Materials for a Flora of Turkey

I.—Geraniaceae

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This is intended as the first of a series of papers to be published on taxonomic groups that are being studied for Davis's proposed Flora of Turkey. The series will be largely based on the Turkish material available in the herbaria at Kew, British Museum and Edinburgh. It will include descriptions of new species, keys to critical groups, and discussions and notes that for lack of space may have to be omitted from the Flora. Unless otherwise indicated, all specimens cited have been examined and were collected in Turkey.

In this paper everything can be considered as the joint work of the two authors unless Davis's name appears in brackets at the end of passages for which he is responsible.

We are indebted to the Botany Departments of Ankara and Istanbul Universities for the loan of material.

ERODIUM L'HÉR. EX AITON

Sect. Barbata Boiss. Subsect. Absinthioidea Brumh.

This subsection was first described by Brumhard (Mon. Übers. Erodium, 48 : 1905). In it he included those perennial species with the leaf rachis lobed or toothed between the pinnae, and with peduncles borne on stems (instead of sessile as in Subsect. *Petraea* Brumh.). Within the subsection, however, he also placed one annual species—*E. ciconium* (L.) Aiton—of very different habit though similar leaf form. Knuth (in Engler, Pflanzenr, Geranicaeae : 1912) followed Brumhard in his placing of *E. ciconium*—as indeed he did in most points pertaining to *Erodium*. Nevertheless, *E. ciconium* is a black sheep in the subsection, and is better placed elsewhere. Woronow (in Kuznezow, Fl. Cauc. Crit. iii (7) 96 : 1912) must have realised this when, with a flair for natural affinity, he placed it in Subsect. *Gruina* Willk. & Lange, whose description he amended. Subsect. *Gruina* now contains eight species : *E. gruinum* (L.) Aiton, *E. botrys* (Cav.) Bert., *E. telavivense* Eig, *E. Hoefftianum* C. A. Meyer, *E. obtusiplicatum* (Maire, Weiller & Wilczek) Howell, *E. ciconium* (L.) Ait., and *E. serotinum* Stev. Unlike the members of Subsect. *Absinthioidea*, all these species are hermaphrodite and, with the exception of *E. serotinum*, annual.

Subsect. *Absinthioidea* is centred in the mountains of Turkey, with outliers in the Balkans, Italy, the Caucasus and Anti-Lebanon. So far as one can judge from herbarium material, most, if not all of these species are dioecious. Attention was drawn to this character by Boissier in his Flora Orientalis, but no mention is made of it by Knuth. In the female the anthers are absent or greatly reduced, and the inner filaments (the fertile whorl in

hermaphrodite *Erodia*) are shorter and broader than in the male. Furthermore, the pedicels in the female thicken and the sepals enlarge after fertilisation—features not shown in the other sex. In the male the ovary is absent or reduced to a knob. The two sexes were beautifully illustrated by Cuisin for *Erodium Vetteri* Barbey & Major (in Stefani, Barbey & Major, Samos, 36, t. 2 : 1891), a plant omitted from Knuth's monograph and from the Index Kewensis. There is a tendency for male plants in this subsection to be better represented in herbaria than females—possibly because the male may retain its petals (in the absence of fertilisation) longer than the female.

There are two taxa in which dioecism may not be complete : *E. leucanthum* Boiss. and *E. absinthioides* Willd. var. *armenum* Trautv. The first species is generally fully dioecious, but I have examined one specimen with apparently hermaphrodite flowers ; this, however, may be functionally male, since no fruit has set. This appears to be the usual morphological condition in *E. absinthioides* var. *armenum*, in which morphologically hermaphrodite and female plants occur, though the former would often appear to be functionally male. However, one can hardly distinguish in the herbarium between true gynodioecism and functional dioecism morphologically disguised as gynodioecism ; one cannot be sure if a hermaphrodite flower has failed to fruit because it is functionally male, or because it has not been pollinated. Whether these two taxa are gynodioecious or functionally dioecious therefore remains in doubt, but we have seen no fully hermaphrodite species in Subsect. *Absinthioidea*. The species, however, are rare and still poorly represented in herbaria. The sexuality of the group needs study in the field and experimental garden. Mr. N. Y. Sandwith tells us that the rare Balkan species, *E. Guicciardii* Heldr., appeared to be dioecious when grown in the experimental ground at Kew. So far as we know, none of the Turkish species is in cultivation.

The closely related Subsect. *Petraea*, centred in the Western Mediterranean, differs from Subsect. *Absinthioidea* in its acaulous habit and generally smaller fruits (beak 20-30 mm. long, instead of 40-60 mm. as described by Knuth for Subsect. *Absinthioidea*).* In Subsect. *Petraea* all the species examined in the Kew Herbarium, except one, are fully hermaphrodite. The exception is *E. trichomanifolium*, centred in Lebanon, which appears to be dioecious. This species is certainly very closely related to a dioecious member of Subsect. *Absinthioidea*, *E. amanum* Boiss. & Ky.,—closer, it seems to us, than to the Spanish *E. cheilanthifolium* Boiss. in Subsect. *Petraea* with which it has often been confused.† *E. amanum*—a predominantly Turkish species—has a variety in the Anti-Lebanon (var. *glandulosum* Boiss.) that comes geographically, as well as morphologically, nearest to *E. trichomanifolium*. In

* The fruit difference breaks down in *E. cinereum* var. *canescens* (Subsect. *Absinthioidea*) which has a beak only 25–30 mm. long.

† In his recent critical paper on the Spanish Flora, V. H. Heywood (in Bull. Brit. Mus. i, 117 : 1954) has combined *E. cheilanthifolium* as a subspecies of *E. trichomanifolium*. We consider these two taxa specifically distinct. *E. trichomanifolium* differs from *E. cheilanthifolium* (incl. *E. celtibericum* Pau) in having leaves that are narrowly oblong (not oblong-ovate) in outline, dioecious flowers, smaller, more glandular sepals, and shorter, equal, immaculate petals. Here, as in Subsect. *Absinthioidea*, the general outline of the leaf is a reliable diagnostic in separating taxa. It may be added that in the Lebanon the leaves of *E. trichomanifolium* (as with *E. cheilanthifolium* in Spain) may or may not bear gland-tipped trichomes ; both forms can occur in the same gathering (Lebanon : Qornet Sauda, *Davis* 9816).

this variety caulescent and virtually acaulous forms can occur in the same gathering (Anti-Lebanon: Ein en Sur, above Bludan, *Davis* 6173A). Indeed one cannot help wondering if the latter has not been derived from a dioecious ancestor of *E. amanum* by reduction of the stems.

Dioecism in Subsect. *Absinthioidea* no doubt accounts for the considerable variability of its constituent species, since out-breeding is obligatory. Most of the taxa are confined to small mountainous areas. Even such narrow endemics as *E. Sibthorpianum* (Bithynian Olympus) are remarkably variable for such small populations. The morphological pattern of variation within the subsection suggests geographical speciation (still in progress) from more widespread ancestral stocks. It seems possible, however, that there may also have been some hybridisation (introgression ?) between certain species, as between *E. cedrorum* Schott & Ky. and *E. micropetalum* Boiss. where their ranges overlap in Cilicia.

In the subsection dioecism is not yet absolute. It seems very likely that the group originally sprang from a hermaphrodite ancestral stock that diverged into the predominantly dioecious Subsect. *Absinthioidea* in the Eastern Mediterranean, and the still hermaphrodite Subsect. *Petraea* in the West; the latter has evolved an acaulous habit.

