

SOME REMARKS ON THE PERENNIAL SPECIES OF ZIZIPHORA WITH SPECIAL REFERENCE TO THOSE IN TURKEY

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Although about forty specific names have been published up till now among the perennial *Ziziphora*, this number tends to give a false impression of the degree of specific differentiation within the group. Many of the names, such as those of Koch and some of the earlier Russian ones, are difficult or virtually impossible to typify and since different authors have used specific and infra-specific epithets in different ways, clarification of the synonymy is no easy task. Apart from the instances of nomenclatural synonyms, there is still a considerable bulk of names in current use (c. 30) whose right to specific rank is most doubtful. Despite the fact that cyto-genetical work and cultivation experiments are probably the prerequisites of a satisfactory classification of this group, it is appropriate at this stage, when the genus appears to be in danger of becoming another nomenclatural and taxonomic jungle, to make some generalizations and proposals based on morphological and phyto-geographical data.

The "Formenkreis" extends in area from Bulgaria, through Turkey and the Caucasus to the west Himalayas and as far east as the Altai mountains.* The general habitat is arid steppe and dry alpine slopes. Two of the most recent floristic accounts of the perennial species are by Juzepczuk (1954) who deals with the species in Soviet territory, and by K. H. Rechinger (1951) who treats the species in Persia and contiguous countries. Unfortunately, in the Russian flora, Juzepczuk does not mention Rechinger's work and consequently this has confused the nomenclature and taxonomy still further in the Caucasian region. Both these authors took a very narrow concept of the species, Rechinger recognizing eleven species and Juzepczuk, at the time of his death in 1959, recognizing about twenty. Rechinger in the introduction to his paper does stress the fact, however, that he uses specific epithets in the belief that they are not necessarily "good species" but that binomial names form a better basis of further study in the group than would a complex hierarchy of several specific and infra-specific categories in which the infra-specific taxa might be associated with the wrong species. The adoption of such a narrow species concept, however, would lead in the case of recently collected material from Turkey, Syria and Iraq to a further swarm of specific names, all difficult to diagnose satisfactorily and to distinguish from previous species.

After several years of intermittent study with fairly abundant herbarium material (from Edinburgh, Kew, Vienna and some from Leningrad), and during some field observations in Turkey during 1957, the impression

* It is of interest that the annual species of the genus, which stand quite distinct from the perennials, have a similar distribution in S.W. Asia though extending further westwards into Europe. Ter-Chatscharurova (1953) deals with the annual species under the resuscitated generic name *Faldermannia* although excluding from it *Z. capitata* L. and *Z. capitellata* Guz.

I have formed is that the perennial *Ziziphora* are *one* actively evolving genetic unit in which although certain phenotypic trends are apparent, specific *and* infra-specific designation of them is extremely artificial, misleading and of little practical use. This conclusion has been reached after consideration of all the available morphological characters, the habit types and their geographical occurrence. Some of these characters which have been used in the taxonomy of the group are considered here.

Indumentum

This is a character on which much stress has been laid in all the previous treatments of the group, e.g. the first alternative in Juzepczuk's key is whether the calyx has a continuous indumentum of hairs longer than the diameter of the calyx or is either glabrous or provided with a few scattered hairs shorter than the diameter of the calyx; in Rechinger's key, one of the alternatives is whether the flowering stems have spreading hairs or are never spreading-hirsute and often with short retrorse hairs. Some field observations in Turkey clearly demonstrated, however, that the degree of indumentum may vary appreciably within a single population.

The herbarium numbers Davis D.31950a and D.31950b were collected in what was undoubtedly the same population yet the "B" number had long spreading hairs all over the leaves and stems and long scattered hairs on the calyx whereas the "A" number had glabrous leaves, very short retrorse hairs on the stem and a very short pruinose indumentum on the calyx. (See Plate 14.) A similar condition was observed in the populations from which were gathered Davis D.31891 and D.32491: glabrescent and hairy forms quite intermixed. Without the knowledge that the two types come from the same population, however, they could quite well be given separate specific names! The Rechinger numbers 10980a and 10980b from N. Iraq presumably represent another instance of a mixed indumentum population.

Clearly, then, the degree of density and presence or absence of an indumentum is not always constant in a population and represents a taxonomic character which should not be overemphasized.

