 cm. long; plants propagating by leafy epigeous stolons from the base; inflorescence often with a few glandular hairs on calyx 10. *obscurum*
16. Pubescence of inflorescence either entirely glandular or with a strong admixture of glandular hairs:
19. Corolla reddish brown, at least near the base. Leaves subsessile. Flowers over 7 mm. long 12b. *anatolicum* subsp. *prionophyllum*
19. Corolla white or nearly so:
20. Petioles conspicuous, 4-8 mm. long; leaves cuneate at base 13. *roseum*
20. Petioles shorter; leaves often broader at base:
21. Flowers 4-5(-6) mm. long, the petals pale pink; inflorescence mostly strigulose, but always with long glandular hairs on the pedicels and main branches; leaves cuneate at base 13. *roseum* subsp. *subsessile*
21. Flowers over 5 mm. long, the petals usually deep lavender-pink; ovaries prominently glandular-pubescent:
22. Seeds obovoid, coarsely papillate; stigma shortly clavate, not emarginate 12. *anatolicum*
22. Seeds attenuate, finely papillate; stigma capitate, emarginate or obscurely 4-lobed at apex; leaves coarsely serrulate, acuminate 19. *algidum*

SECT. CHAMAENERION

1. *E. angustifolium* L., Sp. Pl. 1, 347 (1753) excluding synonyms from Bauhin (= *E. dodonaei*, *E. fleischeri*). Boiss., Fl. Or. 2, 745 (1872).

Chamaenerion angustifolium (L.) Scop., Fl. Carn. ed. 2, 271 (1772). Steinb. in Fl. URSS, 15, 622 (1949), as *Chamaenerium*.

Epilobium spicatum Lam., Fl. France 3, 482 (1778)—type not seen.

Type: sheet 486.1 (LINN), probably from Sweden.

This variable circumboreal species is widespread in Turkey, growing in wooded places in the mountains from 1200-3000 m.

RIZE: Cimil, 2000 m., *Balansa* 156 (G). Trabzon: north side of Soğanlı Dağ above Bayburt, 2000–2200 m., *Davis* 32129 (BM, E, K); Sumila, Pontus, *Sintenis* 1461 (K, W). GÜMÜŞANE: pass between Köse and Gümüşane, 2000 m., *Davis* 31948 (BM, E, K). KASTAMONU: N. side of Ilgaz Dağ, 1600 m., *Davis* 25038 (K); *ibid.*, *Sintenis* 4610 (G). ZONGULDAK: S.W. of Karabük, Keltepe, *Kühne* 1171 (E). BOLU: Kartal Kaya, distr. Ala Dağ, 2000 m., *Khan et al.* 507 (E). ÇANKIRI: above Tukht, summit of Mt. Panair-Tepe, *Czeczott* 264 (G). BURSA: Ulu Dağ, *Montbret* (W); *ibid.*, *Aucher* 2836 (BM, G, K, W); *ibid.* 2000 m., *Kotte* (K); Elma Cukuru, *Başarman* in 1944 (G). İZMİR: yayla of Boz Dağ, *Balansa* in 1854 (G, K). ANTALYA: Han Bogaz forest near Geyik Dağ, 1550 m., *Davis* 14718 (E, K). İÇEL: distr. Anamur, between Beşkuyu and Çamurlu yayla, 1900 m., *Davis* 16276 (E, K); east of Gulek Bogaz, 11755 (G); reg. montagneuse de Taurus, au nord du défilé des portes Ciliciennes, *Balansa* in 1885 (E, G). İÇEL/KONYA: Bolkar Dağları, *Kotschy* 1990 (G, W). HATAY: Mont Amanus, 1200 m., *Haradjian* 338 (E, G); Gavrur Dağları, Kusliji Dağ, 1500–2000 m., *Haradjian* 2543 (G, K). KARS: Sarikamiş, 2100 m., *Davis* 32644 (BM, E, K); Kisir Dağ above Susuz, 2000 m., *Davis* 30526 (BM, E, K); Yagmurlu Dağ between Sarikamiş and Karaorgan, 2200 m., *Davis* 30695 (BM, E, K); Yalnızcam Dağları above Yalnızcam, 2100–2300 m., *Davis* 23492 (BM, E, K). BITLİS: Süphan Dağ, 3000 m., *Davis* 24736 (BM, E, K); Kotum, 1900 m., *Davis* 22412 (BM, E); crater of Nemrut Dağ, 2400 m., *McNeill* 537 (E, K). ERZURUM: Karakose to Horasan, 2500 m., *Rechinger* 15014 (W); Erzurum, *Huet du Pavillon* in 1853 (G); *ibid.*, *Calvert* 394 (G); S. foot of Mt. Bimgoell (Bingöl Dağ) at Gumgum in distr. Warts, Goschar, 1700 m., *Kotschy* 337 (G, K, W). SİVAS: Tohamlibel Dağ, *Girard* in 1892 (G); Sivas to Tokhat, *Girard* in 1892 (G). KAYSERİ: Erciyas Dağ, 1600 m., *Zedebauer* in 1902 (W); *ibid.*, 2225 m. *Balansa* 360 (G).

Turqui d'Europe, *Thirke* in 1845 (G).

2. *E. colchicum* Alboff, Prodr. Fl. Colch. 86 (1895).

E. crassifolium sensu Boiss., Fl. Or. 2, 746 (1872), non Lehm.

E. dodonaei var. *caucasicum* Hausskn., Mon. Epil. 51 (1884).

Lectotype: Turkey: Cimil above Rize, *Balansa* 1396 (JE; isotypes E, G, K, W).

Chamaenerion palustre subsp. *caucasicum* (Hausskn.) Sosnowsky in Fl. Cauc. Crit. 3, 386 (1917).

C. palustre subsp. *caucasicum* var. *colchicum* (Alboff) Sosnowsky in Fl. Cauc. Crit. 3, 389 (1917).

C. caucasicum (Hausskn.) Sosnowsky ex Grossheim, Fl. Kavk. 3, 104 (1932). Steinb. in Fl. URSS, 15, 625 (1949).

C. colchicum (Alboff) Steinb. in Fl. URSS 15, 626 (1949).

Type: Abkhazia: sources of the Ghega, between Mt. Czugdzryrkhw and Mt. Akhagaesh, 3 Sept. 1894, *N. Alboff* 122 ("127") (G; isotype LE).

A Caucasian species, reaching Turkey only in the mountains of Lazistan.

RIZE: Cimil, c. 2000 m., July 1866, *Balansa* 1396 (E, G, JE, K, W)—see above.

I am unable to distinguish the two species recognised by Steinberg in Vol. 15 of Flora USSR, but when combined they constitute a very

distinctive assemblage which is rather sharply delimited morphologically. The species apparently often occurs on scree slopes in the mountains.

3. *E. stevenii* Boiss., Diagn. ser. 2, 2, 55 (1856).

a. forma *stevenii*

E. canescens White in Ann. Nat. Hist. 1, 210 (1848), non *E. canescens* Endl., Enum. Pl. Hüg. 44 (1837). Cultivated Plants said to have come from Central Russia, the seeds from Leningrad. Probably no type preserved.

