A REVISION OF THE GENUS GENISTA L.

P. E. GIBBS

(*University of St. Andrews*)

Genista is a large genus of spiny and non-spiny shrubs centred in the Mediterranean region, where many of the species are prominent constituents of the sclerophyllous scrub or macchie vegetation and the Iberian *matorral*. The genus is also represented throughout most of western and central Europe, extending to the south-east of the U.S.S.R., and is also present in Turkey, Syria and North Africa. Some 72 species are recognised in this revision, ranging in distribution from the virtually pan-European *G. tinctoria* to restricted montane or island endemics such as *G. teretifolia*, *G. dorycnifolia* and *G. cupanii* etc.

The genus has not been studied in its entirety since the revision by Spach (1844–45), and the number of minor revisions devoted to sections or geographical areas is small: Buchegger (1912), Vierhapper (1919), Rothmaler (1941) and Vicioso (1953).

The generic limits of *Genista*, particularly *vis-à-vis Cytisus*, have been a continual source of taxonomic confusion, and this is reflected in the varying treatments found in many local and national Floras; thus, for example, Rouy (1897) united the genera *Genista* and *Cytisus* (under the former name) whilst in the recent Flora R.P.R. (1957) *Genistella* Ortega and *Cytisanthus* Lang have been split from *Genista* and treated as separate genera. It is perhaps fortunate in this context that the two greatest Floras of the nineteenth century—Boissier's *Flora Orientalis* and Willkomm & Lange's *Prodromus Florae Hispanicae* used the revision by Spach as a model for their accounts.

The formal systematic part of this paper aims to provide a basic revision of *Genista* incorporating a number of modifications to the hitherto accepted infra-generic classification and generic limits. All species treated in the revision have a full diagnosis together with a summary of geographical distribution and in most cases selected or complete citation of specimens seen by the author. Only original references and a limited synonymy have been given, and no attempt has been made to cite illustrations or references to accounts in the principal Floras of the areas concerned.

ACKNOWLEDGEMENTS

This revision is based upon studies of herbarium material from throughout the geographical range of the genus with the exception of the south-east of the U.S.S.R. (Georgia, Armenia and Azerbaijan) and areas to the east of the Levant coastlands.[1] The revision derives largely from a thesis accepted for the degree Ph.D. by the University of Liverpool.

[1] The area which has been studied covers virtually the total distribution of the genus. It has not been possible to examine in detail the species described from the S.E. of the U.S.S.R. but they mostly belong to subg. *Genista* and appear to be allied to the *G. tinctoria* and *G. albida* complexes.

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Material in the following Herbaria has also been examined: British Museum (Natural History), London (BM), Instituto Botanico, Barcelona (BC), Royal Botanic Gardens, Kew (K), The Linnean Society of London (LINN) and The Hartley Botanical Laboratories, The University, Liverpool (LIVU).

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GENERIC GROUPINGS WITHIN THE GENISTEAE

Genista was placed in the tribe *Genisteae* subtribe *Spartieae* by Bentham & Hooker (*Genera Plantarum* 1862); the constituent genera of this subtribe were: *Lupinus*, *Argyrolobium*, *Adenocarpus*, *Laburnum*, *Calycotome*, *Petteria*, *Genista*, *Spartium* and *Erinacea*. The genus *Cytisus* was placed in an adjacent subtribe, the *Cytiseae*, together with *Ulex*, *Hypocalyptus* and *Loddigesia*. The *Spartieae* and the *Cytiseae* were distinguished by the species of the former grouping having estrophiolate seeds, those of the *Cytiseae* having strophiolate seeds. It should be noted that *Cytisus* sensu Bentham & Hooker included the section *Lembotropis* (*Cytisus nigricans*) which does not have strophiolate seeds.

The revision by Taubert in Engler & Prantl's *Die Natürlichen Pflanzenfamilien* (1894) retained the subtribes *Cytiseae* and *Spartieae*, and the strophiole character.

Two recent authors have emended the generic groupings of Bentham & Hooker, but in rather widely different ways. Rothmaler (1944) united the *Spartieae* and *Cytiseae* (as the *Cytisinae*[1]), and excluded the genera *Hypocalyptus*, *Loddigesia*, *Lupinus* and *Argyrolobium* from the new grouping. In contrast, Hutchinson (1964) has raised these two subtribes to tribal rank, the *Cytiseae* and *Genisteae*, and has also separated some of the genera of the original *Spartieae* into new tribes. The generic groupings according to Hutchinson thus become as follows:

[1] i.e. the *Genistinae*, since this subtribe presumably contains the type element of the *Genisteae*.

Cytiseae	**Genisteae**	**Laburneae**	**Lupineae**
Ulex	*Genista*	*Laburnum*	*Lupinus*
Cytisus	*Spartium*	*Podocytisus*	*Argyrolobium*
Hypocalyptus	*Petteria*	*Hesperolaburnum*	
Loddigesia	*Erinacea*	*Calycotome*	
Echinospartum		*Adenocarpus*	
Nepa			
Stauracanthus			

Genista sensu Hutchinson includes *Teline* Webb, *Genistella* Ortega, *Retama* Boiss., *Spartidium* Pomel and *Lembotropis* Griseb. as synonyms, a view of these taxa with which the present author does not agree. In his tribal key, Hutchinson distinguishes the *Laburneae*, *Lupineae* and *Cytiseae* from the *Genisteae* by the character: claws of all petals free from the staminal tube (*Cytiseae* etc.) versus claws of the lower petals more or less adnate to the staminal tube in the *Genisteae*. This character was first employed by Taubert in *Die Natürlichen Pflanzenfamilien*, and Pellegrin (1908) has commented on the original usage as follows: "Taubert, dans le *Pflanzenfamilien* groupe les genres de Spartiinées d'après la concrescence des onglets des pétales avec le tube formé par les filets des étamines, ce qui est inadmisable, car cette concrescence est très variable même dans une seul genre (*Genista*)". The present author has not checked this character on a wide range of living material.

Hutchinson (1964, p. 350) also retained the seed strophiole as a differential character for the *Cytiseae* although seeds of species of *Echinospartum* are estrophiolate.

A detailed revision of the generic relationships within the *Genisteae* remains a *desideratum*. Of the three available tribal classifications the author tends to favour the wider view of the *Genisteae* adopted by Rothmaler, since such a grouping emphasises the possible relationships between such genera as *Genista—Genistella—Teline—Cytisus;* or *Ulex—Nepa—Stauracanthus—Genista* subg. *Phyllobotrys;* or *Erinacea—Echinospartum—Genista* subg. *Spartocarpus*.

The author also agrees with Rothmaler's removal from the *Genisteae* of the monospecific genera *Loddigesia*, *Hypocalyptus* and *Spartidium*. Hutchinson and Rothmaler both agree on the removal of *Argyrolobium* and *Lupinus* from the *Genisteae–Cytiseae* grouping, although they disagree on the subsequent reclassification of these taxa. Thus if, *vide* Hutchinson, the elevation of Bentham & Hooker's subtribes to tribal rank is accepted, Rothmaler's grouping becomes:

Tribe **Genisteae**

Syn.: *Leguminosae* sect. *Genisteae* Adanson, Fam. 2: 320 (1763) ampl.

Tribe *Genisteae* subtribe *Spartieae* and *Cytiseae* Benth. & Hook. fil.

Gen. Pl., 1: 441 (1865) emend. Rothm. in Fedde Repert. 53: 137–150 (1944).

Adenocarpus DC., *Calycotome* Link, *Cytisus* L., *Echinospartum* Rothm., *Erinacea* Adans., *Genista* L., *Gonocytisus* Spach, *Hesperolaburnum* Maire, *Laburnum* Medik., *Nepa* Webb, *Petteria* Presl, *Podocytisus* Boiss. & Heldr., *Stauracanthus* Link, *Spartium* L., *Teline* Medik.