Growth form

This is another character which at first sight seems to be of great use in the taxonomy of the group but on detailed examination proves to be of limited value. As with the indumentum, the extremes of the range are very distinct—in this case, the tall, erect growing and the completely prostrate plant—but the abundance of intermediates almost nullifies the value of growth type as a key character. There are many examples to illustrate this: McNeill 540 from S.E. Turkey illustrates a case where both the tall erect habit and the almost completely prostrate were growing in the same population, yet the former might well be named as *Z. ronnigeri* Náb. and the latter *Z. glabrata* Rech. fil.; Davis D.23338 falls between these two "specific" names in having the general facies of *Z. ronnigeri* Náb. and the procumbent-ascending habit of *Z. glabrata*; Rechinger (1951 p. 166) cites several specimens which, although within his concept of *Z. rigida* (Boiss.) Stapf, do not have the tall erect form of that "species" but are



A

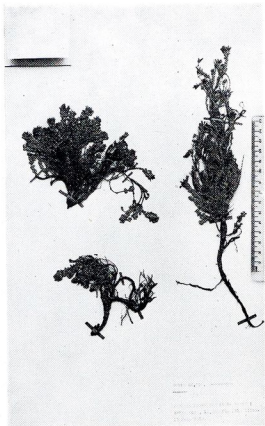


B

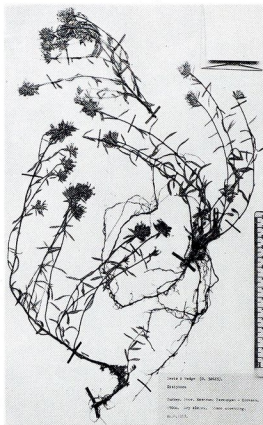
PLATE 14. Indumentum variation within a population of perennial *Ziziphora*.

(A). *Davis 31950 B*—a spreading hirsute form.

(B). *Davis 31950 A*—from the same population—a glabrescent form with short retrorse hairs on the stem.



A



B

PLATE 15. Habit variation within the perennial *Ziziphora*.

(A) *Davis 22890*—a dwarf growing form with orbicular leaves.

(B) *Davis 32623*—an erect form with narrow lanceolate leaves.

low-growing with thicker branched stems; two numbers of *Z. borzhomica* Juz. (issued as duplicates from the Leningrad herbarium) illustrate in one, 4089a, a procumbent habit and in the other, 4089b, an erect habit.

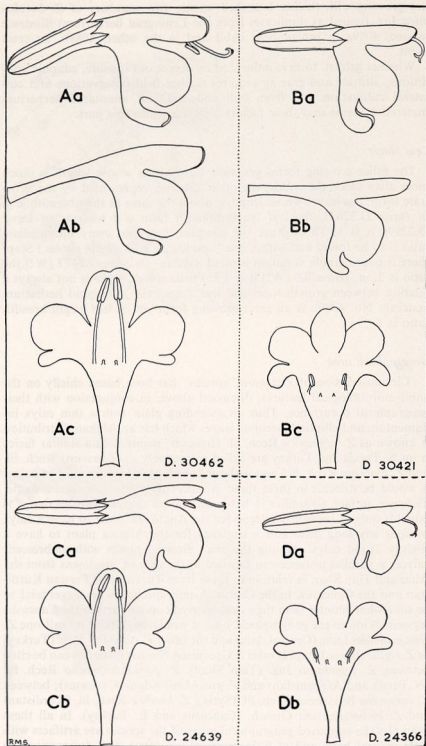
Whether growth form is influenced by degree of exposure, edaphic conditions, altitude and grazing requires further field observations and collateral cultivation, but from well collected and annotated herbarium material it seems that these factors play a considerable part.

Leaf shape

The taller growing forms generally have leaves whose length is much more than twice the width; the other extreme, represented by the prostrate form, has leaves whose length is about the same as their breadth, e.g. in *Davis* D.32623, the leaf length/breadth ratio is 8 whereas in *Davis* D.22890 it is 1. Throughout the complex, however, every intermediate ratio is to be found and within one "species", e.g. *Z. rigida* (Boiss.) Stapf there is considerable variation around a mean—in *Schmid* 6177 (W!) the ratio is 2, in *Aellen* 709 (W!) it is 4-5. Furthermore, there is not always a relation between growth form and leaf shape; the Leningrad herbarium exsiccata No. 4089b is an erect growing form yet its leaf length/breadth ratio is 1.