As mentioned above, the species in Subsect. *Absinthioidea* are usually polymorphic. This does not seem to justify, however, the promiscuous lumping under *E. absinthioides* Willd. engaged in by Brumhard and Knuth. Boissier showed a more satisfactory sense of specific criteria in the group. When the subsection is studied on a geographical basis, it becomes much easier to delimit the species; variability within populations can be distinguished from differences between them. We feel that the Turkish taxa accepted in this paper represent major units, though there may be some doubt as to the taxonomic status that should be assigned to some of them. Varietal rank has been given to those taxa which fall within the geographical range of the typical species (representing a local facies of it), and subspecific rank to those that fall far beyond it. This is not an ideal arrangement, but one which has something to recommend it until the group is better understood. Considerable disjunction sometimes occurs unassociated with any noticeable morphological differences to justify taxonomic separation (as in *E. leucanthum*); in such cases disjunction is presumably recent, or may be more apparent than real, since some mountainous areas have scarcely been botanised.

Habit of plant (especially number and size of rosettes, and form of the general inflorescence), leaf shape and flower colour are all important—and hitherto often neglected—diagnostic characters, but ones which are hard to use in a key. Indumentum—especially presence or absence of glands—is variable in some species, constant in others. We could find little in the character of equal versus unequal petals as stressed by Brumhard and Knuth for *E. cedrorum*; the difference, if any, is slight, and without copious dissections its taxonomic value remains doubtful.

In addition to the Turkish species, we recognise as specifically distinct the Italian *E. alpinum* (Burm.) L'Hér., and the Balkan *E. Guicciardii* Heldr. and *E. chrysanthum* L'Hér. ex DC.; the latter is the only yellow-flowered species. We have not seen enough Caucasian material of the three species recognised by Woronow for that area to feel confident of their status;

nevertheless, we can say that the wholesale lumping under *E. absinthioides* (indulged in by Knuth) seems to be no more warranted in this case than it does for the Turkish species.

The nine Turkish species and their infraspecific taxa are tabulated below, grouped according to the major phytogeographical elements to which they belong. Three major elements are recognised—Mediterranean, Irano-Turanian and Pontic—adapted from the scheme used for Palestine by Eig. It will be seen that six taxa (species) are confined to the Mediterranean element, and six (belonging to four species) to the Irano-Turanian regions; only one appears to be Pontic. Taxonomic affinities often cut across this phytogeographical grouping, some species having races in more than one region. No infraspecific taxon, however, is found in more than one phytogeographical region, disjunctions unaccompanied by morphological differences (as in *E. leucanthum* and *E. flexuosum*) being within a single phytogeographical region. A distributional map is given on p. 14.

MEDITERRANEAN ELEMENT

E. leucanthum Boiss.
E. micropetalum Boiss. & Hausskn. ex Boiss.
E. salmoneum Davis & Roberts.
E. Sibthorpianum Boiss.
E. cedrorum Schott & Ky.
E. amanum Boiss. & Ky. subsp. *amanum*.

IRANO-TURANIAN ELEMENT

E. absinthioides Willd. var. *absinthioides*.
,, var. *armenum* Trautv.
E. cinereum Boiss. & Heldr. var. *cinereum*.
,, var. *canescens* (Bornm. ex Brumh.) Davis & Roberts.
E. flexuosum Davis & Roberts.
E. amanum Boiss. & Ky. subsp. *brevifolium* Davis & Roberts.

PONTIC ELEMENT

E. absinthioides Willd. var. *latifolium* Davis & Roberts.

The Turkish taxa, and the Samian *E. Vetteri*, are keyed out below; a key to the Turkish varieties of *E. absinthioides* appears under the description of *E. absinthoides* var. *latifolium*.

Key to the Species

1a. Laciniae linear-filiform, ± glandular. Petals white, up to 1½× calyx (Caria, Cilicia) . . . . . *leucanthum* Boiss.
1b. Laciniae broader:
2a. Hairs of leaf segments (at least the eglandular hairs) adpressed:
3a. Petals as long as or shorter than the sepals;
4a. Leaf segments deeply bipinnatifid into ovate-lanceolate acute laciniae, eglandular; flowers white (Anti-Taurus, Cilicia) *micropetalum* Boiss.

4b. Leaf segments divided ½ way to midrib into cuneate lobes with 2–3 short obtuse teeth, glandular; flowers shrimp pink (Isauria, Cilicia Trachea) . . . *salmoneum* Davis & Roberts

3b. Petals 1½–2 × sepals:

5a. Plants forming hard cushions of many small rosettes; leaves 1·2–4 cm. long:

6a. Petals 7–8 mm, white; beak 2·7–3·8 cm.; petiole usually at least as long as the 7–13 mm. blade (Samos) *Vetteri* Barbey & Major

6b. Petals 9–15 mm, very pale lilac; beak 3·5–4·6 cm.; petiole usually shorter than the 10–25 mm. blade (Bithynian Olympus) *Sibthorpianum* Boiss.

5a. Plants of few lax rosettes, not forming cushions; leaves 3–20 cm.:

7a. Peduncles usually as long as pedicels, widely divaricate, 4–10 per stem; leaves densely canescent (like the stems) with short eglandular hairs (Lycaonia) . . *cinereum* Boiss. & Heldr. var. *cinereum*

7b. Peduncles much longer than pedicels; leaves adpressed pilose and greenish (though often glandular), or canescent, or sericeous:

8a. Rachis and stems eglandular, hirsute-pubescent or sericeous; stems simple or sparsely (but scarcely divaricately) branched; peduncles 1–3 per stem; leaves ± eglandular (Armenia, Pontus) . . . . . *absinthioides* Willd.

8b. Rachis and stems glandular-hirsute; stems divaricately branched; peduncles 1–8 per stem; leaves glandular, green (Cilicia, Amanus) . . . *cedrorum* Schott & Ky.

2b. Hairs of leaf segments all spreading:

9a. Calyx 6–10 mm. in flower; petals orbicular, bright pink. Stems divaricately branched. Leaves glandular (Cilicia, Amanus) *cedrorum* Schott & Ky.

9b. Calyx 3·5–6·0 mm. in flower (if 6 mm., then stems simple and flowers probably white); petals obovate.

10a. Stem leaves usually 4–5-paired; stems bearing 3–5 short-peduncled umbels forming a lax corymb (Lycaonia) *cinereum* var. *canescens* Davis & Roberts

10b. Stem leaves 1–2-paired; stems bearing 1–2 umbels on long flexuous peduncles:

11a. Leaves densely glandular-pubescent, greenish; calyx glandular-pubescent, without long eglandular hairs. Petals 2 × calyx, probably white (Armenia, Paphlagonia) *flexuosum* Davis & Roberts

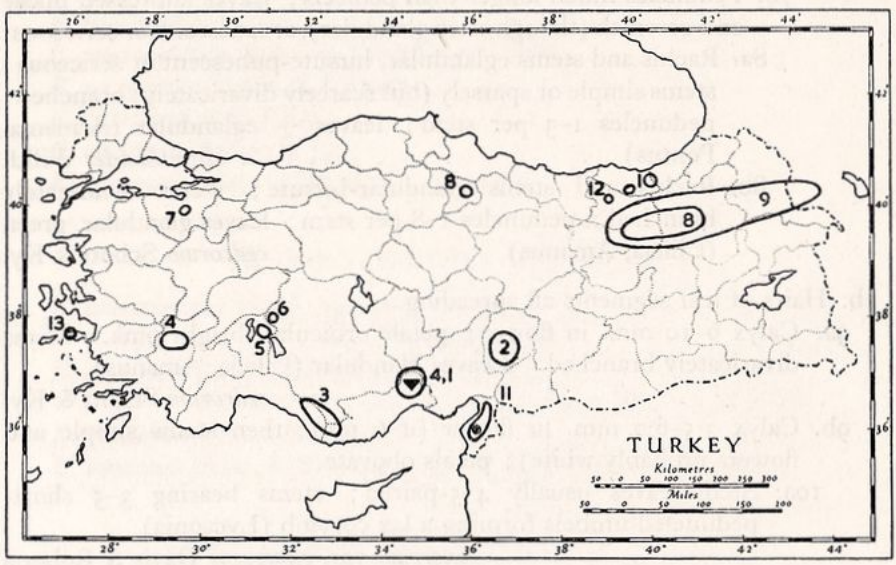
11b. Leaves densely hirsute, ± eglandular; calyx bearing short glandular hairs and long eglandular hairs.