TAXONOMIC HISTORY AND CRITICAL REVIEW OF RECENT LITERATURE

The taxonomic history of *Genista* and allied genera has been covered in some detail by Pellegrin (1908) to which the reader is referred. The historical preamble in Vicioso (1953) slightly amplifies Pellegrin's account, and a recent historical review has been given by Holubová-Klásková (1964). Pellegrin was in favour of a wide circumscription of *Genista* which included *Teline*, *Retama*, *Genistella*, *Petteria* and *Gonocytisus* (but not *Cytisus*) and his account should be read with this bias borne in mind.

The early taxonomic history of *Genista* may, therefore, be briefly reviewed as follows: The genus *Genista* as recognised by Linnaeus (1753) comprised the Tournefortian genera *Genistella*, *Spartium* (the latter including several species of present-day *Cytisus*) and *Genista-Spartium*. Likewise, *Spartium* L. contained *Spartium junceum* and diverse species of present-day *Genista* and *Adenocarpus*, whilst *Cytisus* sensu Linnaeus consisted of a mixture of species with diadelphous stamens (which Adanson (1763) later transferred to the *Phaseolae*) and also some present-day *Cytisus* species.

Following this ambiguous foundation there was a period in which the original Linnaean genera were repeatedly split and amended. De Candolle (1825) improved the Linnaean *Cytisus* by the removal of the diadelphous species (cf. Adanson) and by splitting off *Adenocarpus*. Boissier (1839–45) delimited several natural genera—*Retama*, *Erinacea*—and also recognised the genera *Genista* L., *Cytisus* L., *Ulex* L., *Spartium* L., *Calicotome* Link, *Sarothamnus* Wimm., *Adenocarpus* DC. and *Chasmone* Mey. (the latter a synonym of *Argyrolobium* Eckl. & Zeyh.).

Endlicher (1840) accepted the genera recognised by Boissier (except *Calicotome* which is referred to *Cytisus*) and he introduced the diagnostic character of upper lip of the calyx bifid as opposed to shortly or not bifid to distinguish *Genista* and *Cytisus*. This latter character was adopted by Spach in the first full revision of *Genista* (1844–45).

However, whilst some workers were slowly clarifying the generic limits in the *Genisteae*, others continued indiscriminate splitting and lumping. Thus, on the one hand, Rafinesque (1838) created the splinter genera *Verzinum*, *Nubigena*, *Diauxulon*, *Lygoplis*, *Meiemianthera* and *Aulonix*, whilst, on the other hand, Scheele (1843) united *Cytisus* and *Genista* under *Genista*, and Visiani (1852) united them under *Cytisus*. Kuntze (1904) proposed uniting *Argyrolobium*, *Adenocarpus*, *Petteria*, *Genista* and *Cytisus* into a single genus, whilst Rouy (1897) united under *Genista* the genera *Genista* and *Cytisus* together with the monodelphous species of *Argyrolobium*.

The revision by Spach (1844) is the only full revision of *Genista* throughout most of the geographical range of the genus. Spach's delimitation of the sections within the genus was particularly sound, and the present revision retains many of them intact, but his subgenera are heterogenous groupings due to over reliance on the nature of the legume. The circumscription of the subgenera, and the disposition of their constituent sections has been considerably rearranged in the present revision (see Table II). Spach also included within *Genista* as sections *Pterospartum* (= *Genistella* Ortega) and *Teline* Medik., a view of these taxa which the present author does not follow.

Briquet (1894) in his revision of the *Cytisus* species of the Alpes Maritimes adopted the strophiole character of Bentham & Hooker to separate *Genista*

and *Cytisus* but was of the opinion that "les genres *Genista* et *Cytisus* sont des groupes artificiels et hétérogènes, auquels on a beaucoup de peine à trouver des caractères communs". The artificial nature of these genera to Briquet can be more readily appreciated when it is realised that *Genista* sensu Briquet included *Petteria*, *Cytisus nigricans* and sect. *Lotoides*, the latter being a group of species transferred from *Argyrolobium*, whilst *Cytisus* sensu Briquet included *Teline* and *Genistella* (the latter as *Pterospartum*).

Pellegrin (1908) reviewed the classification of the *Genisteae*, particularly the genera *Cytisus* and *Genista*, on the basis of extensive anatomical studies. The scope of Pellegrin's work is most impressive, and the survey is a stimulating aid to the taxonomist undertaking a revision of any of the genera of this subtribe.

The most significant outcome of Pellegrin's work is that there appear to be three basically different conditions of leaf-insertion anatomy in the *Genisteae*. In outline these are as follows:

1. The leaf petiole takes three complete vascular strands from the parent branch. This condition is found in the genera *Lupinus*, *Adenocarpus*, *Teline*, *Gonocytisus*, *Spartium*, *Genista* subgenera *Genista* and *Spartocarpus* (fig. 1.1 & 1.2).

2. The leaf petiole takes one vascular strand. This condition is found in *Genista* subg. *Phyllobotrys* (fig. 1.3) and *Ulex*.

3. The leaf takes one vascular strand together with two lateral fibrous bundles. This condition is found in the genera *Cytisus* (fig. 1.4), *Calicotome* and *Podocytisus*.

Pellegrin emphasised that in examples where the leaf takes only one complete vascular strand, i.e. *Genista* subg. *Phyllobotrys* and *Cytisus*, *Calicotome* and *Podocytisus*, it is, nevertheless, possible to distinguish between the genera *Genista* and *Cytisus:* in species of subg. *Phyllobotrys* the leaf is inserted opposite a stem ridge, and takes its bundle from that ridge, whilst in *Cytisus* the leaf is inserted between the stem ridges and takes its bundle from the central vascular cylinder, and the two lateral fibrous bundles from the adjacent ridges.

The limited anatomical studies that have so far been made by the author confirm the three basic modes of leaf-insertion anatomy outlined above, but it would appear that the situation with regard to *Cytisus* and *Genista* subg. *Phyllobotrys* is not as unambiguous as thought by Pellegrin. Further anatomical studies are at present in progress.

It should be noted that in a number of cases Pellegrin made taxonomic changes; e.g. he was sufficiently impressed by the nature of the leaf insertion character to include within *Genista* the following taxa: *Petteria*, *Retama*, *Spartidium*, *Gonocytisus* and *Teline*. He also united (without comment) the sections *Echinospartum* and *Acanthospartum* under the former name. There are several additional taxonomic judgements in Pellegrin's study which the present author considers to be anomalous: thus, *G. lucida* was retained in sect. *Scorpioides* (subg. *Genista*) although from anatomical and morphological characters the species clearly belongs to sect. *Voglera* of subg. *Phyllobotrys*. Likewise, although Pellegrin commented on the anatomical distinctness of *G. haenseleri*, the species was retained in sect. *Erinacoides* (subg. *Genista*); floral and legume morphology relate this species to sect. *Spartocarpus* (subg. *Spartocarpus*). *Genista holopetala* was dismissed as "n'est qu'une varieté naine du *G. radiata*" but is in fact a quite distinct species.