Geographical area

Circumscription of *Ziziphora* "species" has been based chiefly on the habit-morphological features, discussed above, in conjunction with their geographical occurrence. Thus an ascending plant with a thin calyx indumentum and elliptic-lanceolate leaves which has an Afghan distribution is known as *Z. afghanica* Rech. fil. However, plants with a similar facies from N. Persia and Turkey are called respectively *Z. elbursensis* Rech. fil. and *Z. glabrata* Rech. fil., and without knowledge of the country of origin it would be difficult in these three instances to give a specimen a name. They are, in fact, so similar in habit and morphological features that it is possible only to recognize a trend for the Anatolian plant to have a calyx without any long hairs and a tendency for the Afghan plant to have a slightly hispid calyx. Among the erect growing plants with glabrescent calyces a parallel instance can be cited in the case of specimens from the Altai and Tian Shan in relation to those from Turkish and Persian Kurdistan and the Caucasus. In the Central Asiatic specimens the leaves tend to be somewhat blunter than their acute-leaved counterparts in the Caucasus regions. Without the geographical clue, it would be difficult to call one *Z. clinopodioides* Lam. (Central Asia) and the other *Z. romigeri* Náb. (Turkey) or *Z. rigida* (Boiss.) Stapf (Persia & Caucasus). Similar instances can be cited between *Z. tomentosa* Juz. (Tian Shan), *Z. pseudodasyantha* Rech. fil. (N. Persia and Afghanistan) and *Z. puschkinii* Adam (Caucasus); between *Z. canescens* Bth. sensu Rech. fil. (Syria), *Z. kurdica* Rech. fil. (Kurdistan) and *Z. biebersteiniana* Grossh. (Caucasus and E. Turkey). In all these examples the supposed geographical areas of the species are artifacts with little natural basis and of little practical use other than designating the country of origin.

FIG. 1. Sex forms in *Ziziphora* Linn.

Sex forms

The occurrence of sex forms within the perennial species of *Ziziphora* is apparently a frequent feature yet one which is not mentioned in previous literature. All the instances I have seen of sexual differentiation are female sex forms: the male organs are not functional. There are several grades within these female forms: the anthers may be more or less aborted or else almost natural sized anthers may be formed but no pollen is produced; whether there is a stage beyond this in which pollen is produced but is not fertile requires further investigation. Among recently collected Turkish material the following show female sex forms: the Davis numbers D.30421, D.22890, D.31950b, D.31707, D.32686, D.31891, (p.p.) and D.24366. It is of interest that D.31950b (discussed above under indumentum) is a female sex form and is hirsute, whereas D.31950a (the same population) is hermaphrodite and more or less glabrous; the opposite linking of character is provided by the mixed gathering D.31891 where the female sex form is more or less glabrous and the hermaphrodite hirsute. Clearly, sexual differentiation occurs frequently and, as far as I can trace, indiscriminately, i.e. within one population (D.31950a and D.31950b) both hermaphrodite and female flowers are to be found on separate plants. Although it requires field observations to verify the frequency of sex forms throughout the range of the group it is probable that it is as common outwith Turkey as it is in that country. This at once throws some doubt on a floral character which was used both by Juzepczuk and Grossheim (1949) in their delimitations of several species, viz. the length of the corolla tube and the width of the limb at its throat. These alternatives were used by Grossheim as the first dichotomy in his key to the Caucasian species. As fig. 1 illustrates, within the same micro-unit the hermaphrodite flower has a longer corolla-tube, exerted from the calyx, than the female sex form which has a shorter corolla tube scarcely or not exerted from the calyx.*

Other than this, I have found no character constantly associated with sexual differentiation. The conclusion that must be drawn, however, is that the length of the corolla tube, its degree of exertion from the calyx, and the degree of exertion of the stamens are characters dependent on the sexual condition of the plant.

Other morphological features

Numerous measurements of calyx lengths, the length and shape of calyx teeth, examination of corolla lobes and nutlet characters proved that they were of little taxonomic assistance.

* This is, of course, typical for sex forms in the Labiatae—the female sex flowers are smaller in species of *Salvia*, *Dracocephalum*, *Mentha*, *Calamintha*, *Origanum* and *Glechoma*.

FIG. 1 (opposite).

Aa, corolla and calyx of D.30462, a hermaphrodite flower showing a somewhat exerted corolla tube. Ba, corolla and calyx of D.30421, the same micro-unit as D.30462, but a female sex form showing a scarcely exerted corolla tube. Ab and Bb—the same corollas with calyces removed. Ac and Bc—the same with corolla opened showing respectively mature and aborted anthers. Ca, Corolla and calyx of D.24639, a hermaphrodite flower with a clearly exerted corolla tube. Da, corolla and calyx of D.24366, the same micro-unit, but a female sex form with a scarcely exerted corolla tube and a much shorter corolla. Cb and Db, the same with the corollas opened out. $\times 4$.