12a. Petiole hirsute-villose, glandular; lamina oblong, 2–6 mm. long, bearing 0·5 mm. hairs (Amanus) *amanum* Boiss. & Ky. subsp. *amanum*

12b. Petiole retrorsely hirsute, egandular; lamina ovate-oblong, 1–2 cm. long, bearing 0·25 mm. hairs. Flowers red-purple (Pontic Taurus) *amanum* subsp. *brevifolium* Davis & Roberts

Before describing the new taxa, we give a list of the synonyms for the Turkish species which are not included under the new plants described :

E. absinthioides Willd. var. *amanum* (Boiss. & Ky.) Brumh.	=*E. amanum* Boiss. & Ky. subsp. *amanum*.
E. absinthioides var. *cinereum* (Boiss. & Heldr.) Brumh.	=*E. cinereum* Boiss. & Heldr. var. *cinereum*.
E. absinthioides Willd. var. *Sibthorpianum* (Boiss.) Brumh.	=*E. Sibthorpianum* Boiss.
E. armenum (Trautv.) Woronow	=*E. absinthioides* Willd. var. *armenum* Trautv.
E. cadmaeum Jaub. & Spach	=*E. leucanthum* Boiss.
E. cedrorum Schott & Ky. var. *micropetalum* (Boiss. & Hausskn. ex Boiss.) Brumh.	=*E. micropetalum* Boiss. & Hausskn. ex Boiss.
E. cilicicum Siehe ex Brumh.	=*E. leucanthum* Boiss.



Distribution of *Erodium* Subsect. *Absinthioidea* in Turkey

1. & ● E. *cedrorum*
2. & ▼ E. *micropetalum*
3. E. *salmoneum*
4. E. *leucanthum*
5. E. *cinereum* var. *cinereum*
6. E. *cinereum* var. *canescens*
7. E. *Sibthorpianum*
8. E. *flexuosum*
9. E. *absinthioides* var. *armenum*
10. E. *absinthioides* var. *latifolium*
11. E. *amanum* subsp. *amanum*
12. E. *amanum* subsp. *brevifolium*
13. E. *Vetteri*

Erodium salmoneum Davis et Roberts, **sp. nov.** (Sect. *Barbata* Boiss. Subsect. *Absinthioidea* Brumh. fil.).

Affinis *E. cedrorum* Schott & Ky. et *E. micropetalo* Boiss. & Hausskn. ex Boiss. ; ab ambobus pinnis foliorum basalium paucioribus minus profunde dissectis differt ; insuper ab illo petalis brevibus angustis recedit ; ab hoc indumento glanduloso, petalis salmoneis divergit.

Planta perennis, radice verticali ad 1 cm. lata, caudice crasso simplice vel breviter ramoso basibus foliorum vetustorum obsito. *Rosulae* paucae, laxae. *Caules* decumbentes, diffusi, divaricato-ramosi, dense glanduloso-hirsuti vel glanduloso-pubescentes, 5–30 cm. longi (pedunculis inclusis). *Folia basalia* haud numerosa, pinnatisecta; lamina ambitu oblonga, 3–6 cm. longa, 1·5–3·0 cm. lata, pilis longis adpressis eglandulosis et pilis brevibus glandulosis dense obsita, virescens; pinnae 2–4-jugatae, inferiores valde distantes, ambitu late ellipticae, solum ad medium in lobos cuneato-oblongos saepe in dentes 2–3 brevissimos obtusos partitos pinnatim divisae; pinna terminalis profunde trifida, segmentis cuneatis; rachis inter pinnas anguste sed obtuse lobulata; petiolus laminam 0·5–1·5-plo aequans, ut rachis glanduloso-pubescens vel glanduloso-hirsutus. *Folia caulina* 3–6-paria, paucius pinnata, breviter petiolata, basalibus magis glandulosa; summa sessilia, dense glanduloso-pilosa. *Stipulae* ovato-lanceolatae, valde glanduliferae, membranaceae, pallide fuscae, 2–5 mm. longae. *Pedunculi* 2–10 in quoque caule, divaricati, 2–5 cm. longi. *Umbella* 2–7-flora, pluribracteata. *Bracteae* ovatae, acutae, glanduloso-pilosae, 2 mm. longae. *Pedicelli* 5–20 mm. longi, ut pedunculi dense glanduloso-pubescentes. *Flores* dioici. *Sepala* ovato-oblonga, manifeste 3–5-nervosa, 5·5–8 mm. longa (mucrone 1–1·5 mm. incluso), in fructu ad 10 mm. longa, subobtusa, dense glanduloso-hirsuta, pilis longis eglandulosis atque brevibus glandulosis magis numerosis commixtis. *Petala* intense salmonea, immaculata, subaequalia, calyce mucronato paulo breviora vel aequantia, ad apicem truncata vel leviter emarginata, ad basin ± puberula; in ♂ 5·5–7 mm. longa, 3–4 mm. lata, anguste obovata; in ♀ 5 mm. longa, 2 mm. lata, obovato-oblonga. *Filamenta* antisepala in ♂ antherifera lanceolato-linearia, 5–6 mm. longa, glabra; in ♀ sterilia breviora, lanceolata, ciliata. *Ovarium* in ♂ abortivum. *Rostrum fructus* 4–5 cm. longum, a basi ad apicem sensim attenuatum, in toto dense et adpresse pubescens inferne saepe glanduliferum. *Mericarpia* 8–9 mm. longa, pilis albis rigidulis patentibus hirsuta, foveis binis obscuris glandulosis ornata; fovea plica concentrica destituta.

Prov. Mersin; distr. Anamur (Cilicia Trachea): Çamurlu Yaylâ—Olucak Ya. (between Ermenek and Anamur), on rocky limestone mountainside above the tree line, perennial, fl. bright shrimp pink, 18 Aug. 1949, *Davis* 16304 (holo. E; iso.K). Prov. Antalya; distr. Alanya (Isauria): Ak Dağ to the S. of Geyik Dağ, *Davis* a. 1947 (sine num.).

E. salmoneum is readily distinguished from all other Turkish species in Subsect. *Absinthioidea* by the shallow division of its leaf segments. Its closest allies are *E. cedrorum* (Cilician Taurus and Amanus) and *E. micropetalum* (centred in the Anti-Taurus); from the first it differs (in addition to leaf shape) by its much smaller and narrower petals, and from the second by its glandular leaf-indumentum and the shrimp-pink colour of its flowers —a striking and unusual shade. We have not seen living material of *E. cedrorum*, but E. K. Balls describes it as having bright pink flowers; in *E. micropetalum* the flowers are white.