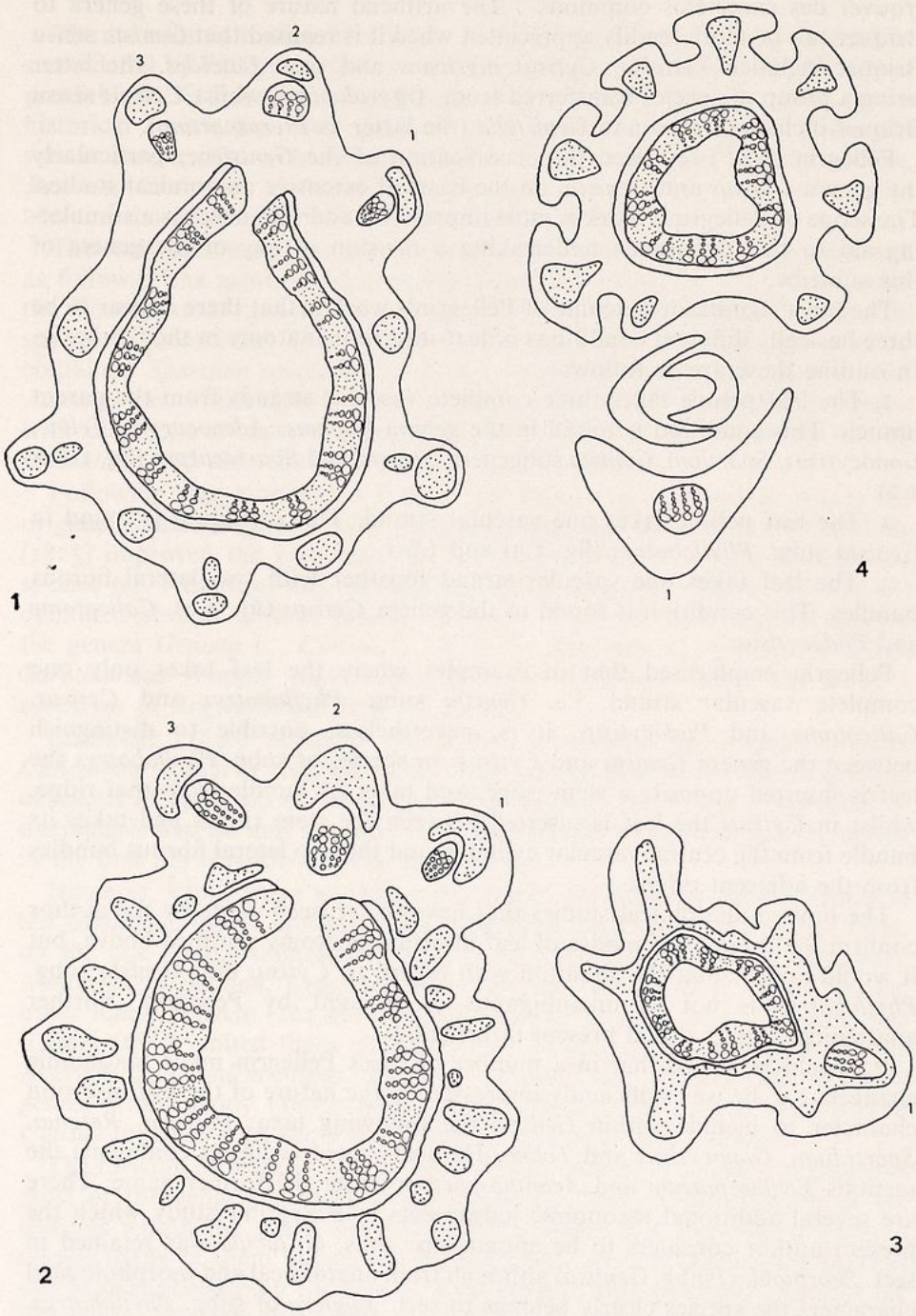


FIG. 1. Leaf trace anatomy in *Genista* and *Cytisus:* 1, *Genista* subg. *Genista* (*G. tinctoria*); 2, *Genista* subg. *Spartocarpus* (*G. ephedroides*); 3, *Genista* subg. *Phyllobotrys* (*G. anglica*); 4, *Cytisus* (*C. ardoinii*).

In addition, Pellegrin distinguished anatomically between a number of species which he considered to be virtually indistinguishable by morphological criteria. Such species are:

1. *G. sericea—G. sakellariadis*
2. *G. boissieri—G. horrida*[1]
3. *G. ulicina—G. tournefortii*
4. *G. jaubertii—G. cappadocica*
5. *G. hirsuta—G. lanuginosa*
6. *G. florida—G. polygalifolia*

The members of the first three species pairs listed above are in fact morphologically distinct and have not been examined anatomically by the author. The anatomical differences given by Pellegrin for the other taxa are listed below:

G. cappadocica
"Tige a stèle ailée, sans méristèle dans l'écorce"

G. aucheri
"Tige cotelée avec stèle ailée et des méristèles complètes dans l'écorce"

G. hirsuta
"Pas de paquets de fibres entre les ailes pericycliques dans l'écorce"

G. lanuginosa
"Des paquets de fibres dans l'écorce entre les ailes de la stele"

G. polygalifolia
"Pas de faisceaux libéroligneux dans l'écorce"

G. florida
"Des méristèles complètes dans l'écorce"

No authenticated material of *G. cappadocica* Spach has been seen (see under *G. aucheri*) so that it has not been possible to confirm the anatomical data for this taxon. Transverse sections have been made of the stem from herbarium specimens of the other two pairs of species distinguished by Pellegrin, and in neither case has it been possible to confirm the differential characters. On morphological and anatomical grounds, therefore, *G. lanuginosa* and *G. polygalifolia* have been reduced to synonymy of *G. hirsuta* and *G. florida* respectively.

Buchegger (1912) revised the species *G. radiata*, *G. holopetalla* and *G. hassertiana* of sect. *Asterospartum*. This account provides an excellent revision of these taxa, with distributional data, keys and specimen citations; *G. holopetala* and *G. hassertiana* had previously been regarded as infraspecific variants of *G. radiata*. No material has been seen of *G. radiata* var. *bosniaca* Buchegg., so that the status of this taxon has not been confirmed, but in others respects the present revision follows Buchegger's account of these three species.

An attempt was made by Buchegger to fit the three species noted above within the wider context of sect. *Asterospartum*, and a key was provided to all the species of this section, and also sect. *Echinospartum* (the two sections were not united formally). This latter key is not entirely successful in the delimitation of the Orient species.

Whilst working through a collection of exsiccata which had resulted from a University expedition to Greece, Vierhapper (1919) encountered difficulties in delimiting *G. parnassica* Hal., a restricted endemic species of sect. *Erinacoides;* with great thoroughness, Vierhapper digressed into a virtual revision of this group of species, so that *G. lobelii*, *G. pumila*, *G. salzmannii* and *G. aspalathoides*, which had been confused in the past, were clearly distinguished

[1] i.e. *Echinospartum boissieri—E. horridum*

for the first time. Vierhapper (1919) also revised the East Mediterranean taxon *G. acanthoclada* which Spach had split into four species.

Vicioso has published a series of revisions, the *Genisteas españolas*, of which the first, (1953), is devoted to the genus *Genista*. The Iberian peninsula is a centre of diversification of the genus *Genista* and any revision of the Spanish taxa is therefore to be welcomed; the revision by Vicioso clarified the taxonomy of the Iberian species since a number of superfluous species described by Spach, Willkomm and others were eliminated, and distributional data was provided for all the Spanish species.

Nevertheless, Vicioso accepted the classification of Spach and Willkomm too uncritically; thus he retained sect. *Voglera*, in subg. *Spartocarpus* together with sections *Ephedrospartum* and *Echinospartum* etc. Likewise, *G. micrantha* was retained as an extremely anomalous species of sect. *Genistoides*. Also, whilst not accepting a number of species recognised by Willkomm *et al.*, Vicioso was loath to reject such taxa entirely, and he frequently retained them as rather dubious subspecies or varieties. No keys were given for infraspecific taxa.

GENERIC LIMITS

Three key characters have been employed by different authors to distinguish *Genista*, *Cytisus* and related genera. They are: leaves unifoliate or trifoliate, seeds estrophiolate or strophiolate, and upper lip of the calyx deeply bifid or entire to shortly bifid.

Rigid adherence to any one of this trio of characters has failed to differentiate *Genista* and *Cytisus* satisfactorily because of the existence of intermediate taxa. These fall into two categories: on the one hand, there are what may be termed anomalous species, which possess the general facies of either *Genista* or *Cytisus* but which lack one or more of the key characters. On the other hand, there are groups of species possessing various combinations of the key characters, e.g. deeply cleft calyx (cf. *Genista*) and strophiolate seeds (cf. *Cytisus*) but which also show an overall similarity of facies between themselves. Such latter species have been grouped as distinct genera by several authors, viz. *Genistella*, *Gonocytisus* and *Teline*.

If such intermediate species of the latter kind are segregated as distinct genera, then *Genista* is quite distinct from *Cytisus* on the basis of a number of characters or character trends. (Table I).