Conclusions

The present abundance of specific names in the perennial species of *Ziziphora* has resulted largely from over-emphasizing the importance of the morphological features discussed above and relating them to unnatural geographical distributions. Part of the reason for this has been the limited amount of previous material. However, as more material throughout the range of the complex becomes available the differences between the previously "distinct species" virtually disappear and, at the same time, more and more variants of the complex come to light. Further botanical exploration in Asia will almost certainly lead to the discovery of more combinations of characters and the possibility of more descriptions of new *Ziziphora* "species". It is important in this context that future botanical collectors should make sufficiently comprehensive field notes and observations to cover variation in regard to indumentum, growth form, sexual differentiation, habitat, degree of exposure, and flower colour; and, at the same time, where possible to make population gatherings to supplement these notes.

Although on the basis of the facts discussed above, I have come to the conclusion that, with our present knowledge, it is preferable to unite all the perennial *Ziziphora* under one binary name, it is, nevertheless, useful to have reference points within the multiplicity of variation trends. There is,

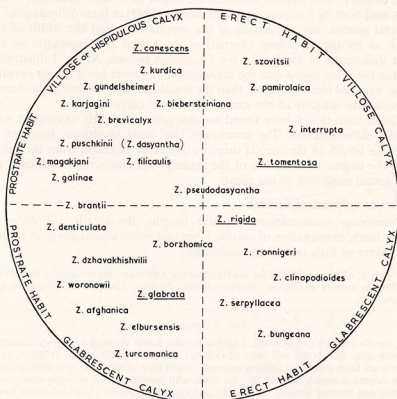


FIG. 2. Schematic representation of the names used within the perennial species of *Ziziphora* Linn.

moreover, a strong case in this group for divorcing the classification from the formal nomenclature and, in place of an unending number of new infra-specific combinations for these reference points, adopting an "informal" nomenclature based on previously used epithets.

This treatment is proposed as an interim and completely unbinding classification in the hope that, although it is a plea for restraint in the description of new taxa and indiscriminate nomenclatural juggling, further research into the biology of the group might give a better framework on which to build a more satisfactory classification.

Classification

It is impossible to formulate a satisfactory key to the variants or to define them satisfactorily. They are, therefore, listed with brief descriptions in linear sequence with their intermediates from one extreme to the other.

Despite the instability of the characters—leaf shape, growth form and indumentum as shown above—these characters, combined with general facies, are used in the absence of any others more suitable or reliable.

A pictorial representation of the specific names used within the complex in relation to growth form and calyx indumentum is given on fig. 2. A circle is divided into four quadrants representing: (1) erect habit and glabrescent calyx, (2) erect habit and villose calyx, (3) prostrate habit and glabrescent calyx and (4) prostrate habit and villose hispidulous calyx. In the lineal listing these four quadrants are called respectively "*rigida*" group, "*tomentosa*" group, "*glabrata*" group and "*canescens*" group. It must be stressed that these names are not the earliest within the groups and have been selected solely for their descriptive suitability.

Z. clinopodioides Lam.

"*rigida*" group

Characterized by erect more or less tall growing stems, leaves narrow or very narrow lanceolate, stiff or flaccid, calyx indumentum of very short hairs visible only under magnification, rarely slightly hirsute.

This variant is very frequent in Iran. It also occurs in S.E. and E. Turkey, the Caucasus region and in central Asia.

The specific names which have been used in this group are:

- Z. clinopodioides* Lam., Illustr. i, 63 (1791). Icon. in Komarov, Fl. U.R.S.S. xxi, 392 (1954). Described from Central Asia—type in Paris.
- Z. clinopodioides* M. Bieb., Fl. Taur. Cauc. i, 17 (1808). Described from Caucasus region—type in Leningrad?
- Z. serpyllacea* M. Bieb., Fl. Taur. Cauc. i, 17 (1808). Described from Caucasus—type in Leningrad. In the Flora U.R.S.S. (xxi, 387: 1954) the reference to the first description is given as Besch. d. Länd zw. Terek u. Kura, 127 (1800)—I have not seen this reference. Probably *Z. fasciculata* Koch sensu Rechinger is a synonym of *Z. serpyllacea*. As Juzepczuk points out *Z. fasciculata* Koch is a nomen nudum.