E. dodonaei var. *stevenii* (Boiss.) Boiss., Fl. Or. 2, 747 (1872).

Chamaenerion domini Nábělek in Publ. Fac. Sci. Univ. Masaryk (Brno), 35, 113, f.12; t.11, f.1; t.16, f.2 (1923). Type: in glareae rivi Gunik-Su prope pagum Čabachčūr Armeniae inter Muš et Charput, 29 Sept. 1910, Fr. Nábělek 271 (Biol. Inst. Slovak Acad. Sc. Bratislava).

Ch. stevenii (Boiss.) Sosnowsky ex Grossheim, Fl. Kavkaza 3, 104 (1932). Type: Trans-caucasia (Georgia): Achalziche, *Steven* in 1850 (G, JE).

Plant canescent throughout with closely appressed strigulose pubescence. E. Anatolia, 900–2000 m., on gravelly slopes and especially dried up gravel river beds.

HAKKARI: Zab gorge south of Başkale, *Davis* 23845 (BM, E, K). VAN: Van to Hakkari, c. 25 km. from Cölemerik, 2000 m., *McNeill* 682 (E, K). ERZINCAN: Erzincan to Selepür, 1200 m., *Davis* 32659 (BM, E, K). SIVAS/GİRESUN: Kelkit river S. of Karahissar, 900 m., *Maunsell* 49 (K).

b. forma *glabrum* (Nábělek) P. H. Raven, **comb. et stat. nov.**

Chamaenerion domini Náb. var. *glabrum* Náb. in Publ. Fac. Sci. Univ. Masaryk (Brno), 35, 114 (1923).

Type: in glareae rivi Gunik-su prope pagum Čabachčūr Armeniae inter Muš et Charput, 29 Sept. 1910, Fr. Nábělek 271a (Biol. Inst. Slovak Acad. Sci. Bratislava).

Plant completely glabrous throughout. A striking variant only known from the type gathering, where it was collected together with the typical form of the species (f. *stevenii*) which it resembles in all other characters.

E. stevenii is a very attractive species found in Eastern Turkey, the Caucasus and Northern Iran. Haussknecht (Mon. Epil., 46; 1884) confused it with *E. dodonaei* since he believed that it was separated only on the basis of pubescence. In leaf shape and in its tall woody stems, however, *E. stevenii* is clearly specifically distinct. It should be re-introduced to cultivation.

4. *E. dodonaei* Vill., Prosp. Fl. Dauph. 45 (1779).

?*E. angustissimum* Weber, Pl. Minus Cogn. Dec. 3 (1784). "Hab. in Norvegiae & Helvetiae alpibus." The description might equally well apply to *E. fleischeri* Hochst.; neither species grows in Norway, except perhaps in cultivation.

E. rosmarinifolium Haenke in Jacq. Coll. 2, 50 (1788), *nom. subs.* for *E. dodonaei* Vill.

Chamaenerion dodonaei (Vill.) Wimm., Fl. Schles., ed. 3, 610 (1857).

Epilobium dodonaei var. *angustissimum* (Weber) Hausskn., Mon. Epil. 45 (1884).

Chamaenerion angustissimum (Weber) Grossheim, Fl. Kavkaza 3, 104 (1932).

Type: from Dauphiné, not seen. Boiss., Fl. Or. 2, 745 (1872).

N. Anatolia, scattered on eroded banks and open hillsides from near sea level up to about 1500 m.

ÇORUH: above Hopa, 300 m., Guichard T/167/1960 (K). KASTAMONU: N. side of Ilgaz Dağ, 1500 m., Davis 25056 (BM, E, K); N. foot of Ilgaz Dağ at Kuz-Yaky, 1250 m., Czecczott 597 (G). Kastamonu to Ilgaz, 1100 m., Khan et al. 636 (E); Karadere, Sintenis 4973 (G, JE, K, W). BURSA: Ulu Dağ, Aucher 2835 (G, K); *ibid.*, Montbret (W); Gökdere, Başarman (G).

Epilobium dodonaei is a European species which reaches its eastern limits in Turkey, the Caucasus and Persian Kurdistan. *Chamaenerion palustre* Scop. (Fl. Carn. ed. 2, p. 271: 1772), a binomial that has sometimes been applied to this species, is as to name clearly based on *Epilobium palustre* L., as is shown by Scopoli's reference to Linnaeus' *Systema Naturae* ed. 12, p. 264 (1767). The collection cited above from Çoruh has glabrescent leaves that are finely serrulate, but its style is not much longer than the stamens and its inflorescence is elongate, indicating that it may be best referred to this species.

SECT. *EPILOBIUM* (LYSIMACHION TAUSCH)

5. *E. hirsutum* L., Sp. Pl. 1, 347 (1753), excl. var. β (= *E. parviflorum* Schreb.).

E. tomentosum Vent., Hort. Cels. 90, t. 90 (1800). Type not seen.

E. hirsutum var. *vilosissimum* ("vilosissima") Koch, Syn. Fl. Germ. Helv. ed. 1, 240 (1835). Type not seen.

E. hirsutum var. *tomentosum* (Vent.) Boiss., Fl. Or., 2, 746 (1872).

E. nassirelmulci Stapf in Denkschr. Akad. Wiss. Wien. 51, 325 (1886).

Syntypes from Jalpan, Iran, and Hamadan, Iran, Polak & Pichler (G). Lectotype: presumably from Holland, Linnaeus ("Chamaenerion villosum, flore magno, purpureo, 3." BM, Hort. Cliff., 145, 1738).

Widely distributed along stream beds and water-courses from sea level to 2300 m.

TRABZON: near Trabzon, Handel-Mazzetti 288 (W); Trabzon, Görz 905 (BM); woods of Calia near Trabzon, Bourgeau in 1862 (G). GÜMÜŞANE: Kovans to Bayburt, 1650 m., Davis 31944 (BM, E, K). AMASYA: banks of Cuts, Tünnük, Griffith 799 (G). TOKAT: Niksar, 350 m., Davis 24846 (BM, E, K). İSTANBUL (Europe): Hunkiar Iskelessi, Aznavour 887 (G); (Asia), Büyükdere to Sultansu, Aznavour in 1892. BURSA: Bursa, Pichler 130 (G, K). İZMİR: vicinity of İzmir, Fidao in 1904 (G); banks of the Mélès, İzmir, Balansa in 1854 (G); İzmir, Balansa in 1854 (G). ANTALYA: Elmali, Bourgeau 162 (G). İÇEL: Cilicia, Siehe 645 (K). HATAY: Gavar Dağları (Amanus), Kusliji Dağ, 1500–2000 m., Haradjian 2669 (E, G, K); Antakya, Post in 1886 (E); *ibid.* in 1882 (BM). HAKKARI: Zab gorge 30 miles S. of Başkale, Davis 23829 (BM, E, K); Koçanis, 2300 m., Davis 24306 (BM, E, K). BITLİS: 20 miles E. of Muş, Davis 24767 (BM, E, K).