TABLE I

DIFFERENTIAL CHARACTERS BETWEEN GENISTA AND CYTISUS

Genista	*Cytisus*
Upper lip of the calyx deeply bifid (1)	Upper lip of the calyx almost entire (2)
Seeds estrophiolate	Seeds strophiolate (3)

Notes: (1) several species, e.g. *G. aetnensis*, *G. dorycnifolia*, *G. spartioides* have a very short calyx which tends to obscure this character.
(2) exception: sect. *Corothamnus* (*C. procumbens*, etc.).
(3) exception: sect. *Lembotropis* (*C. nigricans*).

Genista	*Cytisus*
Leaves usually unifoliolate (4)	Leaves usually trifoliolate
Legume narrowly oblong, falcate or ovoid-acuminate	Legume usually narrowly oblong
Keel narrowly oblong	Keel usually falcate
Leaves taking 3 or 1 vascular traces (5)	Leaves taking 1 vascular trace and two lateral fibrous bundles

(4) c. 1/5 of *Genista* species have trifoliolate leaves. Leaflets in *Genista* are sessile and usually narrowly oblanceolate, whilst those in *Cytisus* are usually petiolate and broadly ovate.

(5) See discussion on p. 15.

Several additional lines of evidence tend to confirm the distinction between *Cytisus* and *Genista*. Spratt (1919) investigated root nodule structure in the Leguminosae and found that *Genista* and *Cytisus* possess distinct patterns of nodule structure, and Nowacki (1960) found differences in the alkaloid constituents of species of the two genera. Both the above observations should be regarded with some caution, however, since the investigations were not devoted entirely to *Genista* and *Cytisus* and did not cover an extensive number of species of these genera.

The species of *Teline*, *Genistella* and *Gonocytisus* tend to blur the distinctness of *Genista* and *Cytisus* with regard to some of the differential characters tabulated above. This can best be shown by listing the *Cytisus*-like and *Genista*-like characters of these groups.

'Genista-characters'	'Cytisus-characters'
Teline Medik.	
Upper lip of the calyx deeply bifid	Leaves trifoliolate (petiolate and sessile species)
Leaf takes 3 vascular traces	Seeds strophiolate
Keel 'oblong'	
Genistella Ortega	
Upper lip of the calyx deeply bifid	
Leaf takes 3 vascular traces	
Seeds estrophiolate (*Genistella sagittalis*)	Seeds strophiolate (*Genistella tridentata*)
Gonocytisus Spach	
Upper lip of the calyx bifid (calyx very short)	Leaves trifoliolate and petiolate
Leaf with 3 vascular traces	Keel falciform
Seeds estrophiolate	

The authors of most of the principal European Floras have tended to group these intermediate taxa into either *Genista* or *Cytisus*, depending upon which key character has been emphasised. The present revision follows Webb,[1] Ortega and Spach in recognising *Teline*, *Genistella* and *Gonocytisus* as distinct genera for the following reasons:

[1] Although the generic name *Teline* was first used by Medikus for the single species *Cytisus monspessulanus*, Webb (1842–50) gave the first comprehensive treatment of this group.

1. The species which comprise each grouping tend to resemble each other in overall facies more than they resemble any species of *Genista* or *Cytisus*.

2. The distribution of *Teline*, the largest and in many ways the most problematical of the intermediate groupings, is fairly distinctive, being centred in the Canary Isles and Maderia. No species of *Genista*, and possibly none of *Cytisus* sensu stricto extend to Macaronesia.

3. The only alternative treatment would be to stress the strophiole character and include *Teline* in *Cytisus*, or to stress the calyx character (and leaf insertion anatomy) and include *Teline* and *Gonocytisus* in *Genista*. Both alternatives succeed in confusing the limits of two large genera, *Genista* with c. 75 species, and *Cytisus* with c. 40 species.

TABLE II COMPARISON OF THE GENERIC CLASSIFICATIONS OF SPACH (1844–45) AND GIBBS (1966)[1]

Subgenus IV **Stenocarpus**	Subgenus I **Genista**
sect. 5 *Genistoides* (Moench) Spach	sect. 1. *Genista*
sect. 3. *Spartioides* Spach	sect. 2. *Spartioides*
sect. 2. *Erinacoides* Spach	sect. 3. *Erinacoides*
sect. 1. *Scorpioides* Spach	sect. 4. *Scorpioides*
sect. 4. *Genistella* (Tournf.) Spach	Genus **Genistella** Ortega
sect. 6. *Chamaespartium* Spach	(united with sect. *Spartioides*)
sect. 7. *Lasiospartum* Spach	(united with sect. *Cephalospartum*)
Subgenus V **Pterospartum** Spach	Genus **Genistella** Ortega
Subgenus VI **Teline** (Medik.) Spach	Genus **Teline** Medik.
Subgenus III **Phyllobotrys** Spach }	Subgenus II **Phyllobotrys**
Subgenus II **Camptolobium** Spach }	sect. 5. *Phyllobotrys*
Subgenus I **Spartocarpus** Spach	
sect. 6. *Leptospartum* Spach }	
sect. 7. *Voglera* (Gaert., Mey. & Schreb.) Spach }	sect. 6. *Voglera*
	Subgenus III **Spartocarpus**
sect. 1. *Asterospartum* Spach }	sect. 7. *Spartocarpus*[2]
sect. 2. *Ephedospartum* Spach }	
sect. 3. *Acanthospartum* Spach	sect. 8. *Acanthospartum*
	sect. 9. *Fasselospartum*
sect. 5. *Cephalospartum* Spach	sect. 10. *Cephalospartum*
sect. 4. *Echinospartum* Spach	Genus **Echinospartum** (Spach) Rothmaler

The genus *Retama* Boiss. with its baccate, globose, non-dehiscent legume has been recognised by many authors and its exclusion from *Genista* is now virtually orthodox treatment. Rothmaler (1944) split off sect. *Echinospartum*

[1] To facilitate comparison the order of Spach's subgenera and sections has been re-arranged, but their original numbering has been retained.

[2] Including *Dendrospartum aetnense* Spach i.e. *Genista aetnensis*.

Spach as a distinct genus from *Genista*,[1] and this treatment has been adopted in the present revision.

The species of *Echinospartum* are similar morphologically to those species of *Genista* subg. *Spartocarpus* with distinctly opposite branching such as *G. radiata* or *G. acanthoclada;* the latter species has the closest resemblance since it too has spiny branches. Nevertheless, *Echinospartum* species have a number of characters not found in *Genista:* the calyx is inflated-campanulate, similar to that in *Erinacea* (which *Echinospartum* also closely resembles in morphology, habit and habitat preference); the bracts are also distinctive, and the species apparently belong to an aneuploid series, with chromosome numbers of 2n: 52 and 44 (Castro 1945) compared with 2n: 48 in most *Genista* species.

INFRA-GENERIC CLASSIFICATION

Spach recognised six subgenera within *Genista*, three of which—*Spartocarpus*, *Stenocarpus* and *Phyllobotrys* were based mainly on the shape of the legume.[2]

In the present revision, three distinct groupings have been recognised within *Genista* on the basis of a number of character correlations (see Table III): the Spach subgeneric names have been retained for these groupings, although the constituent sections and species of each of the new subgenera differ considerably from the original groupings.

Table II lists for ease of comparison the infra-generic classification adopted by Spach and that by the present author. The major rearrangements may be summarised as follows:

1. Subgenus *Camptolobium* has been united with subgenus *Phyllobotrys* under the latter name.

2. Section *Voglera* (to which has been united sect. *Leptospartum*) has been transferred from subgenus *Spartocarpus* to subgenus *Phyllobotrys*.

3. Section *Lasiospartum* has been transferred from subgenus *Stenocarpus* (i.e. subg. *Genista*) to subgenus *Spartocarpus*, where it has been united with sect. *Cephalospartum*.

4. Section *Spartioides* has been united with section *Asterospartum* (as sect. *Spartocarpus*), and an anomalous species *G. fasselata* has been removed from section *Acanthospartum* and placed in a new section *Fasselospartum*.

5. Sections *Echinospartum* and *Genistella* (the latter united with section *Pterospartum*) and section *Teline* have been treated as separate genera.