- Z. mussini* Adam in Weber & Mohr in Bietr. z. Naturkunde, i, 43 (1805). Icon. in Komarov, Fl. U.R.S.S. xxi, 392; 1954. This is another synonym of *Z. serpyllacea*, as is *Z. stenophylla* Juz. ex S.T.-Chatschat., Fl. Grus. vii, 393 (1952).
- Z. rigida* (Boiss.) Stapf in Denkschr. Akad. Wiss. Wien math. nat. Kl. 1, 39 (1885); H. Braun in Verhandl. der Zool.-Bot. Ges. Wien, xxxix, 222 (1889).
- Z. ronnigeri* Náb. in Publ. Fac. Science Univ. Masaryk, lxx, 46 (1926) cum tab. Described from Turkey, Taurus mountains, Gurun-Dasht—type in Nábělek's private herbarium at Mlýnany.
- Z. bungeana* Juz. in Komarov, Fl. U.R.S.S. xxi, 664 (1954). Described from Central Asia—type in Leningrad.

A. The narrowest leaved form of this group is represented from Turkey by: Prov. Erzurum, Karaugan-Horasan, 1900 m., dry slopes, stem ascending, 24 Aug. 1957, *Davis & Hedge* (D.32623); Musch ad radices australes Bim Göl montis ad Gumgum in distr. Varto, inter fragmina rupium ad pagum Goschkar, 5000 ped., *Kotschy* 339 (W!). An almost identical Caucasian specimen is *Hohenacker* s.n., in collibus aridis Georgiae caucas., Mai 1831, named as *Z. serpyllacea* M.B.

The description of the central asiatic *Z. bungeana* Juz. reads very like this form.

B. The specimens from Iran which Rechinger calls *Z. rigida* (Boiss.) Stapf have slightly broader leaves and are generally taller growing. Rechinger (1951) cites a large number of specimens under this name and mentions their variability. He also points out that in the north-west of Iran there are several forms with lower and sturdier stems. These merge into the next division.

C. In south-east Turkey, this group is represented by a form with shorter, stouter, more branched stems than the preceeding. *Z. ronnigeri* is the name which Nábělek used for them.

Turkey: Prov. Bitlis, slopes of Nemrut dağ, 2000 m., steep slopes, closed community, perennial, fls. pale lilac, leaves lanceolate, 11 Aug. 1956, *McNeill* 528; Prov. Van, Artos dağ above Gevaş, 2300 m., limestone gorge on rocky slopes, fl. stems erect, fls. lilac, 14 July 1954, *Davis & Polunin* (D.22702); Prov. Hakkari, Kara dağ, 2800 m., procumbent perennial, fls. pale lilac, 15 Aug. 1954, *Davis & Polunin* (D.24366)—female sex form; Prov. Ağrı, inter Karaköse et Horasan, 45 km. W. Karaköse, 4–5 Sept. 1957, *K. H. Rechinger* 15003 (W!).

The following Turkish specimens do not fit within the previous divisions and are transitional into the following "glabrata" group.

Prov. Bitlis, crater of Nemrut Dağ, c. 2400 m., rough pasture, perennial, fls. pinkish-lilac, 11 Aug. 1956, *McNeill* 540; as pointed out above this gathering covers typical specimens of *Z. ronnigeri* Náb. and *Z. glabrata* Rech. fil., both from the same population.

Prov. Van, Artos Dağ, northern slopes above Gevaş, 2750 m., rock ledges above snow patch, perennial, fls. lilac, 2 Sept. 1956, *McNeill* 757; this has the general facies of *Z. ronnigeri* Náb. but has very broad leaves

for that species. Prov. Kars, Yağmurlu dağı above Karaorgan, 2100 m., rocky slopes, ascending, 23 Aug. 1957, *Davis & Hedge* (D.32602); this is similar to 'A' above but is dwarfier growing and has broader leaves.

Prov. Van, distr. Hoşap, Kepir dağı, 2800 m., rocky slopes, fls. lilac, 30 July 1954, *Davis & Polunin* (D.23338).

"*glabrata*" group

Stems procumbent, ascending or prostrate, rarely more or less erect, not tall growing, leaves lanceolate, ovate, or almost circular, calyx indumentum of very short hairs visible only under magnification, or with scattered long hairs, flowering stems more or less glabrous or hirsute, hairs retrorse or spreading.

This variant occurs throughout the entire range of the genus. It is the most frequent form in Turkey. The multiplicity of variation within this group makes further division even more artificial than the previous one.