Erodium flexuosum Davis & Roberts, **sp. nov.** (Sect. *Barbata* Boiss. Subsect. *Absinthioidea* Brumh. fil.).

Valde affinis *E. amano* Boiss. et Ky. praesertim subsp. *brevifolio* Davis et Roberts sed foliis dense glanduloso-pubescentibus virescentibus, calyce

glanduloso-pubescenti pilis longis eglandulosis absentibus, floribus ut videtur albis recedit.

Planta perennis, radice verticali ad 1 cm. lata, caudice breviter ramoso superne petiolis vetustis persistentibus rigidis obsito. *Rosulae* plures, condensatae. *Caules* decumbentes, simplices, 2–5 cm. longi, retrorse pubescentes, glandulosi, pedunculos tenues 1–2 emittentes. *Folia basalia* adpressa, tripinnatisecta ; lamina ambitu ovata, valde obtusa, 2–3 cm. longa, 12–16 mm. lata, pilis brevibus glandulosis dense pubescens, virescens ; pinnae approximatae, 6–8-jugatae, fere ad basin in lacinias oblongas obtusas bipinnatisectae ; rachis inter pinnas anguste sed obtuse lobulata ; petiolus laminam 1·5–2-plo superans, glanduloso-pubescens. *Folia caulina* 1–2 paria, abbreviata ; lamina petiolum aequans, pinnis paucis praedita. *Stipulae* foliorum basalium lanceolatae, fuscae, longe ciliatae, circ. 4 mm. longae. *Pedunculi* 1–3 cm. longi, procumbentes, ut pedicelli glanduloso-pubescentes. *Umbella* 4–7-flora, pluribracteata. *Bracteae* anguste ovato-oblongae, breviter ciliatae. *Pedicelli* 5–12 mm. longi. *Flores* dioici, femineis ignotis. *Sepala* oblonga, obtusa, 4·5–5·5 mm. longa, breviter mucronata (mucrone haud 1 mm. longo), pilis saepe brevissimis glanduloso-pubescentia. *Petala* obovata, aequalia, calyce duplo longiora, ut videtur alba. *Fructus* ignotus.
ARMENIA, *Calvert & Zohrab* (holo. E ; iso. K ; as *E. Sibthorpianum*). PROV. ERZERUM : Erzerum, *Zohrab* 438 ; Tech Dağ above Erzerum, *Huet* a. 1853 (as *E. Sibthorpianum* var. *glandulosum*). PROV. ERZINCAN : Kechich Dağ [Keşiş Dağ near Erzincan], *Montbret* a. 1834 (as *E. sp. nov. aff. E. trichomanifolio*). PROV. AMASYA : Ak Dağ, *Bornmüller* a. 1889, 955 (as *E. absinthioides var. albiflora*).
PERSIA : Kurdistan, *Olguin*.

The new species is certainly very close to *E. amanum* Boiss. & Ky., especially subsp. *brevifolium* from the environs of Gümüşane. It differs from this plant in its densely glandular-pubescent greenish leaves, and in the lack of long eglandular hairs on the glandular-pubescent calyx ; it appears to have white flowers, whereas those of *E. amanum* subsp. *brevifolium* are described by E. K. Balls as red-purple. Its calyx is like that of *E. cinereum* Boiss. & Heldr. The specimen collected by Bornmüller from near Amasya differs from the typical (and more easterly) *E. flexuosum* in having a longer indumentum and in the virtual absence of persistent petioles. Although we have tentatively included it in this species, it is not covered by the latin description.

From the parenthesis following the cited specimens of *E. flexuosum*, it will be seen that there has been much disagreement as to the species' identity. This was taken further by Knuth who cited the plant under *E. absinthioides* var. *cinereum* forma *glandulosum* (Boiss.) Brumh. fil. together with the Macedonian plant we call *E. absinthioides* subsp. *elatum* (Form.) Davis & Roberts. To have combined these two taxa in one form must have required considerable ingenuity, especially as the type of forma *glandulosum* (Boiss.) Brumh. fil. is an Anti-Lebanon plant (*E. amanum* var. *glandulosum*) which cannot be matched in Turkey or Macedonia.

E. flexuosum appears to be centred in the Irano-Turanian territory of N.E. Anatolia, and would seem to be a plant of the alpine zone. It is unfortunate that so many of the old records of plants from Eastern Turkey are very poorly localised.

Erodium amanum Boiss. et Kotschy subsp. **brevifolium** Davis & Roberts, **subsp. nov.**

Syn.: *E. absinthioides* Willd. var. *hirtum* Freyn & Sint. in Bull. Herb. Boiss. iii, 105 (1895).

E. absinthioides var. *amanum* (Boiss. et Kotschy) Brumh. fil. forma *uniflorum* Brumh. fil. ex Knuth in Engler, Pflanzenr. Geraniaceae, 264 (1912.)

A typo petiolo retrorse hirsuto eglanduloso, lamina ovato-oblonga breviore pilis brevioribus obsita divergit.

Planta pulvinum multirosulatum ad 15 cm. diametro formans. *Lamina* foliorum basalium ovato-oblonga, (1) 1·5–2·5 cm. longa, 7–15 mm. lata, aromatica, pilis patentibus eglandulosis 0·25 mm. longis dense obsita, cinerea; pinnae profunde 1–2-pinnatifidae, in lobos oblongos obtusos divisae; petiolus retrorse hirsutus, eglandulosus, 1–1·5 (3·0)-plo laminam aequans. *Umbellae* 1–2 in quoque caule, 1–4-florae. *Flores* dioici. *Sepala* 5–7 mm. longa (mucrone 1 mm. incluso) ad 10 mm. in fructu, pilis longis eglandulosis patentibus et pilis brevibus glandulosis numerosis commixtis. *Petala* rubro-purpurea, calyce circa 1·5-plo longiora. *Rostrum* fructus 3–3·5 cm. longum, pilis aliquantum patentibus pubescens, ad basin glandulosum.

ARMENIA TURCICA: Szandschak Gumuschkhane, in lapidosis mont. Aktasch, 28 Jun. 1894, *Sintenis* 6053 (holo. K; iso. E. & Geneva). Gümüşane, 1600 m., on scree and limestone rocks, fl. red-purple, *E. K. Balls* 2018.

Although morphologically very close to the type from the Amanus mountains (of which an isotype and two other gatherings have been examined), the geographical disjunction would seem to warrant sub-specific status. Unlike subsp. *amanum*, which belongs to the Mediterranean element, subsp. *brevifolium* is probably Irano-Turanian, Gümüşane lying in the rain-shadow of the Pontic Taurus.

The new taxon forms a link between *E. amanum* subsp. *amanum* and *E. flexuosum*.

Erodium absinthioides Willd. subsp. **absinthioides** var. **latifolium** Davis et Roberts, **var. nov.**

A typo lamina ovata breviore, pinnis in lobos valde obtusos simpliciter pinnatifidis, caulibus uniumbellatis dense et retrorse hirsutis recedit.

Caules breves (1–2 cm. longi), dense et retrorse hirsuti, simplices, procumbentes. *Folia* basalia ± sericea; lamina ovata, 2·5–3·5 cm. longa, 2–2·5 cm. lata, valde obtusa, bipinnatim divisa; pinnae in lobos oblongos obtusos simpliciter pinnatifidae; petiolus laminam aequans, retrorse hirsutus, eglandulosus. *Umbella* in quoque caule solitaria. *Flores* verisimiliter dioici. *Petala* late obovata, rosea, calyce 2·5-plo longiora.