ERZURUM: Erzurum, *Calvert* 469 (G); Mt. Bimgoell (Bingöl Dağ) between Muş and Erzurum, 1400 m., *Kotschy* 785 (G, W). ELAZIĞ: Hasarbaba Dağ at Lake Göldschik, western source of the Tigris, 1900 m., *Handel-Mazzetti* 2610 (W). URFA: Titrisch, Suverek, *Sintenis* 1475 (G). MARAŞ: Maraş, 350 m., *Hausknecht* in 1865 (G, W); *ibid.*, 550 m., *Hausknecht* in 1865 (BM, K); Elbistan, Cataonia, 600 m., *Hausknecht* in 1865 (W). KASTAMONU: above Edjevid, Paphlagonia, 1100 m., *Czeczott* 464 (G). TUNÇELI: above Pülümür, 1900 m., *Davis* 30975 (BM, E, K). KONYA: Akşehir, *Saint Leger* in 1907 (G); distr. Beyşehir (Isauria), Hoyran to Kurucaova, 1100–1200 m., *Davis* 16085 (E, K). MALATYA: Malatya, 1000–2500 m., v. *Ajtai-Kovach* (W); *ibid.*, *Hausknecht* in 1865 (G). ANKARA: Kübrüs gorge near Kayaş, *Davis* 13139 (E, K); Ankara, *Kotte* in 1932 (K). Anatolia, *Wiedemann* (G, K). Turkqui d'Europe, *Thirke* in 1845 (G).

Epilobium hirsutum is widespread across Eurasia and also extends through East Africa to South Africa. Although it is variable in the amount of pubescence, this variation does not appear to be geographically correlated, and in my opinion it is not particularly helpful to recognise white-pubescent plants taxonomically.

6. *E. parviflorum* Schreb., Spic. Fl. Lips. 146, 155 (1771). Boiss., Fl. Or. 2, 746 (1872). Steinb. in Fl. URSS, 15, 580 (1949).

E. menthoides Boiss. & Heldr. in Boiss., Diagn. Ser. 2, 2, 53 (1856).

Type: Taurus, near Tchifte Khan at foot of Bulgar Dag, Sept. 1845, *Heldreich* (G, BM).

E. parviflorum var. *menthoides* (Boiss. & Heldr.) Boiss., Fl. Or. 2, 747 (1872).

Type: from the vicinity of Leipzig, Germany, now lost.

Widely distributed in moist places and along stream beds from sea level to about 2000 m.

TRABZON: woods at Calia near Trabzon, *Bourgeau* 289 (G). AMASYA: Amasya, 500 m., *Bornmüller* 1992 (G); Ak Dağ, 1200 m., *Bornmüller* in 1890 (G). TOKAT: Tokat to Artova, *Davis* 24853 (BM, E, K). KASTAMONU: near Ekitnhai, *Sintenis* 5036 (G); near Erzschevill, *Sintenis* 5140 (G). BOLU: distr. Ala Dağ, 700 m., *Khan et al.* 515 p.p. (E). KOCAELI: Üsküdar to İzmit, c. 55 km. from Istanbul, 100 m., *McNeill* 221 (E, K). ISTANBUL (Europe): Therapia, *Aznavour* in 1887 (G); Domuzdere, *Aznavour* 888 (G). MUGLA: Sandras Dağ near Ağla, 600 m., *Davis* 13637. ANATALYA: distr. Gebiz, on Bozburun Dağ at Pinargazu yayla, *Davis* 15491 (E, K); road from Elmali to Finike, *Khan et al.* 214 (E); Yuva yayla, 1500 m., *Davis* 14229. (E). AYDIN: Samsun Dağ, 400 m., above Priene, *Davis* 18351 (K). IÇEL: Ermenek, *Périnin* 148 (BM, K); Dschennan Deressi on the Cydnus, 500 m., *Siehe* 675 (E); Tchifte Khan at foot of Bolkardağları, *Kotschy* 1265 (G). SEYHAN: distr. Fekke, Sencan deresi near Görümze, 1300 m., *Davis* 19680 (BM, E, K). HATAY: Gavur Dağları (Amanus), Egbej, 450–600 m., *Haradjian* 602 (G); Gavur Dağları, valleys, 900 m., *Haradjian* 476 (E, G, K). VAN: Ereğ Dağ, 2000 m., *Davis* 22961 (BM, K); 5 miles E. of Satak, *Davis* 23189 (BM, E, K). BITLİS: 20 miles E. of Muş, *Davis* 24765a (BM, E, K); Tatvan, 1800 m., *Davis* 23598 (K). ERZINCAN: E. of Erzincan, 1250 m., *Davis* 31851 (BM, E, K). MALATYA: near Bekikara

between Malatya and Kjecta, 1600 m., *Handel-Mazzetti* 2403 (W). TUNCELI: Ovacik, 1400 m., *Davis* 31111 (BM, E, K), *ibid.*, D. 31492 (E, K). ELAZIĞ: near Goldschik at lake Goldschik, western source of the Tigris, 1350 m., *Handel-Mazzetti* 2546 (W). DIYARBAKIR: Diyarbakir to Bitlis, about 70 km. from Diyarbakir, 750 m., *McNeill* 503B (E). MARAŞ: Ahir Dağı, . . . 84 (G).—Ins. Ikaria, near Hagios Kirikos, K. H. & F. *Rechinger* 4756 (BM).

Epilobium parviflorum extends from Europe to Western China.

7. *E. montanum* L., Sp. Pl. 1, 494 (1753). Boiss., Fl. Or. 2, 747 (1872). Steinb. in Fl. URSS 15, 581 (1949).

Type: presumably from Sweden, *Linnaeus* (LINN).

Along streams and in moist woods, from sea level to about 2500 m., mainly in N. Anatolia.

RİZE: Cimil, 2000 m., *Balansa* 150 (G), 153 (G). TRABZON: near Bakadjak, 960 m., *Handel-Mazzetti* 1118 (W). KASTAMONU: Ilgaz Dağları on road from Kastamonu to Ilgaz, 1400 m., *Khan et al.* 682 (E). BOLU: distr. Ala Dağ, 700 m., *Khan et al.* 515 p.p. (E); woods above Abant Gölü, B. V. D. Post in 1941 (G); forest track from Akcakoca into the mountains, 1300 m., *Kühne* 3021. BURSA: Kitirli Dağ, Bursa, *Pichler* in 1874 (G). HATAY: Gavrur Dağları (Amanus), 1200 m., *Haradjian* 316 (E, G, K), 468 (G, K). KAYSERİ: Erciyas Dağı, 2300 m., *Zedebauer* in 1902 (W).

Epilobium montanum extends across the temperate regions of Eurasia from western Europe to Japan.

8. *E. lanceolatum* Séb. & Mauri, Fl. Rom. Prodr. 138 (1818). Boiss., Fl. Or. 2, 747 (1872). Steinb. in Fl. URSS, 15, 585 (1949).

Type: from vicinity of Rome, Italy (not seen).

Moist places up to 2100 m., widely scattered in the coastal provinces of the western half of Anatolia.

BOLU: Adapazari (Sakarya) to Bolu, c. 35 km. from Bolu, 300 m., *McNeill* 238 (E, K); Karadere, N. of Bolu, *Kühne* 793 (G); distr. Ala Dağ, 700 m., *Khan et al.* 515 p.p. (E). BURSA: Ulu Dağ, *Aucher* 2833 (G, K). ISTANBUL (Europe): Kestane Su, Fistiksu, *Aznavour* 890 (G). İZMİR: Bergama, *Montbret* (E); Lydia, in Mt. Kara-Tscham (above Burnabad), 1100–1200 m., *Bornmüller* 9483 (K). İÇEL: Kar Boghas valley above Gulek-Boghaz, . . . 757 (G); rég. montagneuse de Taurus, au nord de défilé des Portes cilicies, *Balansa* in 1855 (G, K). SEYHAN: distr. Feke, Sencan Dere between Görümze and Süphandere, 1000–1200 m., *Davis* 19601 (BM, E, K). HATAY: Mount Amanus, *Haradjian* 390 (G), 750 m., H. 350 (E, K), 1800 m., H. 565 (G); Gavrur Dağları (Amanus), near Düldül 1500–2100 m., *Haradjian* 2390 (G), H. 2435 (G); mont. de Dumanly, 700–1200 m., *Haradjian* 3760 (G). İSPARTA: distr. Sütçüler (Isauria), between Tota beli yayla (Kuyucuk Dağ) and Daribuku, 1400–1500 m., *Davis* 15880 (E, K).