The differential characters of the three new subgenera are listed in Table III and fig. 2 summarises the floral and legume characters of each group.

[1] Vicioso (1953) retained *Echinospartum* as a section of *Genista*, but Laínz (1961) has recently made on Vicioso's behalf the combination *Echinospartum lusitanicum* subsp. *barnadesii* (Graells).

[2] It is difficult to understand why Spach separated the essentially similar species *G. anglica* and *G. falcata* by placing the former in subg. *Phyllobotrys* and the latter in subg. *Camptolobium*.

TABLE III

DIFFERENTIAL CHARACTERS OF THE THREE SUBGENERA OF GENISTA

Genista	*Phyllobotrys*	*Spartocarpus*
Leaves usually simple (3 trifoliolate spp.) Leaves and branching alternate.	Leaves usually simple (3 trifoliolate spp.) Leaves and branching alternate.	Leaves simple and trifoliolate. Leaves and branching alternate, subopposite and opposite.
Spiny and non-spiny spp. Spiny species with fertile axillary spines or spiny branches.	Spiny species with sterile axillary spines (2 non-spiny spp.)	Mostly non-spiny species. Spiny spp. with fertile axillary spines or spiny branches.
Standard petal broadly ovate, as long as the wings and keel (Fig. 2.1).	Standard petal usually triangular or ovate with an acute apex, usually shorter than the keel (Fig. 2.2).	Standard petal broadly or angular ovate, usually shorter than the keel (Fig. 2.3).
Legume narrowly oblong, 3- many seeded (Fig. 2.1).	Legume ovoid-acuminate 1 (–2) seeded, or falcate, inflated, and many seeded (Fig. 2.2).	Legume ovoid-acuminate, 1 (–2) seeded. (3 spp. with an oblong legume) (Fig. 2.3).
Leaf takes 3 vascular traces.	Leaf takes 1 vascular trace.	Leaf takes 3 vascular traces.

The three subgenera are fairly distinctive, although examples of intermediate taxa can be found for almost all the differential characters tabulated. The most striking group in this respect is the North African section *Cephalospartum* of subgenus *Spartocarpus;* thus *G. cephalantha*, with scarcely opposite branching and *G. capitellata* with markedly opposite branching both possess a standard shape associated with section *Voglera*. In the same section, *G. umbellata*, *G. quadriflora* and *G. clavata*, all with opposite branching (*G. clavata* also has trifoliolate leaves) have a narrowly oblong legume comparable to that found in subgenus *Genista*. Other intermediate conditions occur in species of different sections; thus the axillary spines of *G. fasselata* (subgenus *Spartocarpus*) resemble those of *G. scorpius* of subg. *Genista*. The shape and length of the standard of several species, e.g. *G. hispanica* (subgenus *Phyllobotrys*), *G. clavata*, *G. aucheri* and *G. acanthoclada* (subgenus *Spartocarpus*) resemble the condition found in subgenus *Genista*. Despite such exceptions, however, most species can be readily assigned to their subgenus.

Phyllobotrys is the most distinctive subgenus with its sterile, usually much-branched axillary spines and leaves with a single vascular trace. Since in both of these characters *Phyllobotrys* resembles the genera *Ulex*, *Nepa* etc., it is worth emphasising that in other characters the group shows positive *Genista* affinities. The occurrence of the natural hybrid *G. x fritschii*, which results from the cross between *G. tinctoria* (subg. *Genista*) and *G. germanica* (subg. *Phyllobotrys*) also reinforces the case for retaining *Phyllobotrys* in *Genista*.

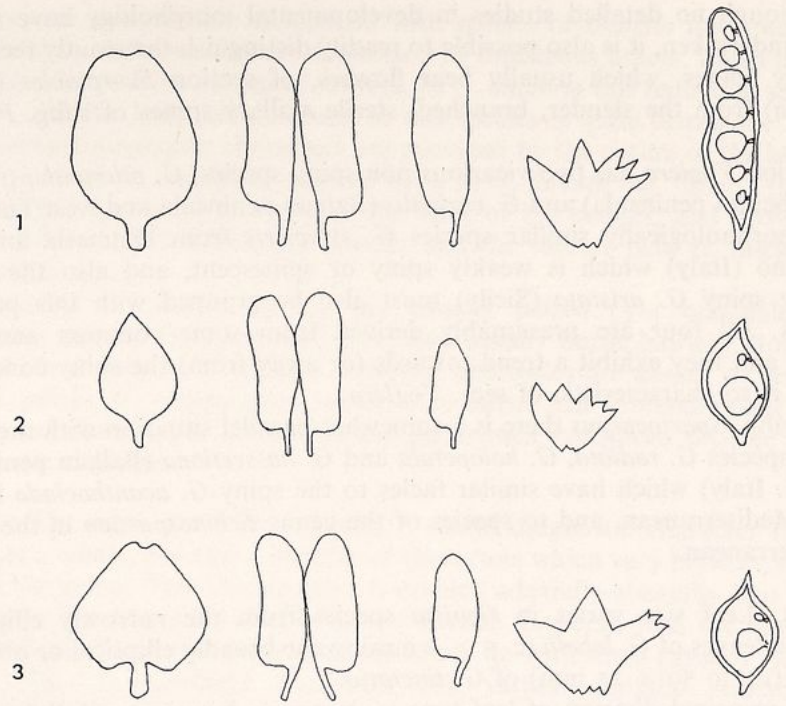


FIG. 2. Corolla and legume morphology within the three subgenera of *Genista:* 1, subg. *Genista* (*G. tinctoria*); 2, subg. *Phyllobotrys* (*G. erioclada*); 3, subg. *Spartocarpus* (*G. haenseleri*).

MORPHOLOGY OF GENISTA SPECIES

HABIT: All Genistas are shrubs, ranging from woody chamaephytes to nanophanerophytes. Considerable variation is encountered, from cushion or mat-forming xeromorphic Mediterranean species to erect, laxly branched treelets and rather mesophytic broad leaved plants.

The stems and branches of most *Genista* species are prominently ridged or ribbed; the character is most strongly pronounced in subg. *Spartocarpus* whilst species of subg. *Phyllobotrys* tend to lack such marked ridging of the branches.

As noted in Table III the mode of branching is an important subgeneric character: branching is alternate in subg. *Genista* and *Phyllobotrys* but tends to be opposite in subg. *Spartocarpus*. In this latter group a trend can be followed from (or to) such species as *G. sessilifolia* and *G. spartioides* with mostly alternate but some opposite branching to such species as *G. radiata* and *G. acanthoclada* with strictly opposite branching. It is perhaps worth noting that in the *Genisteae* the only other genera to possess species with strictly opposite branching are *Echinospartum* and *Erinacea*.

SPINES: It is possible to distinguish two main types of spiny species within *Genista*—those with axillary spines, and those with *spiny* branches. In the former case the spines are usually of limited growth, axillary, and either unbranched, or not branched to more than the third or fourth degree. In species with spiny branches all branches simply terminate in a small cartilaginous spine.

Although no detailed studies in developmental morphology have as yet been undertaken, it is also possible to readily distinguish the stoutly recurved axillary spines, which usually bear flowers, of section *Scorpioides* (subg. *Genista*) from the slender, branched, sterile axillary spines of subg. *Phyllobotrys*.

Section *Voglera* has two vicarious non-spiny species, *G. micrantha* (north-west Iberian peninsula) and *G. carinalis* (Balkan peninsula and west Turkey). The morphologically similar species *G. sylvestris* from Dalmatia and the Gargano (Italy) which is weakly spiny or spinescent, and also the more stoutly spiny *G. aristata* (Sicily) must also be grouped with this pair of species. All four are presumably derived from some common ancestral taxon, and they exhibit a trend towards (or away from) the spiny condition which is so characteristic of sect. *Voglera*.

In subg. *Spartocarpus* there is a somewhat parallel situation with the non-spiny species *G. radiata*, *G. holopetala* and *G. hassertiana* (Balkan peninsula and N. Italy) which have similar facies to the spiny *G. acanthoclada* in the East Mediterranean, and to species of the genus *Echinospartum* in the West Mediterranean.