PROV. TRABZON: Kuzitaschi, Mesourach, 2500 m., in crevices of coarse scree limestone, 2 July 1933, *E. K. Balls* 436 (holo. K; iso. E).

At first sight the dwarf var. *latifolium* is so different from *E. absinthioides* Willd. var. *absinthioides* and var. *armenum* Trautv. that we did not at first place them together. However, two specimens referable to var. *armenum* (*Zohrab* 433 and 437, from near Erzincan) so closely approach our plant in habit that var. *latifolium* must be associated with this species. The new variety seems to fall within the Pontic phytogeographical region, just outwith the Irano-Turanian range of var. *armenum*.

In Macedonia *E. absinthioides* is represented by subsp. *elatum* (Form). Davis & Roberts * whose leaves, though variable in indumentum, have narrower leaf segments than the Turkish varieties, all of which fall within subsp. *absinthioides*. A key to the Turkish plants is given here :

1. Lamina of basal leaves oblong, length 2–4 × breadth, 3·5–13·0 cm. long, segments laxly and deeply bipinnatifid into lanceolate acute laciniae ; stems 1–3-umbelled :
   2. Stems densely canescent with short adpressed hairs ; leaves densely canescent or subsericeous . . . . var. *absinthioides*
   2. Stems hirsute with spreading hairs, often also with subsessile glands ; leaves greenish, adpressed pilose . . var. *armenum* Trautv.
1. Lamina of basal leaves ovate, length c. 1·5 × breadth, 2–4 cm. long, segments crowded and simply pinnatifid into oblong very obtuse laciniae, subsericeous ; stems 1-umbelled, densely and retrorsely hirsute . . . . . var. *latifolium* Davis & Roberts

The distribution of var. *absinthioides* is not marked on the map (p. 00) because it has only been recorded from ' Armenia ' (*Aucher* 4303 ! 2646 !). These specimens fit perfectly Willdenow's original description of the species —the only one whose type we have not seen.†

Erodium cinereum Boiss. et Heldr. var. **canescens** (Bornm. ex Brumh. fil.) Davis et Roberts, **comb. et stat. nov.**

Syn. : *E. absinthioides* Willd. var. *cinereum* (Boiss. & Heldr.) Brumh. fil. f. *canescens* Bornm. ex Brumh. fil., Mon. Übers. Erod. 50 (1905).

E. absinthioides Willd. var. *alpiflorum* [sic] Hausskn. & Bornm. f. *canescens* in sched. (nom. nud.).

A typo indumento longiore subpatente, umbellis brevipedunculatis in corymbum laxum dispositis, floribus paulo minoribus recedit.

Indumentum of stems and leaves longer than in the type and subspreading, that of the stems ± glandular. Stem leaves in 4–6 pairs. Stems emitting 3–5 short peduncles glandular-pubescent above, the umbels forming a lax corymbose inflorescence 2·5–4 cm. across. Sepals 3·5–5 cm. long, very shortly mucronate, densely glandular-pubescent. Petals white, obovate, 1·5 × calyx. Beak of fruit 2·5–3 cm. long, shortly adpressed pubescent, eglandular.

PROV. KONYA : Phrygien, Sultandagh oberhalp Akscheher, 1900 m., *Bornmüller* a. 1899, n. 4228 (iso. K. & E.).

E. cinereum is an Irano-Turanian species ; the typical plant (var. *cinereum*) grows in the same province as var. *canescens* though apparently at lower altitudes. The species is most closely allied to *E. leucanthum* Boiss. and *E. Vetteri* Barbey & Major, both members of the Mediterranean element. It differs from its allies by its short-peduncled umbels, and may be shorter lived.

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* **Erodium absinthioides** Willd. subsp. **elatum** (Form.) Davis et Roberts, **stat. nov.**—Syn. *E. absinthioides* Willd. var. *elatum* Form. in Verh. Nat. Vereins Brünn, xxxviii, 228 (1896).

† Material from Turkish Kurdistan, collected in 1954, is referable to var. *armenum*.

SUBSECT. GRUINA WILLK. & LANGE

Erodium Hoefftianum C. A. Meyer subsp. **Neilreichii** (Janka) P. H. Davis, **stat. nov.**

Syn. : *E. Neilreichii* Janka in Öst. Bot. Zeitschr. xvii, 101 (1867).

E. Hoefftianum var. *Neilreichii* (Janka) Hayek, Prodr. Balc. i, 578 (1925).

Although there is some morphological overlap between this taxon and typical *E. Hoefftianum* (syn. *E. tmoleum* Reuter ex Boiss. and *E. Semenovii* Regel & Herder), the material examined does not justify Woronow's treatment of them as completely synonymous. The two plants occupy largely different areas, and this fact, associated with the morphological differences tabulated below, leads me to treat *E. Neilreichii* as a subspecies of *E. Hoefftianum*.

subsp. *Hoefftianum*	subsp. *Neilreichii*
Stems generally shorter than the basal leaves, bearing 1–2 (3) pairs of leaves.	Stems tall, at least 2–3 times the basal leaves, bearing 3–7 pairs of leaves.
Winged rachis of stem leaves scarcely toothed, segments crenate-dentate, the lower pair not lobed or only very shortly so.	Winged rachis of stem leaves often manifestly toothed, segments incised, the lower pair with a spreading lobe below.
Peduncles 1–4-flowered.	Peduncles 2–8-flowered.
Filaments of stamens glabrous.	Filaments of stamens ciliate.

Specimens of subsp. *Hoefftianum* have been seen from Central Asia, Transcaspia, Anatolia and E. Roumania (Dobrudja), and of subsp. *Neilreichii* from Hungary and Serbia ; Hayek and Knuth also record the latter from Macedonia. Both taxa apparently grow under steppe conditions. To these must be added the following new subspecies from S.W. Anatolia.

Subsp. **Birandii** P. H. Davis, **subsp. nov.**

Affinis subsp. *Neilreichii* (Janka) P. H. Davis sed caulibus ramosioribus, foliis caulinis pinnatisectis segmentis inferioribus magis distantibus rachide manifestius dentata, filamentis glabris divergit.

Planta annua, in specimine fero unico 30 cm. alta, ad basin ramosa. *Caules* robusti, (in cult. procumbentes), striati, pallidi, pilis longis eglandulosis et pilis brevibus glandulosis patentim obsiti, manifeste ramosi et foliosi, internodiis 5–10 cm. longis. *Folia basalia* in typo emarcida. *Folia caulina* pinnatisecta ; lamina 3–5 cm. longa, ambitu ovato-oblonga, petiolum aequans, hirsuta, in pagina inferiore pilis longis eglandulosis patentibus atque pilis brevibus glandulosis commixtis ; rachis parce et simpliciter dentata, superne insuper anguste alata ut petiolus glanduloso-hirsuta ; duo paria segmentorum infima distantia, ambitu ovata, in lobos 3–5 dentato-incisos pinnatifida ; segmenta superiora 5–7, haud ad rachidem attingentia, dentato-incisa. *Folia summa* subsessilia. *Stipulae* anguste lanceolatae, 4–6 mm. longae, ciliatae. *Pedunculi* 6–10 cm. longi, foliis 2–3-plo longiores, glanduloso-pubescentes. *Umbella* 6–8-flora, multibracteata ; bracteae ovato-lanceolatae, 2 mm. longae, ciliatae. *Pedicelli* 10 mm. longi, glanduloso-pubescentes, in fructu patentes vix incrassati. *Flores* hermaphroditi. *Sepala*

mucronata 5–6 mm. longa (in fructu 7–9 mm.), brevissime glanduloso-pubescentia sed superne et ad marginem pilis longis eglandulosis patentibus obsita ; lamina sub anthesi 4 mm. longa ; mucro gracilis, 1–2 mm. longus, hirsutus. *Petala* lilacina, aequalia, obovato-oblonga, obtusa, integra, 4·5–5·0 mm. longa (in cult. 9 mm. longa), supra unguem brevem minute ciliolata. *Filamenta* glabra, lanceolata, superne subulata, staminodiis oblongis triplo longiora. *Rostrum* 5–6·7 cm. longum, gracile, brevissime et adpresse pubescens. *Mericarpia* 6 mm. longa, inferne sensim attenuata ad basin curvata, eglandulosa, pilis brevissimis albis adpressis dense obsita, ad apicem foveis binis obliquis ornata ; fovea plica concentrica destituta.
PROV. ISPARTA : by Yenea, 1000 m. ; meadow in ravine, on sandy soil, 11 May 1932, *Mehmet Saim* (holo. Ankara ; photo. E).