This distinctive species, widespread in Europe, reaches its eastern limits in Turkey and the Caucasus.

9. *E. tetragonum* L., Sp. Pl. 1, 348 (1753). Boiss., Fl. Or. 2, 748 (1872).

A polytypic species that is divisible into three subspecies, two of which are represented in Turkey.

a. subsp. *tetragonum*

E. adnatum Griseb. in Bot. Zeitung **10**, 854 (1852). Type not seen. Steinb. in Fl. URSS, **15**, 586 (1949).

Leaves parallel-sided, their blades more or less decurrent. Flowers 4–8 mm. long, the stigma surrounded by the anthers at anthesis. In scattered localities from sea level to 6000 m.

Type: near Montpellier, France, *Sauvages* (now lost).

RIZE: near Hopa, 350 m., *Görz* 774 (BM). TRABZON: near Goerele (Elehn), 100 m., *Handel-Mazzetti* 962 (W). BOLU: Abant Gölü, *B. V. D. Post* in 1941 (G). BURSA: Bursa, *Pichler* 24 (G); near Bursa, *Pichler* 131 (K); Bardezag, Bithynia, *Post* in 1892 (G). ISTANBUL (Europe): Belgrade forest, *F. Yaltirik* in 1959 (E); (Asia): Alem Dağ, *Aznavour* 893 (G). BALIKESIR: Seitini, *Sintenis* 466 (E, K, W). IZMIR: Boz Dağ yayla, *Balansa* in 1854 (G). SEYHAN: Saimbeyli (Hacin), *Manisadjian* 105 (K, W). HATAY: Gavur Dağları, Djebel Mousa near Antioch, 600–1200 m., *Haradjian* 3197 (G). *Calvert & Zohrab* (E). KONYA: Beyşehir, *Heldreich* in 1845 (BM, G). MARDIN: Bakakri (near Mardin), *Sintenis* 1273 (G). Armenia—Is. Mytilini (Lesbos); Philia, 300 m., *K. H. & F. Reehinger* 5900 m., (K, W). Is. Chios: Kardhamyla, *Platt* 526 (K); Sklavica, *Platt* 494.

Extending from western Europe to Central Asia.

b. subsp. *tournefortii* (Michal.) H. Lév. in Monde des Pl. **6**, 22 (1896).

E. tournefortii Michal. in Bull. Soc. Bot. Fr. **2**, 731 (1856). Boiss., Fl. Or. **2**, 748 (1872).

Leaves often lanceolate, often short-petiolate. Flowers 8–13 mm. long, the stigma usually elevated above the anthers at anthesis. Rare along streams in Turkey.

Based on specimens from Corsica, Morocco, Portugal and Sardinia. Type not seen.

GÜMÜŞANE: Argyri Dağ, *Sintenis* 6290 (BM, E, G, K, W). ISTANBUL (Europe): Zekeriekeyu, tomb of Ovid, *Aznavour* in 1901 (G). HATAY: Akra Dağ (Cassius), 900–1200 m., *Haradjian* 3096 (G). GAZIANTEP: near Gaziantep, 700 m., *Haussknecht* in 1865 (W).

This subspecies has a typically Mediterranean distribution and reaches its eastern limit in Turkey. In the Near East and in N. Africa it appears to intergrade completely with subsp. *tetragonum*.

A collection labelled "Tech Dag, Armenia" (near Erzurum), *Calvert* 252 (G) appears to be referable to subsp. *lamyi* (F. W. Schultz) H. Lév., with small flowers as in subsp. *tetragonum* but leaves evidently petiolate. Its presence in Turkey, however, requires confirmation.

10. *E. obscurum* Schreb., Spic. Fl. Lips. 147, 155 (1771). Boiss., Fl. Or. **2**, 750 (1872). Steinb. in Fl. URSS, **15**, 588 (1949).

Type: from near Leipzig, Germany (now lost).

Moist woods. HATAY: Mont Amanus, *Haradjian* 321 (G), 358 (G), 405 (G), 406 (G).

A European species that does not extend east of the Amanus in South Anatolia, its only known station in Asia.

11. *E. warakense* Nábělek in Publ. Fac. Sci. Univ. Masaryk (Brno) **35**, 115, t.11, f.2 (1923).

Type: Turkey: Werin-Warak in monte Warak Dagħ (Erek Dağ) Armeniae prope Wan, c. 2200 m., 23 Aug. 1910, *Fr. Nábělek* 269 (Herb. Biol. Inst. Slovak Acad. Sci. Bratislava).

VAN: Erek Dağ, 1981 m., *Davis* 22950 (BM, E, K).

This is apparently an adequately distinct species but nevertheless it is difficult at times to draw the line between it and *E. roseum* subsp. *sessile*, particularly when one is dealing with relatively non-glandular individuals of the latter. Though in Turkey *E. warakense* is only known from the vicinity of the type locality, it is also found in northern Iran.

12. *E. anatolicum* Hausskn. in Oest. Bot. Zeit. **29**, 59 (1879). Steinb. in Fl. URSS, **15**, 598 (1949).

Along streams, often in oak woodland, 900–2600 m. Divisible into the following two subspecies:

a. subsp. *anatolicum*

Coma white.

Lectotype: N. Anatolia, between Töptscha and Mersivan, *Wiedemann* 260 (JE; LE).

ÇORUH: Yalnızcam Dağları between Ardanuç and Kütül, 1400 m., *Davis* 32447 (BM, E, K). *GİRESUN*: Tamdere to Yavuzkema, near Karınca, 1500 m., *Davis* 20708 (BM, E, K). *GÜMÜŞANE*: Tempede, *Sintenis* 7427 (BM, G, JE, K, LE, W). *AMASYA*: in mt. Ak Dağ, 1200 m., *Bornmüller* 1615a (JE), 1615b (W), 1300 m., 1991 (G, JE), 1100 m., 1997 (JE), 900–1200 m., 1990 (JE), 1800–1900 m., 1889 (JE), 2200–2600 m., 1069 (JE), 1400 m., cultivated, *s.n.* (LE). *KASTAMONU*: *Sintenis* 4745 (K), 5115 (G, JE). *MUĞLA*: Girdev Dağ at Bel yayla 1900 m., *Davis* 13879 (E, K), 2000 m., *Davis* 13964. *MARAŞ*: distr. Göksun, Hobek Dağ, 1700 m., *Davis* 20211 (BM, E, K); Berit Dağ, 2100 m., *Haussknecht s.n.* (JE). *BITLİS*: foot of Karz Dağ near Kotum, 1900 m., *Davis* 24552 (BM, E, K). *VAN*: 5 km. N. of Şatak, *Davis* 23256 (BM, E, K); Erek Dağ, 2000 m., *Davis* 22961 (E). *ERZINCAN*: Kemaliye (Eğin), *Sintenis* 2787. *TUNCELİ*: Ovacık to Hozat, 2000 m., *Davis* 31534 (BM, E, K). *ELAZIĞ*: near Goldschick at Goldschick Lake, W. source of the Tigris, 1350 m., *Handel-Mazzetti* 2563 (W).—Anatolia, *Wiedemann* (K).