LEAVES: Leaf size varies in *Genista* species from the narrowly elliptical, inrolled leaves of *G. lobelii* (c. 5 × 2 mm) to the broadly elliptical or obovate leaves (up to 50 × 15 mm) of *G. tinctoria*.

The principal division of leaf type is, however, between unifoliolate and trifoliolate species. The genus as a whole tends to be unifoliolate, but trifoliolate species occur in all three subgenera, although predominating only in subg. *Spartocarpus*. Thus, in subg. *Genista* there are three trifoliolate species: *G. morisii*, *G. ferox* (sect. *Scorpioides*) and *G. aspalathoides* (sect. *Erinacoides*); likewise, there are three trifoliolate species in sect. *Voglera: G. tridens*, *G. triacanthos* and *G. cupanii*.

Most Genistas have sessile leaves, but a few species, *G. florida*, *G. sericea*, *G. pilosa*, and to some extent *G. tinctoria* have shortly petiolate leaves. Leaf pulvinules[1] are prominent in some Mediterranean sections such as *Erinacoides*, *Spartocarpus* and some *Spartioides*. Spinescent or awn-like stipules are present in most species, but in a few taxa, *G. hystrix*, *G. baetica*, *G. cephalantha* and *G. demnatensis*, the stipules are persistent as fairly prominent spines on the pulvinus.

INFLORESCENCE: In the subgenera *Genista* and *Phyllobotrys* the majority of species have simple racemose inflorescences or modified axillary clusters of flowers. This condition is found in some species of subg. *Spartocarpus*, e.g. *G. sessilifolia*, *G. nissana*, *G. ephedroides*, *G. spartioides* and *G. haenseleri*. In the other species of this subgenus (excluding sect. *Cephalospartum*) opposite and sub-opposite flowers are found, as with the branching and leaves of these taxa.

In sect. *Cephalospartum* the inflorescence is capitate. The development of a capitate inflorescence is a recurring feature of papilionaceous genera (cf. *Adenocarpus*, *Anthyllis*, *Cytisus* etc.) and the tendency is found in other *Genista* species, such as *G. hispanica* (sect. *Voglera*), *G. subcapitata* (sect. *Spartioides*) and *G. radiata* (sect. *Spartocarpus*).

[1] The basal swelling of the leaf of *Genista* is traditionally termed a pulvinus although they are apparently not responsible for leaf movement. (cf. Dormer 1947).

BRACTS AND BRACTEOLES: In general with species of *Genista* the lowermost flowers of the inflorescence are subtended by foliaceous bracts, which usually become reduced with the apical flowers. In *G. tinctoria* this reduction scarcely occurs, and the leafy inflorescence of this species is quite distinctive.

Important diagnostic characters are provided by the nature of the bract in *G. radiata* and *G. sessilifolia* (see the key). In *G. hirsuta* the "bract" (strictly a developed bracteole) is borne at the apex of the pedicel, and provides a useful differential between this species and the similar taxa *G. ulicina*, *G. tricuspidata* etc.

Bracteoles in *Genista* species are usually paired (3–4 bracteoles are frequently present in *G. aspalathoides*) and usually borne halfway along the pedicel. In a number of species, however, bracteoles are absent or vestigial e.g. *G. pilosa*, *G. obtusiramea*, or they are borne just subtending the calyx e.g. *G. sakellariadis*, *G. holopetala* and again such exceptions provide useful diagnostic characters.

CALYX: The calyx not only provides a useful diagnostic character for the genus as a whole, but also a number of characters which vary between species within the genus. The *Genista* calyx is divided adaxially-abaxially into upper and lower lips (the *labre* and *labiole* of French authors), with the upper lip deeply divided into two teeth, and the lower lip with three (usually shorter) teeth. Fig. 3 (*overleaf*) illustrates the various lengths referred to throughout the revision.

In most species the upper lip is equal to the lower one, and the lips are subequal to the tube; the upper teeth are subequal to the lip whilst the lower teeth are c. 1/3 to 1/2 the length of the lower lip. In three species, *G. tournefortii*, *G. ulicina* and *G. aristata*, the upper lip is considerably shorter than the lower one, and in a number of other species the relative lengths of the lower teeth vary, with the median segment being longer than the laterals.

COROLLA: As noted in Table III the shape of the standard (vexillum) and its length relative to the keel (carina) provide important subgeneric characters. Fig. 2 illustrates the typical standard shapes for each subgenus, although there is variation between species in aspects of standard shape, and, as noted above, some exceptions to the prevalent subgeneric pattern occur.

In *G. sessilifolia* the length of the wings (alae) relative to the keel is an important differential character cf. *G. aucheri*.

LEGUME: The shape of the legume also provides a subgeneric character (also summarised in Table III and illustrated in fig. 2) but three atypical examples should be noted:

1. The falcate, many seeded legume of sect. *Phyllobotrys* approaches the narrowly oblong legume of subgenus *Genista*. Apart from the falcate as opposed to strictly oblong shape, a further difference is that the legume of sect. *Phyllobotrys* is distinctly inflated and turgid whilst this characteristic is less marked in subg. *Genista*.

2. The legumes of some specimens of *G. lobelii* (subg. *Genista*) approach the ovoid-acuminate 1–2 seeded condition of sect. *Voglera* and subgenus *Spartocarpus*. Narrowly oblong, several seeded legumes are found for most individuals of this species however.

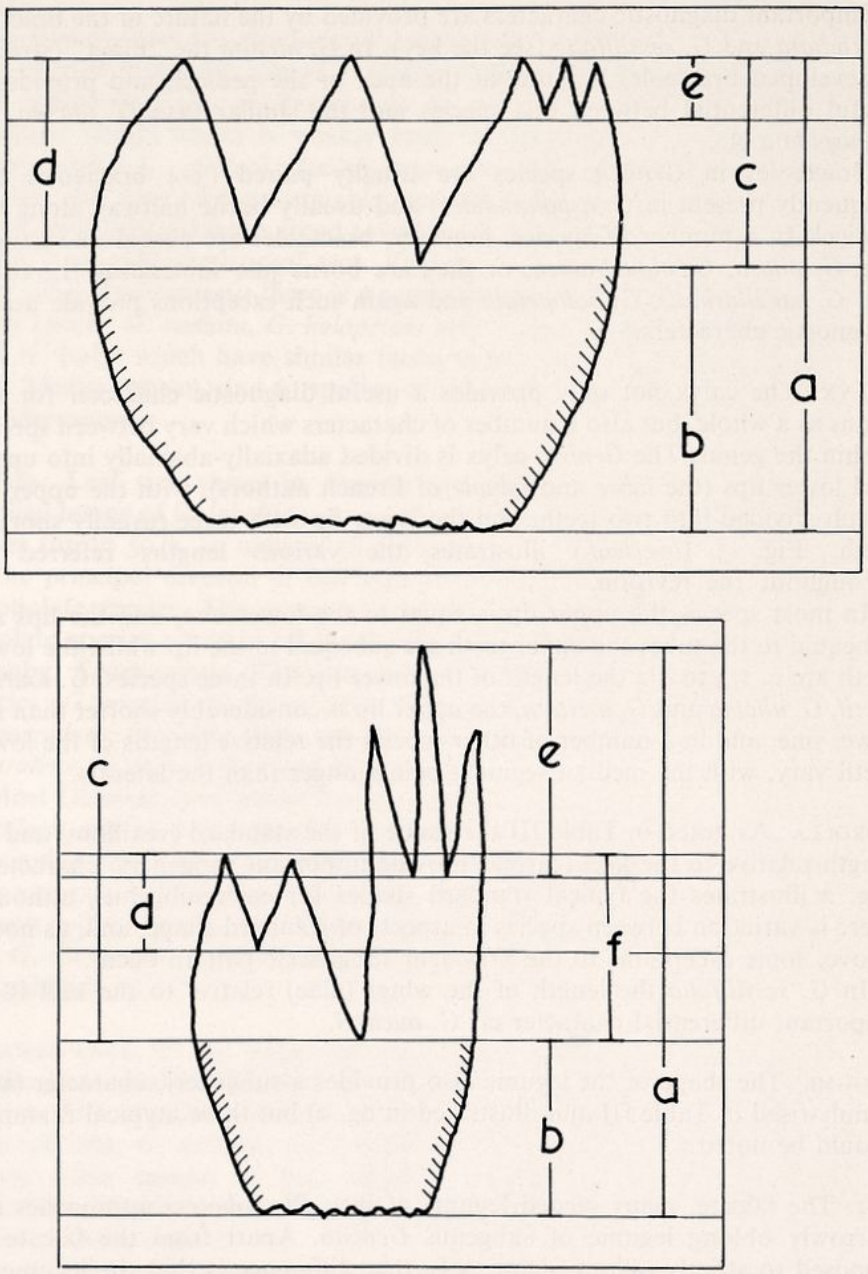


FIG. 3. Calyx morphology in *Genista:*
a—calyx length, b—calyx tube, c—lower lip, d—upper teeth, e—lower teeth, f—upper lip. (calyces depicted have been split along the line marked by hatching).