Subsp. *Birandii* comes nearest to subsp. *Neilreichii*, differing from it in its pinnatisect stem leaves which have more distant segments and a markedly dentate rachis, and in its glabrous filaments. In the shape of its stem leaves the plant approaches *E. ciconium* (L.) Aiton.

Seed from the type specimen, though 22 years old, germinated within a week at Edinburgh. The rosettes of the young plants have the first four leaves pinnately lobed, the later ones grading from lyrate-pinnatisect to pinnatisect, all with crenate-dentate segments. The stems are procumbent, and the petals larger than in the type specimen—probably because only a few late blooms are represented on the latter. Cultivated material is preserved in the Edinburgh Herbarium.

The new subspecies is named after Professor Hikmet Birand, Professor of Botany in Ankara University, through whose kindness the type specimen —and much other material—has been made available for study. [P. H. Davis]

SECT. PLUMOSA BOISS.

Erodium oxyrrhynchum M.B., Fl. Cauc. i, 133 (1808).
PROV. ERZINCAN : Ak Dağ near Erzincan, 1500 m., on lime soil by roadside, *E. K. Balls* 1517.

This appears to be the first unequivocal record of this species—and its section—for Turkey, though I have seen a specimen collected by Szovits in [Russian ?] ' Armenia.' *E. oxyrrhynchum* belongs to the Irano-Turanian element, and extends eastwards into Central Asia ; most of the other species in the section are Saharo-Sindian.

GERANIUM L.

Geranium cinereum Cav. subsp. **subcaulescens** (L'Hér. ex DC.) Hayek, Prodr. Balc. i, 572 (1925).

We agree with Knuth that *G. subcaulescens* L'Hér. ex DC. cannot be kept specifically distinct from the Pyrenean *G. cinereum* Cav., since in the Eastern Mediterranean plants showing intermediate characters are quite common. The complex gets increasingly variable towards the East, reaching maximum variability (like so many other species) in Turkey, where its classification presents problems similar to those found in *Erodium* Subsect. *Absinthioidea*.

G. cinereum subsp. *cinereum* is confined to the Pyrenees and is relatively uniform—a plant with large pale emarginate petals and with the calyx

indumentum composed entirely of very short adpressed hairs. In the Atlas Mountains this is replaced by subsp. *nanum* (Cosson) Maire.* The Italian plant has hitherto been referred to *G. cinereum* sensu stricto, but this is erroneous; it belongs to subsp. *subcaulescens*. This subspecies, in which we have included all the Turkish material, was originally described from Parnassus,† and is widely distributed, though local, in the mountains of the Balkan Peninsula, Asia Minor and Lebanon. It is very variable in habit, in the shape and indumentum of its leaves, and in the colour and shape of its petals. Whereas dark-flowered forms (with blackish stigmas

Distribution of *Geranium cinereum* subsp. *subcaulescens* in Turkey

● var. *subcaulescens* ▼ var. *ponticum*
+ var. *subacutum* O var. *lazicum*

and stamens) greatly predominate in the Balkans, pale-flowered forms predominate in Turkey. However variable in leaf, flower and habit, the Eastern Mediterranean plants nearly always bear some long and generally spreading hairs on the calyx, in addition to the short adpressed indumentum —a character which distinguishes them from subsp. *cinereum*.

In Turkey subsp. *subcaulescens* shows local variation from mountain to mountain, but is often rather variable within each population, although flower colour is usually constant. It ranges from 1600–3100 m. It does not appear to have been previously noted that most of the gatherings from the Pontic provinces have leaf segments which are 3–6-lobed, instead of

* V. H. Heywood (in Bull. Brit. Mus. Bot. i, 112 : 1954) has recently described a new Spanish Geranium, *G. cazorlense* Heywood, and differentiated it from *G. cinereum* (*sensu stricto*). We have not had an opportunity to examine type material of the new species (the isotype has not yet been deposited in the Edinburgh Herbarium), but from the description it would seem that this plant might well be treated as a subspecies of *G. cinereum*. It is approached by certain forms of subsp. *subcaulescens* in Lebanon and Turkey (Lebanon : Birket—Nsour (above Hermel), *Davis* 10201. Turkey, Prov. Denizli : Baba Dağ (Cadmus), *Davis* 257) which have the broad 3-crenate leaf-segments described for *G. cazorlense*.

† Figured as *G. asphodeloides* in Sibth. & Smith, Fl. Graeca, vii, t. 661.

2-3-lobed (or sometimes entire) as elsewhere in Turkey, the Balkans and Italy. This might give grounds for assigning the Pontic plants to a subspecies co-ordinate with subsp. *subcaulescens*; however, the leaf character is not entirely constant and, as the calyx indumentum does not differ from that of typical subsp. *subcaulescens*, we have retained them (as var. *ponticum* and var. *lazicum*) within the latter subspecies. The following key differentiates the varieties of subsp. *subcaulescens* we recognise in Turkey. It must be admitted, however, that var. *subcaulescens* is more heterogeneous than the others, and may require division when better understood; but at present any attempt to sort out its variation on a geographical basis has failed.

1. Leaf segments generally 2–3-lobed, sometimes entire; stems 1–4 (8)-flowered. Predominantly plants of the Mediterranean and Irano-Turanian territories:
   2. Sepals acute; flowers white (rarely pale pink?); leaves densely canescent, with acute lobes. Stem indumentum adpressed var. *subacutum*
   2. Sepals subobtuse; flowers pink or purple; leaves ± canescent:
      3. Leaf segments with short obtuse or subacute lobes; stems shortly pubescent or shortly adpressed-canescent; flowers pink or purple var. *subcaulescens*
      3. Leaf segments entire and acute, or deeply divided into 2–3 acute lobes; stems hirsute-pubescent; flowers purple var. *palmatipartitum*
1. Leaf segments 3–6 (8)-lobed; stems 2–10-flowered. Sepals obtuse. Indumentum of stem short and adpressed, rarely absent. Plants of the Pontic Taurus.
   4. Leaves discolorous, adpressed canescent below, green above, the lobes broadly ovate and obtuse; flowers pink, genitalia pale var. *lazicum*
   4. Leaves ± concolorous, adpressed puberulent, often glabrescent with age, lobes ovate and acute, rarely lanceolate; flowers and genitalia dark . . . . . var. *ponticum*

var. **subcaulescens.**

Syn.: *G. subcaulescens* L'Hér. ex DC., Prodr. i, 640 (1824).
G. subcaulescens var. *subacutum* Boiss., Fl. Or. i, 872 (1867), pro parte.

Type. Greece: in summo monte Parnasso, *Sibthorp* (Oxford, n.v.).