This subspecies extends from the Lebanon to the Caucasus, but in Turkey grows mainly in N. and E. Anatolia. It is very close to the following and only imperfectly separated from it, some specimens being intermediate.

b. subsp. *prionophyllum* (Hausskn.) P. H. Raven, *comb. et stat. nov.*

E. prionophyllum Hausskn. in Oest. Bot. Zeit. **29**, 58 (1879). Steinb. in Fl. URSS, **15**, 598 (1949).

Plants robust. Coma reddish brown, at least at base.

Lectotype: Turkey, south base of Mt. Bimgoell (Bingöl D.), at Gumgum in distr. Warton, above Goschkar, 1800 m., *Kotschy* 359 (JE; G, K, W). *RİZE*: near Cimil, Lazistan, 2000 m., *Balansa* in 1886 (G, LE). *TRABZON*: near Bakadjak, 960 m., *Handel-Mazzetti* 1108 (W); Sumila (near Maçka), *Sintenis* 1457 (G, JE). *ÜNYE*: Ünye to Karakuş, 10–1000 m., *Davis* 24917 (BM, E, K).

Subspecies *prionophyllum* grows in Turkey and the Caucasus, but in Anatolia is known only from Lazistan. *E. × prionophylloides* Handel-Mazzetti (Ann. Nat. Hofmus. Wien, **23**, 172: 1909), which is the hybrid between *E. anatolicum* subsp. *prionophyllum* and *E. montanum*, is only known from the type, a single plant from near Bakadjak, Trabzon, at 960 m., *Handel-Mazzetti* 1157 (W). It is separable by its shallowly-notched style, sterile pollen and failure to set seed.

13. *E. roseum* Schreb., Spic. Fl. Lips. 146, 155 (1771). Boiss., Fl. Or. **2**, 749 (1872). Steinb. in Fl. URSS, **15**, 588 (1949).

Scattered in moist, often wooded places, from sea level to 2000 m. Divisible into three subspecies, all of which are represented in Turkey.

a. subsp. *roseum*

Petioles conspicuous, 4–15 mm. long. Ovaries and sepals strigulose.

Type: from vicinity of Leipzig, Germany, now lost.

Cilicia—no collector (K). Ins. Samos, *Forsyth Major* 868 (E).

This essentially European taxon reaches its eastern limits in Turkey and the Caucasus.

b. subsp. *subsessile* (Boiss.) P. H. Raven, stat. nov.

E. smyrnaeum Boiss. & Bal. in Boiss., Diagn. ser. 2, **2**, 52 (1856).

Steinb. in Fl. URSS, **15**, 589 (1949). Lectotype: Turkey, prov. Izmir, yayla of Boz Dağ (Tmolus occid.), July 1854, *Balansa* (G).

E. nervosum Buhse, in Nouv. Mém. Soc. Imp. Nat. Moscou **12**, 88 (1860). Type: Nemaadabad at Tabriz, Iran, 11 July 1847, *Boissier & Buhse* 673 (LE, not seen; G).

E. roseum β. *subsessile* Boiss., Fl. Or. **2**, 749 (1872). Lectotype: same as for *E. smyrnaeum* (G).

Leaves subsessile. Ovaries and sepals strigulose.

RISE: Cimil, 2000 m., *Balansa* 152 (G, K). IZMIR: distr. Odemiş, Boz Dağ, 1200 m., *Davis* 18174 (E, K), 1300 m., 18236 (E, K); cult. from seeds from Tmolus (Boz D.) coll. by *Balansa* (BM, G, K, W); Izmir, . . . 231 (G). VAN: 20 km. S.W. of Gevaş, 2000 m., *Frödin* 39 (W). ELAZIĞ: near Goldschick at lake of same name, W. source of Tigris, 1350 m., *Handel-Mazzetti* 2563 (W). ISTANBUL: Byzantium et Gemlek, *Wiedemann* (G). Turqui d'Europe, *Thirke* in 1845 (G).

From Eastern Europe through the Near East to Iran and the Caucasus.

c. subsp. *consimile* (Hausskn.) P. H. Raven, comb. et stat. nov.

E. consimile Hausskn., Oest. Bot. Zeit. **29**, 58 (1879). Steinb. in Fl. URSS, **15**, 590 (1949).

Petioles conspicuous, 5–8 mm. long. Pubescence of ovaries and sepals predominantly glandular.

Type: Toptscha, N. Anatolia, *Wiedemann* (LE, not seen).

AMASYA: Mt. Aku Dağ, Cappadocia bor., 1500–2000 m., *Bornmüller* 1069 (JE); Mt. Sana Dağ, 1500–1600 m., *Bornmüller* 1070 (G; JE, W).

Epilobium roseum subsp. *subsessile* intergrades completely with subsp. *roseum* and largely replaces it in the Near East and easternmost Europe. The third subspecies, subsp. *consimile*, is most common in the Caucasus and is restricted to the mountains of the Near East. Its type locality (Toptscha) is probably the same as Topcu near Küre in the province of

Kastamonu. The relationship of this taxon to the other two is, I believe, best indicated by relegating it to the status of subspecies.

14. *E. palustre* L., Sp. Pl. 1, 495 (1753), excl. synonym from Flora Lapponica (= *E. davuricum* Fischer). Boiss., Fl. Or. 2, 748 (1872). Steinb. in Fl. URSS, 15, 613 (1949).

E. rhynchocarpum Boiss., Diagn. ser. 2, 2, 53 (1856). Type: near Lar at foot of Mt. Demawend, north Persia, Kotschy 616 (G; BM, W). Type: presumably from Sweden, Linnaeus (LINN).

Moist springy slopes in the mountains, 600–2200 m., very local.

RIZE: Cimil, 2030 m., Balansa 149 (G). BOLU: Ala Dağ, Kühne 1228 (E). BURSA: Ulu Dağ, 2200 m., Kotte in 1932 (K). ANTALYA: Söbüçimen yayla, north of Geyik Dağ, 600 m., Davis 14682 (E, K). KAYSERİ: Erciyas Dağ, Tichomakly, 1700 m., Zederbauer in 1902 (W).

This circumboreal species is known in the Near East from very scattered localities in the mountains, but the plants appear to be quite typical.

15. *E. minutiflorum* Hausskn. in Oest. Bot. Zeit. 29, 55 (1879). Steinb. in Fl. URSS, 15, 620 (1949).

E. modestum Hausskn. in Oest. Bot. Zeit. 29, 55 (1879): Lectotype: Nubra valley, Ladakh (Kashmir), 4 Aug. 1848, T. Thomson (K).

Lectotype: Turkey, banks of the river Sadsihur (Sajur Suyi?) near Gaziantep (Aintab), 26 June 1865, Haussknecht 812 (JE).

Scattered along the streams and water courses of Inner Anatolia from 800–2300 m.