The specific names which have been used are:

- Z. woronowii* Maleew. in Trav. Inst. Bot. Tiflis, i, 120 (1934). Icon. in Fl. Grus. (Fl. of Georgia) vii, 391 (1952). Described from, and as an endemic to, the Caucasus—type in Leningrad.
- Z. borzhomica* Juz. ex Grossh., Opred. Rast. Kavk. 343 (1949). Described from near Borzhomi in the Transcaucasus—type in Leningrad.
- Z. elbursensis* Rech. fil. in Phytion, iii, 169 (1951). Described from Iran, prov. Mazanderan, *Rechinger fil.* 6525—type in W!
- Z. afghanica* Rech. fil. l.c. 169. Described from Mamakhel, Afghanistan; *Koelz* 11527—isotype in W!, E!
- Z. glabrata* Rech. fil. l.c. 170. Described from Anatolia, Gülek-Maden (Taurus), *Balansa* 541—type in W!
- Z. turcomanica* Juz. in Komarov, Fl. U.R.S.S. xxi, 665 (1954). Described from Ashkhabad, Transcaspiia—type in Leningrad.
- Z. denticulata* Juz. in Komarov, Fl. U.R.S.S. xxi, 669 (1954). Transcaucasus—type in Leningrad.
- Z. dzhavakhshvili* Juz., Exsicc. Fl. U.R.S.S., no. 4090 (1954) in sched. Transcaucasus, Georgia, distr. Bakuriana—type in Leningrad. This is a very narrow "split" off the preceding species.

D. In the Transcaucasian region of Georgia and in eastern Turkey there are forms with broad leaves, more or less hirsute inflorescence stems and a tendency to ascending stems.

Turkey: Prov. Kars; Gölebert near Ardahan, 1800 m., igneous slopes, perennial, procumbent, fls. lavender-blue, 30 June 1957, *Davis & Hedge* (D.30421); Yalnızçam Dağları above Yalnızçam, 2100–2300 m., rocky igneous slopes, procumbent, fls. lavender, 19 Aug. 1957, *Davis & Hedge* (D.32491).

Z. borzhomica Juz., *Z. denticulata* Juz., and *Z. dzhavakhshvili* Juz. cover this micro-unit.

Between this and the next aggregate of similar gatherings are a heterogeneous collection of specimens showing great variation in all characters—indumentum, leaf shape and growth form.

Turkey: Prov. Erzincan, Refahiye-Suşehri, 1800 m., slopes, procumbent, 26 Aug. 1957, *Davis & Hedge* (D.32686). This gathering, as mentioned above, varies considerably in the density of the indumentum. The more hirsute form, like the following gathering, fits the description of *Z. brantii* Koch.

Turkey: Prov. Gümüşane, above Köse, 1750 m., rocky igneous slopes, hairy, growing with 31950a, 2 Aug. 1957, *Davis & Hedge* (D. 31950b). The glabrescent form of the previous number (D.31950a), D.32682 from Prov. Erzincan and *Rechinger* 15161 from Prov. Erzincan are more procumbent than is generally the case in the next group.

The following gathering, made from the same population, contains plants which are typical *Z. glabrata* Rech. fil. and others which are apparently typical *Z. brantii* Koch.

Turkey: Prov. Erzincan, Erzincan-Kelkit, 1650 m., dry igneous hillsides, procumbent, fls. lavender, 1 Aug. 1957, *Davis & Hedge* (D.31891).

E. This corresponds with *Z. glabrata* Rech. fil., *Z. afghanica* Rech. fil. and *Z. elbursensis* Rech. fil. Growth like *Thymus serpyllum*, forming mats up to 70 cm. across, leaves lanceolate, glabrous sometimes uppermost leaves ciliate at base, calyx sparsely papillose or papillose hirsute. The following are a representative selection of Turkish plants:

Turkey: Prov. Erzincan, foot of Keşis dağ above Cimin, 2300 m., rocky metamorphic slopes, 26 July 1957, *Davis & Hedge* (D.31707); Prov. Tunceli, Munzur dağ in Aksu dere above Ovacik, 1700 m., rocky limestone slopes, perennial, procumbent, flowers lavender, 21 July 1957, *Davis & Hedge* (D.31468); Prov. Gümüşane, fls. lavender-blue in heads 1 inch diameter, steep non-lime scree slopes in full sun, 17 July 1934, *E. K. Balls* 1722; Prov. Isparta, distr. Sütçüler (Isauria), Dedegöl Dağ, 700 m., prostrate, fls. lilac, 3 Aug. 1949, *Davis* 16003; Prov. Antalya, distr. Gebiz (Pisidia), Bozburun dağ between Taslı yayla and Kozlu dere, fls. mauve, 1600 m., 29 June 1949, *Davis* 15716; Prov. Denizli, Babadağ, 2200 m., fls. lilac-white, 24 Aug. 1950, *Davis* 18393; Prov. Muğla, Girder dağ, 600 m., fls. very pale mauve, 3 Aug. 1947, *Davis* 13779.