PROV. GUMUŞANE: Courcoulizos, *Bourgeau* 61; Kirkpauli, *Sintenis*, 5694. PROV. DENIZLI: Baba Dağ, *Davis* 257; Cadmus, *Boissier*. PROV. ISPARTA; distr. Sütçüler: Dedegöl Dağ, *Davis* 15992. PROV. ANTALYA: Katara (Lycia), *Forbes* 166. PROV. MARAŞ; distr. Göksun: Binboga Dağ, *Davis* 20028; Hobek Dağ, *Davis* 20169 (tall shade form—now being cultivated at Edinburgh); distr. Çardak: Berit Dağ, *Davis* 20313. PROV. KONYA: Kara Dağ, *Heldreich*. PROV. KAYSERI; distr. Kisge: Bakir Dağ, *Davis* 19451.

A very variable taxon, linked to var. *subacutum* by intermediate forms (cf. *Sintenis* 5761, *Aucher* 2104, *Montbret*, all from Cappadocia). The nature of the stem indumentum is not closely correlated with flower colour or leaf shape. Some of this variability may well be due to inter-racial hybridisation. All the Balkan material would fall within this variety as circumscribed here.

var. **subacutum** (Boiss.) Davis & Roberts, **comb. nov.**

Syn.: *G. subcaulescens* var. *subacutum* Boiss., Fl. Or. i, 872 (1867) pro parte.

G. subcaulescens var. *leucophaeum* Hausskn. et Bornm. ex Bornm. in Mitt. Thur. Ver. Neue Folge, xx, 11 (1904–5).

Lectotype: Cappadocia, in Monte Argaeo, *Balansa* 1036 (Geneva, n.v.; duplicate in Herb. Kew !).

PROV. AMASYA: Sana Dağ, *Bornmüller* a. 1890 n. 2893, 953b, a. 1889 n. 954; Ak Dağ, *Manissadjan* 1108b; Karababa Dağ, Ak Dağ, *Bornmüller* a. 1889 n. 953. PROV. KAYSERI: Ercyeş DAĞ, *Siehe* 209, *Balls* 1404, *Bagda* a. 1944, *Heilbronn* a. 1941.

Boissier's var. *subacutum* included plants which have been placed under var. *subcaulescens*, and the specimen that we have chosen as the lectotype and which seems to be the same as Bornmüller's var. *leucophaeum* from Amasya. The variety belongs to the Irano-Turanian element.

var. **palmatipartitum** [Hausskn. ex] Knuth in Pflanzenr. Geraniaceae, 94 (1912).

Type: Armenia Turcica. Egin: Kizgoez-baschi, in lapidosis, 28 May 1890, *Sintenis* 2481 (Berlin; K ! E !).

A robust plant, with elongated caudices clothed with numerous leaf-bases. Endemic.

var. **ponticum** Davis & Roberts, **var. nov.**

Caules 2–10-flori saepe ramosi indumento brevissimo adpresso vel raro absente. *Folia* ± concoloria, adpresse puberulentia vel deinde glabrescentia, segmentis 3–6 (8)-lobatis, lobis ovatis acutis vel etiam elongatis lanceolatis. *Flores* purpurei. *Sepala* obtusa pilis brevissimis adpressis et pilis longioribus subpatentibus praedita. *Genitalia* nigricantia.

Type. Prov. Rize: region alpine superieure du Lazistan, au dessus de Djimil [Cimil], ver 2800 m., *Balansa* 1369 (K !).

PROV. TRABZON: Kara Kaya Dağ, N. of Bayburt, *Balls* 1669a; Sari Kaya, *Balls* 471; Zingana Dağ, *Balls* 1669, *Schischkin* a. 1917; Bayburt—Trabzon, *Montbret*. PROV. RIZE: Çağrankaya Yaylâ—Başköy (Cimil), *Davis* 20936. PROV. ERZERUM: İspir, *Huet*.

From 2100–3000 m., among non-calcareous rocks and turf, and on granite screes with *G. ibericum* subsp. *jubatum*. Endemic.

In its most extreme form (*Davis* 20936), with glabrous narrowly segmented leaves and branched elongated stems with up to 10 flowers, this taxon is so distinct that we did not at first associate it with *G. cinereum* subsp. *subcaulescens*. However, it does show some morphological overlap with var. *lazicum* in the same area, suggesting that hybridisation may be occurring between two initially distinct taxa. The inflorescence is less reduced than

in any other race of *G. cinereum* s.l. It seems possible that the Pontus—so rich in species of Geranium—may be the centre from which the species spread towards the West.

var. **lazicum** (Woronow) Davis & Roberts, **comb. nov.**

Syn.: *G. subcaulescens* var. *lazicum* Woronow in Kuznezow, Fl. Cauc. Crit. iii (7), 10 (1908).

Type. In alpinis Lazistaniae rossicae (Leningrad ?—n.v.).
PROV. RIZE: Cermanin Tepe above Cimil, *Davis* 21067; Anger, S. of Rize, *Balls* 1669b.

The distribution of the Turkish varieties (based on specimens examined) is given on the map on p. 21. It will be seen that the subspecies has a distribution rather similar to that of the whole of *Erodium* Subsect. *Absinthioidea* in Turkey, but appears to be entirely lacking from the main Cilician Taurus.

Geranium ibericum Cav., Diss. iv, 209 (1790) subsp. **ibericum.**
PROV. ARTVIN: Kutul near Artvin, *M. Heilbronn* a. 1947.

Probably the first authentic record of the typical form of the species from Turkey. It is centred in the Caucasus and Russian Armenia.

subsp. **jubatum** (Hand.-Mazz.) P. H. Davis, **comb. et stat. nov.**

Syn.: *G. jubatum* Hand.-Mazz. in Ann. Nat. Hofmus. Wien, xxiii, 160, t. 9, f. 2 (1909).

G. ibericum Cav. var. *platypetalum* Boiss., Fl. Or. i, 876 (1867) pro parte—non *G. platypetalum* Fischer & Meyer, Index Sem. Horti Petrop. [i] 28 (1835).
PROV. GIRESUN: Balaban Dağları above Tamdere, *Davis* 20570. PROV. TRABZON: Bayburt—Trabzon, *Montbret*; Tashli Ova, *Balls* 559; Harami Dağ, Haldizan, *Balls* 1892; Trabzon—Zigana Dağ, *Kasapligil* a. 1945, PROV. GUMUŞANE: Istavros, *Sintenis* 1670. PROV. RIZE: Tatosdağları. between Çarankaya Yaylâ and Başköy (Cimil), *Davis* 20935; Cimil, *Balansa* 1372, p.p. PROV. ERZINCAN: Sipikordağ, *Sintenis* 3477. ARMENIA, *Aucher* 2109.

This taxon was recognised as a distinct species by Handel-Mazzetti, who differentiated it from *G. platypetalum* Fischer & Meyer with which it was confused by Boissier (as *G. ibericum* var. *platypetalum*). The taxonomic association with *G. platypetalum*, however, is evidently based on the glandular indumentum of the pedicels; in all other characters the plant conforms to *G. ibericum* Cav. I have therefore reduced it to a subspecies of the latter. Although only a single differential character has so far been detected (glandular pedicels), the plant occupies a considerable geographical area quite outwith the range of *G. ibericum* s.s., replacing it in the Pontic Taurus. From *G. platypetalum* the plant is well distinguished by its leaf shape (being more deeply divided) and short bracts. Knuth in his monograph cites material of *G. ibericum* subsp. *jubatum* under both *G. ibericum* s.s. and *G. platypetalum*. [P. H. Davis].