VAN: Ereğ Dağ, 2000 m., Davis 22947 (BM, E, K); Başkale to Hakkari (Cölemerik), about 50 km. from Başkale, McNeill 687 (E, K). BITLİS: Diyarbakir to Bitlis, Hazan road junction about 5 km. from Bitlis, 1350 m., McNeill 498 (E, K). ERZURUM: Erzurum, Zohrab 831 (K). SİVAS: Zara to Suşehri, 20 km. S. of Suşehri, 1300 m., Stainton & Henderson 5758 (E); Zara to Suşehri, 2200 m., Rechinger 15221. MALATYA: near Bekikara, between Malatya and Kjachta, 1600 m., Handel-Mazzetti 2408a (W). KAYSERİ: Erciyas Dağ, Seisaly, Zederbauer in 1902 (W). GÜMÜŞANE: Taltabon, Sintenis 5867 (G, JE). KONYA: Lycaonia, Hayek 468 (BM, E); Beyşehir, Heldreich 1231. ANKARA: Ankara, H. Birand 128. KURDISTAN, Sintenis 1015 (K). Anatolia, Wiedemann (K).

This characteristic species occurs from Central Anatolia through the Near East to the Caucasus and eastwards in the Himalaya to Kumaun. In Anatolia it is confined to the Irano-Turanian region.

16. *E. confusum* Hausskn. in Oest. Bot. Zeit. 29, 151 (1879). Steinb. in Fl. URSS, 15, 606 (1949).

Lectotype: in Armenia Ruthenica, Daratschitschan, C. Koch in 1837 (LE; JE).

Along streams in E. Anatolia, 2100–2350 m.

KARS: Yağmurlu Dağ between Sarikamiş, and Karaorgan, 2350 m., Davis 30817 (E, K); Sarikamiş, 2100 m., Davis 30775 (BM, E, K). VAN: Darnis Ashagi, N. of Şatak, 2200 m., Frödin in 1936 (W).

This very distinctive species extends from E. Turkey and the Caucasus to Afghanistan. It is unlikely to be confused because of its pale pink flowers, large seeds and strict habit.

17. *E. ponticum* Hausskn., Mon. Epil. 202 (1884) Steinb. in Fl. URSS, 15, 593 (1949).

E. origanifolium sensu Boiss., Fl. Or. 2, 750 (1872), p.p.—non Lam.

E. ponticum var. *olympicum* Hausskn., Mon. Epil. 202 (1884) *Lectotype*:

Turkey, Ulu Dağ, Bursa, Aug. 1842 *Boissier* (JE).

Lectotype: Pontus, *Thirke* 7 (JE; LE).

Along streams and in most mountain meadows, 1800–3350 m., mainly in N. Anatolia and Kurdistan.

SIZE: Cimil, 2200 m., *Balansa* 148 p.p. (G, JE). TRABZON: Bayburt to Of, 3 km. N. of summit pass, 2400 m., *Stainton & Henderson* 6185 (E). GÜMÜŞANE: Bilbiloglu chanlar, *Sintenis* 7025 (BM, E, W), 7026 (E, G, K). GİRESUN: Balabandağları (Kilinç Tepe) above Tamdere, 2600 m., *Davis* 20563 (BM, E, K). BURSA: Kitiirli Dağ, Bursa, *Pichler* 37 (K); Ulu Dağ (Bithynian Olympus), *Boissier* in 1842 (W), *Aucher* 2831 (BM, G, K), ... in 1884 (G); ... in 1855 (E), *Maire* in 1904 (JE), *Bornmüller* 3358 (JE); Ulu Dağ summit, 2400 m., *Bornmüller* in 1886 (JE). VAN: distr. Şatak, Kavuşahap Dağ, 2750 m., *Davis* 23072 (BM, E, K). HAKKARI: Cilo Dağları, outflow from Mia Hrara glacier, W. of Kelesin, *Deutschmann & Freh* in 1956 (W); outflow of Kelesin east glacier, Cilo Dağları, *Deutschmann* in 1956 (W); Cilo Tepe, 3350 m., *Davis* 24056 (BM, E, K), 3000 m., *Davis* 24116 (BM, E, K). BITLIS: Meleto (Meretug) Dağ, 2200–3100 m., *Handel-Mazzetti* 2857 (W). ERZURUM: Mt. Bimgoell (Bingöl D.) between Muş and Erzurum, 1800 m., *Kotschy* 786 p.p. (G, W—mixed with *E. frigidum*); Erzurum, Tech Dağ, *Calvert* 743 (G). KAYSERİ: Erciyas Dağ, Rosaroht, 1900 m., *Siehe* 195 (E, G, JE, K).

E. ponticum ranges from Turkey to the Caucasus and northern Iran. In the absence of mature fruit it is difficult to distinguish from *E. algidum*. Living plants of the two species, however, are apparently separated by a number of characters concerned with the drooping inflorescence, crowding of the leaves and so forth.

18. *E. frigidum* Hausskn. in Oest. Bot. Zeit. 29, 51 (1879). Steinb. in Fl. URSS, 15, 594 (1949).

E. origanifolium sensu Boiss., Fl. Or. 2, 750 (1872) p.p. non Lam.

Lectotype: Iran, Kuh Daena near Shiraz, *Kotschy* 638 (W; BM, G, K, JE, LE).

Wet places in the mountains, 1500–2800 m., very local.

VAN: distr. Hoşap, Kepir Dağ, 2800 m., *Davis* 23342 (E, K). BITLIS: Süphan Dağ, 2800 m., *Davis* 24732 (E, K). HAKKARI: Cilo Dağ above Sua, 2400 m., *Davis* 24229 (BM, E, K). KAYSERİ: Erciyas Dağ, 2000 m., *Siehe* 196 (JE, K, LE). ERZURUM: Mt. Bimgoell (Bingöl D.) between Muş and Erzurum, 1800 m., *Kotschy* 786 p.p. (JE, W). MARAŞ: Berit Dağı, 2400 m., *Hausknecht* (JE). Muğla: Girdev Dağ, 2400 m., *Davis* 13990 (E, K).

This species is obviously closely related to *E. ponticum* and occurs in similar habitats, having been collected twice with it in Turkey in mixed gatherings. *E. frigidum* is distinguished by its smaller flowers, white petals (occasionally very pale pink) and perhaps smoother seeds. It is restricted to the Caucasus, Turkey and north Iran.

19. *E. algidum* M. Bieb., Fl. Taur.-Cauc. 1, 297 (1808). Steinb. in Fl. URSS, 15, 604 (1949).

E. origanifolium sensu Boiss., Fl. Or. 2, 750 (1872), p.p., non Lam.

E. trigonum sensu Boiss., Fl. Or. 2, 749 (1872), p.p., non Schrank.

Type: Kaishaur, Caucasus, *M. Bieberstein* (LE).

Moist marshy meadows in the mountains, 1550–3500 m., in N. Anatolia and Kurdistan.

ÇORUH: Şavval Tepe above Murgul, 2100 m., *Davis* 32367 (BM, E, K). RIZE: Cimil, 2000 m., *Balansa* 151 (G); distr. İkizdere, between Çarankaya yayla and Başköy, 3000 m., *Davis* 20934 (BM, E, K). TRABZON: N. side of Soğanlı Dağ above Çaykara, 2000–2200 m., *Davis* 32151 (BM, E, K); Bayburt to Of, 3 km. N. of pass top, 2400 m., *Stainton & Henderson* 6185 (E). BOLU: Ala dağ, 1550 m., *Kühne* 1252 (E). HAKKARI: Kara Dağ, 2900 m., *Davis* 24385 (BM, E, K).