Throughout most of Turkey this is the commonest form. In the south-east of Turkey, where both the erect growing "*rigida*" group and the "*glabrata*" group occur, there is, as pointed out above, considerable intergradation between the groups. There is also, in the same area, a gradual transition into the following "*canescens*" group. In many of these high alpine forms the calyces are dark violet coloured.

Turkey: Prov. Van, distr. Başkale, İspiriz dağ, 3300 m., rocky slope, prostrate, fls. lavender, 31 July 1954, *Davis & Polunin* (D.23695). This specimen is a link between the "*glabrata*" specimens cited above and the following more hirsute forms:

Iraq: distr. Erbil, mons. Helgurd ad confines Persiae, ca 3000–3800 m., 10–14 Aug. 1957, *K. H. Rechinger* 11424 (W!). Turkey: Prov. Van, distr. Şatak, Kavuşşahap dağ, 3000 m., fls. pale lilac, 23 July 1954, *Davis & Polunin* (D.23218)—this gathering shows marked variation between individuals in indumentum density and leaf shape; Prov. Hakkari, Çilo dağ, 3200 m., dry rocky slope, procumbent, fls. lilac, 9 Aug. 1954, *Davis & Polunin* (D.24145).

F. The two specimens cited here are separated from the rest of the "*glabrata*" group on account of their apparently unique facies. The leaves are small, orbicular to ovate-orbicular, abruptly acuminate, prominently nerved beneath and closely imbricate. They probably represent an extreme local race of the high alpine forms cited above.

Turkey: Prov. Van; distr. Gevaş, Artos dağ, 2900 m., screes, fls. lilac, 16 July 1954, *Davis & Polunin* (D.22771); Artos dağ, 2800 m., 15 July 1954, *Davis & Polunin* (D.22890).

"*canescens*" group

Stems prostrate or ascending, generally with a more or less dense indumentum on the stems, leaves, and calyces. The leaves vary from orbicular to lanceolate. The calyx indumentum is composed either of long white hairs longer than the diameter of the calyx, or hairs shorter than the calyx diameter, but in both cases the indumentum is more or less continuous and not scattered.

Variants of this kind occur throughout the range of the genus but are specially frequent at the western end.

The following specific names have been used:

- Z. puschkinii* Adam in Web. & Mohr, Beitr. i, 42 (1805). Icon. in Fl. Grus. vii, 383 (1952) et Komarov, Fl. U.R.S.S. xxi, 391 (1954). Described from the Caucasus and treated by Juzepczuk as endemic to that region. Type ?
- Z. dasyantha* M. Bieb., Fl. Taur. Cauc. i, 18 (1808). A synonym of the previous name.
- Z. canescens* Benth., Lab. 321 (1832-36). Syria—type in the De Candolle herbarium.
- ? *Z. gundelsheimeri* Koch in Linnaea, xvii, 293 (1843). Described from Armenia—type, the original description?
- Z. brantii* Koch in Linnaea, xvii, 294 (1843). Described from Turkish Kurdistan—type, the original description?
- Z. biebersteiniana* Grossh. in Beih. Bot. Centralb. xlv, 237 (1928). Described from Swant?—type in Leningrad.
- Z. subnivalis* S. T.-Chatschat. ex Grossh., Opred. Rast. Kavk. 343 (1949). Icon. in Fl. Grus. vii, 395 (1952). A synonym of *Z. puschkinii* Adam.
- Z. filicaulis* Rech. fil. in Phytion, iii, 167 (1951). Described from Persia, prov. Shahrud-Bustam, 3500-3900 m., *Rechinger* 6014—type in W!
- Z. kurdica* Rech. fil. l.c. Iraqi Kurdistan, *Kotschy* 326—type in W!
- Z. galinae* Juz. in Komarov, Fl. U.R.S.S. xxi, 666 (1954). Described from Turcomania—type in Leningrad.
- Z. raddei* Juz. in Komarov, Fl. U.R.S.S. xxi, 669 (1954). Described from Ararat—type in Leningrad.
- Z. karjagini* S. T.-Chatschat. in Notul. Syst. Geogr. Inst. Bot. Tphili, xviii, 58 (1955).
- Z. magakjani* S. T.-Chatschat in l.c.