Geranium platypetalum Fischer & Meyer, Index Sem. Hort. Petrop., [i] 28 (1835)—non *G. platypetalum* Franch. (1889).

PROV. RIZE: distr. Hemşin: Ortaköy—Çat, *Davis* 21255; distr. İkizdere, at Cimil, *Balansa* 1372 p.p. PROV. ARTVIN: Kutul near Artvin, *Heilbronn* a. 1947. [P. H. Davis].

Geranium libani P. H. Davis, **nom. nov.**

Syn.: *G. libanoticum* (Boiss. & Blanche ex Boiss.) Boiss., Fl. Or. i, 877 (1867).

G. peloponnesiacum Boiss. var. *libanoticum* Boiss. et Blanche ex Boiss., Diagn. Ser. i (5), 73 (1856)—non *G. libanoticum* Schenk, Pl. Sp. Aegypt. 39 (1840).

Boissier records the species from the Amanus Mountains, collected by Kotschy, but I have only seen material from Lebanon. [P. H. Davis].

Geranium kurdicum Bornm. in Fedde, Repert. viii, 82 (1910).

PROV. BITLIS: Kambos Dağ above Hürmüz, 2100 m., 31 June 1954, *Davis & Polunin* (*Davis* 23386). PROV. VAN: dist. Şatak: Kavuşşahap Dağ, 3000 m., 23 July 1954. PROV HAKKÀRI: Cilo Tepe, 3000 m., 8 Aug. 1954, *Davis & Polunin* (*Davis* 24034); Kara Dağ, 3200 m., 15 Aug. 1954, *Davis & Polunin* (*Davis* 24403).

This rare species, originally described from near Rowanduz in Iraq and related to *G. libani* P. H. Davis, has previously been collected in Turkey only by Nàbêlek. Its obcordate petals are lilac-blue, rarely dark violet. It grows by springs, streams and flushes, evidently requiring, like another Irano-Turanian species, *G. collinum* Steph. ex Willd., plenty of water. [P. H. Davis].

Geranium Wiedemannii P. H. Davis, **nom. nov.**

Syn.: *G. ibericum* Cav. var. *parviflorum* Boiss., Fl. Or. i, 876 (1867).

G. parviflorum (Boiss.) Hand.-Mazz. in Ann. Nat. Hofmus. Wien, xxiii, 161 (1909)—nec *G. parviflorum* Andr., Geran. ii (1806), nec *G. parviflorum* Curtis, Fl. Lond. ii, [(6) t. 46], (1798), nec *G. parviflorum* Willd., Enum. Hort. Berol. 716 (1809).

The taxon was first described from material collected by Wiedemann on Yıldız Dağ near Sıvas (type in Herb. Boiss., n.v.), and later found by Handel-Mazzetti in the province of Trabzon (Ulugoba by Fol, 1750 m., *Handel-Mazzetti* 1152). I have not seen either specimen, but Sommier and Levier's amplified description (given by Handel-Mazzetti) would seem to justify the specific status assigned to it; the name adopted by Handel-Mazzetti, however, is invalid, so that a new binomial is given here. [P. H. Davis].

Geranium gracile Ledeb. ex Nordm. in Bull. Acad. Petersb. ii, 314 (1837).

PROV. TRABZON: Hamseköy, *Balls* 1650; Dzevizlik, *Schischkin* a. 1917; Sumila, *Sintenis* 1514 (fide Hand.-Mazz.).

This predominantly Caucasian species was wrongly keyed out by Knuth; it differs from both *G. versicolor* L. (*G. striatum* L.) and *G. nodosum* L. in

having spreading glandular hairs on the pedicels. Sintenis' gathering of *G. gracile* was erroneously referred to *G. versicolor* by Knuth—a species that has not yet been found in Turkey, though occurring in the Balkans.

Geranium tuberosum L., Sp. Pl. 680 (1753).
The following is a key to the subspecies I recognise in Turkey :

1. Peduncles and pedicels densely glandular. Leaf segments deeply pinnatifid, those of the basal leaves elliptical in outline and with laciniae often toothed. Beak of carpels manifestly attenuated and glabrescent below the stigmas. Stems generally with one pair of leaves below the dichotomy . . . . . subsp. *macrostylum*

1. Peduncles and pedicels eglandular :

2. Beak of carpels scarcely attenuated below the stigmas, hairy to apex ; basal leaves as in subsp. *macrostylum*, or the segments incised-serrate ; stem naked below the dichotomy . . . subsp. *tuberosum*

2. Beak of carpels manifestly attenuated and glabrescent below the stigmas ; leaf segments often much elongated, few-lobed or serrate, even those of the basal leaves linear in outline and with short entire divisions ; stem generally with 1–2 leaves below the dichotomy subsp. *linearifolium*

subsp. **tuberosum**
Syn. : *G. radicatum* M.B., Fl. Taur. Cauc. i, 134 (1808).
G. tuberosum var. *genuinum* Boiss., Fl. Or. i, 873 (1867).
G. tuberosum var. *pinnatifidum* Woronow in Kuznezow, Fl. Cauc. Crit. iii (7), 11 (1908).
G. tuberosum var. *inciso-dentatum* Woronow, l.c. 12.

The typical subspecies is widespread in Turkey, both in the Mediterranean and Irano-Turanian parts of the country, ranging from near sea level to at least 1400 m. ; Siehe (n. 224 !) collected it as high as 2500 m. near Bereketli [on Ala Dağ].

subsp. **linearifolium** (Boiss.) P. H. Davis, **stat. nov.**
Syn. : *G. tuberosum* var. *linearifolium* Boiss., Fl. Or. i, 873 (1867).
G. linearilobum DC., Prodr. i, 640 (1824).
ARMENIA [Turkish], *Calvert & Zohrab*. KURDISTAN [Turkish], *Brant & Strangways* a. 1840.

This eastern Irano-Turanian race seems to be widespread in Persia, but overlaps, geographically and morphologically, with subsp. *tuberosum* in the eastern part of the latter's range.

subsp. **macrostylum** (Boiss.) Hayek, Prodr. Fl. Balc. i, 576 (1925).
Syn. : *G. macrostylum* Boiss., Diagn. Ser. i (1), 58 (1842).
PROV. DENIZLI : Baba Dağ, *Davis* 255. CARIA, *Pinard* a. 1842. PROV. NIĞDE : Hasan Dağ below Taşpınar Yaylâ, *Davis* 19001. CILICIA : Thal Gusguta, *Siehe* 235. LYDIA : Montes Lydiae, *Boissier*. (iso-syntype K !).

PROV. KASTAMONU : Küre—Kastamonu, *Davis* 21710 (forma caulibus nudis).

Specimens of subsp. *macrostylum* have been seen from Greece, Albania, Thasos and Anatolia. In Turkey it often replaces the more widespread subsp. *tuberosum* between 1200 and 2000 m. In subalpine regions it has been found in the shade of *Quercus cerris*, *Cedrus libani* subsp. *stenocoma* and *Juniperus excelsa*. *Davis* 21710 is the only gathering I have seen with naked stems—a character of subsp. *tuberosum* ; the gathering is a uniform one, and was made in a fallow field at 1200 m.

G. tuberosum s.l. requires further revision in the Nearer East. There appears to be a distinctive race in the Lebanon. It might be mentioned here that Sibthorp & Smith's description and plate of *G. tuberosum* (Fl. Gr. vii, t. 659) combine the characters of subsp. *tuberosum* and subsp. *macrostylum*. [P. H. Davis].