Epilobium subalgidum Hausskn. (Oest. Bot. Zeit. 29, 59, 1879) is close to this species but said to differ *inter alia* in its turioniferous base, more clavate stigma, and rounded, weakly toothed leaves. I am not certain on the basis of the single specimen I have seen (Alkuli in d. Steppe. Hb. Fischer, JE, lectotype) whether it is specifically distinct from *E. algidum*, but Steinberg (Fl. URSS, 15, 605, 1944) and Grossheim (Opred. Rast. Kavk. 191, 1949) consider it so on the basis of more abundant material than I have had at my disposal. Grossheim (l.c.) records it from the southern Caucasus immediately adjacent to Turkey.

In the absence of mature seeds, *E. algidum* might be confused with *E. ponticum*, but that species has ovate leaves which are subsessile, truncate at the base and obtuse, and its inflorescences are conspicuously nodding at anthesis. The closeness of the relationship between *E. algidum* and *E. gemmascens* is commented on under that species.

Epilobium algidum is confined to Turkey, the Caucasus and northern Iran.

20. *E. gemmascens* C. A. Meyer, Verz. Pfl. Cauc. 172 (1831). Steinb. in Fl. URSS, 15, 605 (1949).

E. algidum M.B. var. *humile* M.B., Fl. Taur.-Cauc. 1, 297 (1808).

Type not seen.

E. origanifolium Lam. var. *balansae* Boiss., Fl. Or. 2, 750 (1872). Type: Turkey, Cimil (Djamil), above Rize, Lazistan, 2000 m., *Balansa* in 1866 (G; K, W).

Type: subalpine regions at the margins of streams near Castle Kaschaur, Caucasus, *Meyer* in 1829 (LE).

Along streams and in moist meadows in the mountains, 1200–2900 m., mainly in N. Anatolia and the Taurus.

RIZE: distr. Hemşin, Ortaköy to Çat, 2000 m., *Davis* 21250 (BM, E, K); distr. İkizdere, Haros Dağ to Baltaş Tepe, *Davis* 20957 (BM, E, K). TRABZON: Mt. Ulugoba near Fol, 1350 m., *Handel-Mazzetti* 628 (W). GÜMÜŞANE: Bilbiloglu to Chanlar, *Sintenis* 7025 (BM, E, G, K). BURSA: Ulu Dağ, *Mitchell* (K). ERZINCAN: Keşiş Dağ above Cimin, 2450 m., *Davis* 31649 (BM, E, K). ISPARTA: in summo mt. Anemas, Lycania, 2100–2400 m., *Heldreich* 1208 (BM, W); in schistibus mt. Anemas, 2100 m., *Heldreich* (BM, G, W). IÇEL: Bolkar Dağları, in high valleys

between Utsch Tepe and Mededsiz, 2800 m., *Kotschy* 141b (G, W); Taurus mts. N. of Cilician Gates, *Balansa* in 1855 (K). In monte Tauro, *Kotschy* 195 (K, W). Taurus, *Kotschy* in 1836 (W). Armenia Turcica, Lijukor (?), along streams towards Orumserai, *Sinten* 3326 (W).

This species is the only member of the genus with which I am familiar that propagates fairly regularly by vegetative buds in the leaf axils. Although distinctive, it is nevertheless very close to *E. algidum*. In addition to the characters given in the key, it usually differs in its much lower stature. It extends from the Balkans through Turkey to the Caucasus.

21. *E. anagallidifolium* Lam., Encycl. 2, 376 (1786).

E. alpinum auct. mult., non Linn. Boiss., Fl. Or. 2, 750 (1872). Steinb. in Fl. URSS, 15, 607 (1949).

Type: from France (not seen).

Wet scree or rocky slopes in the mountains, 1600–2700 m., only in N. Anatolia.

ÇORUH: Tiryal Dağ above Murgul, 2300 m., *Davis* 29945 (BM, E, K).

RIZE: above Cimil, 2300 m., *Balansa* 147 (G). TRABZON: Mt. Ulugoba near Fol, 2000 m., *Handel-Mazzetti* 660 (W). GÜMÜŞANE: Kariel Dağ, *Sinten* 7023 (BM, E, G, K, W). BURSA: Ulu Dağ, *Aucher* 2834 (BM, G, K), 1600 m.–1800 m., *Moore* 7324 (E).

This rather distinctive species has a circumboreal distribution.

APPENDIX

The distribution of Epilobium in Turkey

P. H. DAVIS

In the present account Dr. Raven has recorded 21 species (including 7 subspecies) of *Epilobium* from Turkey. Most genera in Turkey have a considerable proportion of species that are endemic to Anatolia. This is not the case with *Epilobium*, even at subspecific level, although 11 Turkish taxa are in fact endemic to the Asiatic part of the Near East (*E. algidum*, *E. anatolicum* subsp. *anatolicum* and subsp. *prionophyllum*, *E. colchicum*, *E. confusum*, *E. stevenii*, *E. frigidum*, *E. minutiflorum*, *E. ponticum*, *E. roseum* subsp. *consimile*), and two more extend only into Eastern Europe (*E. gemmascens* and *E. roseum* subsp. *subsessile*). Anatolia is the meeting place of circumboreal species and of groups of species centred in Europe and Western Asia. It may be instructive to analyse the distributional patterns further and to consider the species' ecology.

Epilobium is essentially a mesophytic genus—the species grow in situations where an abundant water supply is available throughout the spring and summer. Except in North Anatolia, such situations are of local occurrence in Turkey, which no doubt explains the very scattered distribution of many of the species. In the Near East, where xerophytes are extending their range, the mesophytic element is nearly everywhere on the retreat as a result of deforestation and probably (though the evidence is somewhat conflicting) of the increasing aridity of the climate. The species of Sect. *Chamaenerion* appear to be less dependent on surface water than those of Sect. *Epilobium*: *E. angustifolium* grows mainly in montane woods, *E. dodonaei* on eroded slopes, *E. stevenii* on gravel

terraces and dried-up gravel river beds, *E. colchicum* on scree. The species of Sect. *Epilobium* (which probably have a more superficial root system than those of Sect. *Chamaenerion*) grow mostly by streams or water channels or in alpine flushes, at least in the drier regions of Turkey. Considering this close association with water, it seems surprising that the distribution patterns of Turkish *Epilobia* are scarcely less well-marked than those of xerophytic genera which one might expect to be more intimately connected with areas characterised by certain rainfall values. Many of the species of *Epilobium* grow only at high altitudes in Turkey, which of course partly accounts for their interrupted distribution. These include the circumboreal *E. palustre* and *E. anagallidifolium*.