G. This covers the low growing prostrate forms with orbicular to lanceolate leaves and a dense white calyx indumentum. They are all high alpine plants, closely connected with the more hirsute forms of the "*glabrata*" group, and with the dwarf growing forms of the "*tomentosa*" group.

Z. puschkinii, *Z. filicaulis*, *Z. karjagini*, *Z. galinae*, *Z. magakjani*, *Z. raddei* and *Z. dasyantha* var. *vestita* Ronniger (in Fedde Rep. xxxi, 157: 1933) are the names which have been used in this section.

Turkey: Prov. Bitlis, Suphan dağı, 4100 m., south ridge, prostrate, fls. lilac, 28 Aug. 1954, *Davis & Polunin* (D.24690).

H. Taller growing plants with larger, longer leaves and a less conspicuous indumentum on the calyx.

Z. canescens, *Z. brantii*, *Z. biebersteiniana* and *Z. kurdica* cover this division—they grow in Syria, Lebanon, Turkish, Iraqi and Persian Kurdistan, Caucasus and Transcaucasus.

Turkey: Prov. Konya; distr. Ermerek (Cilicia Trachea), 1500–1700 m., fls. lilac-white, 16 Aug. 1949, *Davis* 16233; Bulğhar Maaden, 2000 m., July 1913, *Siehe* 565. Prov. Malatya, Akdağ, inter Adiaman et Malatia, 1800 m., 12 Sept. 1865, *Hausknecht* s.n. (W!). Conf. remarks on p. 218 about *Z. brantii*.

The following plant from the dry hills near Malatya is anomalous in having acute narrow lanceolate leaves like *Z. ronnigeri*, the facies of *Z. glabrata* and the short thick indumentum on leaves and calyces of *Z. canescens*.

Turkey: Prov. Malatya, Gürün-Malatya, c. 8 km. N.W. of Darende, c. 1200 m., stony ground—open community with *Astragalus* sp., fls. pale lilac—smell of lavender, 5 Aug. 1956, *McNeill* 426.

“*tomentosa*” group.

Characterized by erect more or less tall growing stems, narrow lanceolate leaves and indumentum of long white hairs densely covering the calyx, leaves glabrescent without long hairs.

Plants of this type are especially common in N.E. Persia, Afghanistan, Chitral, Tian Shan and the Altai. They are less frequent in the western part of the range of the genus.

Specific names used are:

Z. pseudodasyantha Rech. fil. in *Phyton*, iii, 167 (1951). Described from N.E. Persia (Khorasan), *Rechinger* fil. 1425—type in W!

Z. szovitsii Rech. fil. l.c. 166. Armenia et Persia borealis, *Szowits*—type in W! Only known from one gathering.

Z. interrupta Juz. in Komarov, Fl. U.R.S.S. xxi, 667 (1954). Described from the Pamiro-Alai region—type in Leningrad. In the original description it was compared with *Z. biebersteiniana*.

Z. tomentosa Juz. in Komarov, Fl. U.R.S.S. l.c. Tian Shan—type in Leningrad.

Z. pamiroalaica Juz. l.c. Pamiro-Alai—type in Leningrad.

I. Turkey: Prov. Hakkari; Çilo dağı, in Diz deresi, 1700 m., gravel terrace, 6 Aug. 1954, *Davis & Polunin* (D.23935).

This incomplete specimen is the only representative of this group which I have seen from Turkey.

* * *

I have been unable to reach any conclusion about the status of the following names:

- Z. acinoides* Pall., Reise, iii, 362 (1776).
Z. cunila Desf., Tabl. ed. 1, 55 (1804).
Z. capitata Falk., Beitr. ii, 98 (1810).
Z. tenuior Falk., l.c.
Z. media Lk., Enum. Hort. Berol. i, 17 (1821).
Z. odoratissima Lodd. ex Schult., Mant. i, 178 (1822).
Z. nummularia Fisch. & Mey., Ann. Sc. Nat. ser. 4, i, 33 (1854).

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JUZEPCZUK (1954) in Komarov, Fl. U.R.S.S. xxi, 386-410.