3. As noted above, three species of sect. *Cephalospartum*—*G. clavata*, *G. umbellata* and *G. quadriflora* have the narrowly oblong legume shape usually associated with subg. *Genista*.

In the following revision specimen citations have been given for most taxa. For widely distributed species only a selection of the specimens seen have been appended, but for species with restricted distributions, or for critical taxa, all specimens have been listed. No specimens have been listed for the following very widely distributed species: *G. tinctoria*, *G. pilosa*, *G. anglica*, *G. germanica* and *G. scorpioides*.

GENISTA Linn. Sp. Pl., 709 (1753)

Spiny and non-spiny shrubs with alternate and opposite branching. *Leaves* simple of trifoliolate, alternate or opposite, the trifoliolate species with sessile, narrowly oblanceolate leaflets. *Flowers* borne alternately or opposite, in racemes or axillary clusters, or capitate. *Calyx* tubular, usually with prominent upper and lower lips, the upper lip bifid, the lower lip with three distinct teeth. *Standard* broadly ovate, ovate with an acute apex or triangular, glabrous or pubescent, as long as or shorter than the keel. *Keel* narrowly oblong rather than falcate, glabrous or pubescent. *Wings* as long as the standard, glabrous. *Legume* narrowly oblong and compressed, or falcate-rhomboid and inflated, several seeded, or ovoid-acuminate, 1–2 seeded, glabrous, or usually pubescent. *Seeds* without a strophiole.
Type species: *G. tinctoria* Linn. (according to Britton & Brown, Ill. Fl. N. States and Canada, ed. 2, 2: 350, 1913).

KEY TO THE SPECIES OF *Genista*

(excluding the south eastern area of the U.S.S.R., Georgia, Armenia and Azerbaijan)

1a Plant more or less spiny 2
1b Plant not spiny 39
2a Legume narrowly oblong, 3–12 seeded, somewhat compressed. Standard broadly ovate, as long as the keel and wings 3
2b Legume ovoid-acuminate 1–2 seeded, or rhomboid-falcate and inflated, 2–12 seeded. Standard triangular, ovate, or ovate with an acute apex, usually shorter than the keel 18
3a Plant spinescent. Bracteoles absent . . . . 16. *G. villarsii*
3b Plant stoutly spiny. Bracteoles present 4
4a Spines axillary, usually recurved. Standard glabrous. . . . 5
4b Spines at the ends of the main branches, not axillary. Standard usually sparsely to densely pubescent 10
5a Leaves trifoliolate 6
5b Leaves unifoliolate 7
6a Leaves narrowly elliptical or narrowly oblanceolate, with sericeous hairs on both surfaces . . . . . 32. *G. morisii*
6b Leaves oblanceolate to obovate, upper surface glabrous 33. *G. ferox*
7a Pedicels c. 1 mm. Stems and branches subglabrous . . . 8
7b Pedicels 2–5 mm. Young branches sparsely pubescent . . 9

8a Calyx not more than 2·5 mm. Stems and branches terete. Legume glabrous . . . . . 30. *G. myriantha*
8b Calyx longer than 3 mm. Stems and branches somewhat winged. Legume pubescent . . . . . 31. *G. carpetana*

9a Flowering branches subtending the axillary spines. Lips of the calyx as long as the tube . . . . . 29. *G. corsica*
9b Flowering branches borne on the axillary spines. Lips of the calyx shorter than the tube . . . . . 28. *G. scorpius*

10a Some leaves trifoliolate. . . . . 27. *G. aspalathoides*
10b No leaves trifoliolate 11

11a Flowers borne singly (occasionally some in pairs) . . . 12
11b Flowers borne in pairs or fascicles (some singly) . . . 14

12a Pulvinules with prominent spinose stipules. Leaves 3–8 mm 22. *G. baetica*
12b Pulvinules without spinose stipules. Leaves 3–5 mm . . 13

13a Pedicels (1–)3–4(–5) mm, rather stout . . . 21. *G. pumila*
13b Pedicels (2–)4–9(–11) mm, slender . . . 20. *G. lobelii*

14a Calyx 2·5–5 mm. Plant typically with lax branching, young branches with racemose inflorescences of 4 cm or more 15
14b Calyx 4–7 mm. Plant much branched. Flowers borne in clusters . 16

15a Standard densely pubescent (S. & S.W. Iberian peninsula). Flowering March-April (early May) . . . . 26. *G. polyanthos*
15b Standard glabrous to uniformly pubescent (N.W. Iberian peninsula). Flowering (late May) June-July . . . . 25. *G. hystrix*

16a Some pulvinules with spiny stipules. Standard with a median strand of sericeous hairs . . . . . 25. *G. hystrix*
16b No pulvinules with spiny stipules. Standard uniformly pubescent . 17

17a Pedicels 1–4 mm. Leaves with appressed or patent hairs beneath, subglabrous above (Corsica, Sardinia, N. Italy) 23. *G. salzmanii*
17b Pedicels 3–5 mm. Leaves with cinerous sericeous hairs on both surfaces (Greece) . . . . . 24. *G. parnassica*

18a Plant with spiny branches, not axillary spines 19
18b Plant with recurved axillary spines 20

19a Branching alternate. Leaves simple . . . 20. *G. lobelii*
19b Branching opposite. Leaves trifoliolate . . 64. *G. acanthoclada*

20a Flowers or flowering branches borne directly on the spines. Leaf traces black, scale-like . . . . . 65. *G. fasselata*
20b Flowers or flowering branches not borne on the spines. Leaf traces not black or scale-like 21

21a Most leaves trifoliolate 22
21b No leaves trifoliolate (sometimes fasciculate) 24

22a Calyx and leaves with sparse patent hairs. Flowering branches sometimes terminated by a spine . . . . . 51. *G. cupanii*
22b Calyx and leaves subglabrous. Flowering branches never terminated by a spine 23

23a All leaves trifoliolate. Lower lip of the calyx as long as the upper 50. *G. triacanthos*
23b Some leaves simple. Lower lip of the calyx longer than the upper 52. *G. tridens*

24a Leaves with spinose stipules 25
24b Leaves without spinose stipules 26

25a Standard c. 10 mm, cordate at the base . . 48. *G. lucida*
25b Standard c. 6 mm, truncate at the base . . . 52. *G. tridens*

26a Bracts, at least of the lowermost flowers, less than 1 mm or lacking. Bracteoles minute or lacking 27
26b Bracts, at least of the lowermost flowers, longer than 1 mm. Bracteoles usually prominent, sometimes lacking 29

27a Calyx glabrous or with very sparse hairs. Legume falcate, 3–12 seeded 35. *G. falcata*
27b Calyx with dense appressed or patent hairs. Legume ovoid-acuminate, 1–2 seeded 28

28a Flowers in congested terminal racemes. Standard subequal to the keel 41. *G. hispanica*
28b Flowers in lax racemes. Standard c. half as long as the keel 42. *G. germanica*