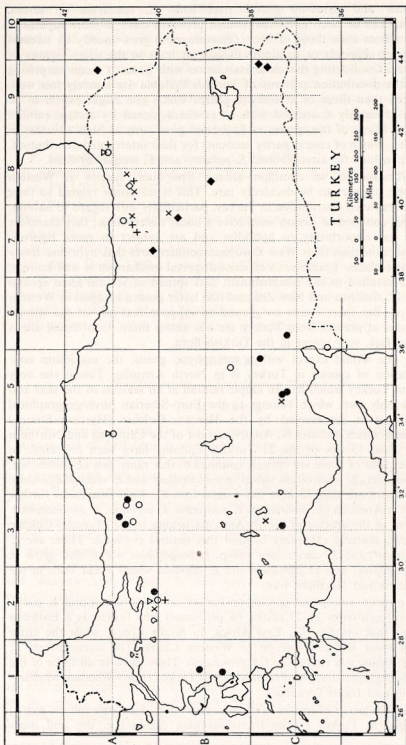
Hybridisation, so common among *Epilobium* species in Western Europe, appears to be decidedly rare. This is no doubt related to their more restricted distribution in Turkey, particularly with regard to habitat. Species confined to stream sides have a linear distribution; they therefore have less opportunity to hybridise and are subject to more rigorous competition than their West European counterparts that hybridise freely in waste places. *Epilobium*'s efficient dispersal mechanism is well known; it has resulted in the establishment and spread of several alien species from N. America and New Zealand (the latter garden escapes) in Western Europe. But there seems no ground to suppose that any of the species recorded at present from Turkey are not native there. Established aliens are, in fact, very scarce in the Turkish flora.

As one would expect with a mesophytic genus, the maximum concentration of species in Turkey is in North Anatolia. This is the only part of Turkey which has an ample rainfall at all seasons of the year and is the only part which belongs to the Euro-Siberian phytogeographical region; it is represented by the Hyrcano-Colchic (Hyrcano-Euxine) province which includes N. Anatolia, most of the Caucasus and Northern Iran. Here 15 out of the 21 Turkish *Epilobia* have been collected. In Turkey four of these are entirely confined to this rainy belt (*E. colchicum*, *E. dodonaei*, *E. anatolicum* subsp. *prionophyllum* and *E. anagallidifolium*). Four more are centred here but extend into the high mountains further south in Anatolia (*E. montanum*, *E. ponticum*, *E. algidum*, *E. gemmascens*). Several of the species of North Anatolia belong to the Hyrcano-Colchic element, scarcely extending beyond this natural province. These are *E. colchicum** and *E. anatolicum* subsp. *prionophyllum* which also grow in the Caucasus, and *E. ponticum* and *E. algidum* which occur both in the Caucasus and Northern Iran.

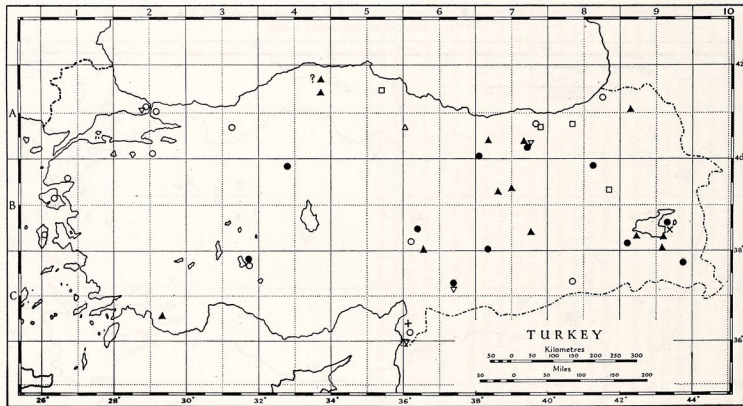
The most widespread species in Turkey are *E. hirsutum* and *E. parviflorum* (seen from 21–22 of the 68 provinces); the former is a Eurasian species that extends, via East Africa, to South Africa, while the latter grows from Western Europe to Western China. The circumboreal *E. angustifolium* is a runner-up (16 provinces). These grow in all three of the phytogeographical regions represented in Turkey (Euro-Siberian, Mediterranean and Irano-Turanian).

Another group of species is (rather surprisingly for a mesophytic genus) confined in Turkey to the Irano-Turanian region (i.e. the arid inner

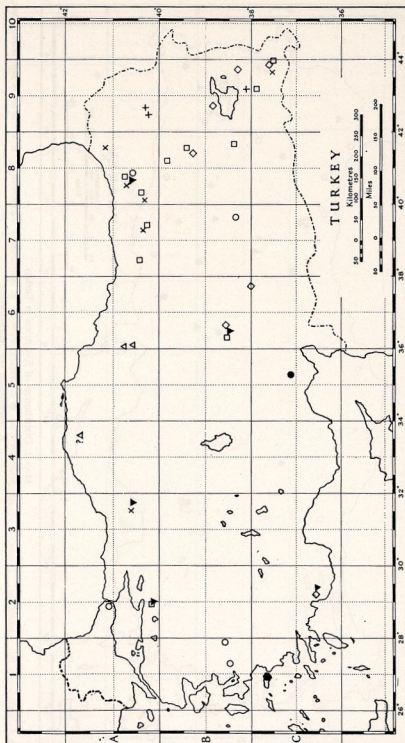
* Dr. Raven tells me that he is describing a new subspecies of *E. colchicum* (ssp. *iranicum*, now in press) collected by Dr. Wendelbo in N. Iran.

MAP 1. Distribution of *Epilobium* in Turkey.

+ *E. angalidifolium*. ◆ *E. colchicum*. ▽ *E. dononaet*. ● *E. lanceolatum* × *E. gemmascens* ○ *E. montanum*. ◆ *E. stevenii*.

MAP 2. Distribution of *Epilobium* in Turkey.

▲ *E. anatolicum* ssp. *anatolicum* □ *E. anatolicum* ssp. *prionophyllum* ● *E. minutiflorum* + *E. obscurum* × *warakense* ○ *E. tetragonum* ssp. *tetragonum*
 ▽ *E. tetragonum* ssp. *tournefortii*

MAP 3. Distribution of *Epilobium* in Turkey.

× *E. algidum*, ◊ *E. frigidum*, ▼ *E. palastre*, ◻ *E. ponticum*, Δ *E. roseum* ssp. *consimile*, ● *E. roseum* ssp. *roseum*, ○ *E. roseum* ssp. *sessile*.

plateau with cold winters), a region which extends eastwards as far as the western Tien Shan. These are *E. confusum*, *E. minutiflorum* (rather common), *E. stevenii* and *E. warakense*.

E. dodonaei, *E. lanceolatum*, *E. obscurum*, *E. tetragonum* and *E. roseum* subsp. *roseum* are essentially European species that extend into the Near East. The only Turkish taxon whose centre of distribution is in the Mediterranean region is *E. tetragonum* subsp. *tournefortii*—a large-flowered race which partly replaces subsp. *tetragonum* and subsp. *lamyi* in southern Europe.

E. obscurum calls for special comment. This European species is known in all Asia only from the Amanus mountains of S. Turkey, a range within the Mediterranean region with an exceptionally high rainfall that supports numerous Euro-Siberian species, most of which have probably migrated from North Anatolia during a Pluvial phase of the Pleistocene and maintained themselves in favourable habitats. *E. obscurum*, however, has not yet been found in the north of Turkey, so that its presence in the Amanus may be due to long distance dispersal rather than to contraction of a once more continuous area. It is known from Bulgaria, Greece and European Russia. Further collecting in Turkey, however, may extend the known range of this and other very local species.

The Turkish distribution of *Epilobium* (with the exception of the widespread *E. angustifolium*, *E. hirsutum* and *E. parviflorum*) is shown on maps 1-3, and is based entirely on specimens cited in Dr. Raven's account. The concentration of species in Lazistan (especially Cimil) and Ulu Dağ (Bithynian Olympus) shows up well on the map but may be accentuated by under-collecting elsewhere.