29a Leaves glabrous. Legume falcate 3–12 seeded . . . 30
29b Leaves with at least the lower surface pubescent. Legume ovoid-acuminate, 1–2 seeded 31

30a Branches, calyx and legume glabrous . . . 34. *G. anglica*
30b Branches, calyx and sutures of the legume with patent hairs 36. *G. berberidea*

31a Plant low, less than 30 cm. Spines usually weak . . . 32
31b Plant erect more than 30 cm. Spines, at least of the non-flowering branches usually stout 34

32a Flowering branches with a spine projecting beyond the uppermost flower . . . . . 49. *G. anatolica*
32b Flowering branches not terminated by a spine . . . 33

33a Upper lip of the calyx subequal to the lower. Base of the standard truncate to cuneate . . . . . 39. *G. sylvestris*
33b Upper lip of the calyx c. 1/2 the lower. Base of the standard subcordate . . . . . 40. *G. aristata*

34a Flowering branches with a spine projecting beyond the uppermost flower . . . . . 49. *G. anatolica*
34b Flowering branches not terminated by a spine . . . 35

35a Lower teeth of the calyx half the lip or less. Calyx usually less than 8 mm 36
35b Lower teeth of the calyx c. 2/3 of the lip. Calyx usually longer than 8 mm 37

36a Standard glabrous. Bracts half as long as the calyx or less. Upper surface of the leaves with sparse sericeous hairs . . 44. *G. tricuspidata*
36b Standard pubescent. Bracts subequal to or longer than the calyx. Upper surface of the leaves glabrous . . . . . 45. *G. erioclada*

37a Bracts borne at the base of the pedicel . . 47. *G. tournefortii*
37b Bracts borne at the apex of the pedicel 38

38a Upper lip of the calyx subequal to the lower . 43. *G. hirsuta*
38b Upper lip of the calyx half as long as the lower . 46. *G. ulicina*

39a Leaves simple 40
39b Leaves trifoliolate 72

40a Inflorescence capitate 41
40b Inflorescence racemose, or flowers in axillary or subterminal clusters 48

41a All branching alternate 42
41b At least some branching opposite 43

42a Upper surface of the leaves pubescent. Leaves and calyx with patent hairs . . . . . 18. *G. involucrata*
42b Upper surface of the leaves glabrous. Leaves and calyx with appressed sericeous hairs . . . . . 14. *G. subcapitata*

43a Pulvinules with two persistent spinose stipules. Branches recurved and angled 44
43b Pulvinules without spinose stipules. Branches not recurved, subterete 45

44a Standard broadly ovate, apex retuse . . 67. *G. demnatensis*
44b Standard ovate, apex acute . . . . 66. *G. cephalantha*

45a Legume narrowly oblong, several seeded 46
45b Legume ovoid-acuminate, 1–2 seeded 47

46a Inflorescence heads of more than 4 flowers. Internode length and branching very irregular . . . . . 71. *G. umbellata*
46b Inflorescence heads of 4 (rarely 2) flowers. Internode length and branching very regular . . . . . 70. *G. quadriflora*

47a Standard c. 7 mm, triangular, glabrous. Calyx with short appressed sericeous hairs . . . . . 69. *G. capitellata*
47b Standard more than 8 mm, broadly ovate with a median ridge of sericeous hairs. Calyx with dense patent hairs . 68. *G. microcephala*

48a Legume ovoid-acuminate, 1–2 seeded. Standard triangular or angular ovate, usually shorter than the keel 49
48b Legume narrowly oblong, 3–12 seeded. Standard broadly ovate, as long as the keel 54

49a All branching alternate. Lower teeth of the calyx linear, half as long as the lip or more. Plant low, suffruticose 50
49b At least some branches opposite. Lower teeth of the calyx very short, usually less than half the lip. Plant erect 52

50a Calyx glabrous 51
50b Calyx with sericeous hairs . . . . 39. *G. sylvestris*

51a Leaves narrowly elliptical. Standard c. 1 mm shorter than the keel (N.W. Spain and Portugal) . . . . 37. *G. micrantha*
51b Leaves narrowly oblong. Standard c. 2 mm shorter than the keel (Balkan peninsula, Turkey) . . . . . 38. *G. carinalis*

52a Calyx subglabrous, upper teeth obtuse, c. 1/3 the tube 61. *G. aetnensis*
52b Calyx with sericeous hairs, upper teeth acute, as long as or longer than the tube 53

53a Calyx 2·5–4 mm. Standard 7–9 mm, claw less than 1 mm wide 62. *G. spartioides*
53b Calyx 5–6 mm. Standard 10–11 mm, claw more than 1 mm wide 63. *G. haenseleri*

54a Keel and standard glabrous 55
54b Keel and usually the standard with sericeous hairs . . . 58

55a Stems and branches usually winged triquetrous. Leaves with a narrow, hyaline, obscurely denticulate margin; heterophyllous, leaves of the flowering branches elliptical or obovate, those of the sterile branches usually lanceolate and larger . . . . . 2. *G. januensis*

55b Stems and branches ridged but terete. Leaves without a hyaline denticulate margin, not heterophyllous 56

56a Leaves not larger than 10 × 4 mm, narrowly elliptical or narrowly oblong 57

56b Leaves usually larger than 10 × 5 mm, elliptical to broadly lanceolate 1. *G. tinctoria*

57a Leaves with sericeous hairs on both surfaces. Plant low with compact branching . . . . . 4. *G. libanotica*

57b Leaves glabrous (except for ciliate margins). Plant erect and laxly branched or semi-prostrate . . . . . 3. *G. lydia*

58a Standard subglabrous, or with a narrow median ridge of sericeous hairs 59

58b Standard uniformly pubescent, often densely so 61

59a Most flowers borne in pairs or fascicles (some singly). Bracts fasciculate 6. *G. cinerea*

59b All flowers borne singly. Bracts not fasciculate 60

60a Leaves usually longer than 8 mm, somewhat petiolate 8. *G. florida*

60b Leaves 2–5 mm, sessile . . . . . 7. *G. valentina*

61a Plant erect, laxly branched with long flexuous branches . . 62

61b Plant low, much branched 63

62a Standard with dense subpatent hairs. Most flowers borne in fascicles on short lateral branches, 5–15 mm . . . . 5. *G. ramosissima*

62b Standard with appressed sericeous hairs. Most flowers in pairs (some singly, some fasciculate) borne directly on the main branches 6. *G. cinerea*

63a Upper surface of the leaves glabrous 64

63b Upper surface of the leaves pubescent 68

64a Bracteoles present (sometimes small) 65

64b Bracteoles absent 66

65a Flowers in congested terminal racemes. Leaves usually larger than 10 × 3 mm . . . . . 13. *G. sericea*

65b Flowers in lax racemes. Leaves usually smaller than 10 × 3 mm. 10. *G. pseudopilosa*

66a Standard 12–14 mm. Inflorescence of 1–2 flowers per branch, borne subterminally . . . . . 9. *G. obtusiramea*

66b Standard 8–12 mm. Inflorescence racemose or axillary clusters . 67

67a Flowers borne in long racemes of axillary clusters. Leaves shortly petiolate . . . . . 19. *G. pilosa*

67b Flowers borne in clusters towards the ends of branches. Leaves sessile 17. *G. albida*

68a Bracteoles borne just below the calyx 69

68b Bracteoles borne halfway along the pedicel or lacking . . 70

69a Bracteoles c. 3 mm (Greece) . . . . 12. *G. sakellariadis*

69b Bracteoles less than 1 mm (Spain) . . . 11. *G. teretifolia*

70a Flowers borne singly (rarely in pairs), usually in clusters of 2–7 towards the ends of branches 71
70b Flowers in pairs, borne subterminally, usually one pair per branch 15. *G. millii*
71a Calyx usually longer than 5 mm. Standard 9–12 mm. Plant never spinescent . . . . . 17. *G. albida*
71b Calyx usually 5 mm or less. Standard 7–10 mm. Plant sometimes spinescent . . . . . 16. *G. villarsii*
72a Inflorescence capitate with 4–16 flowers. Legume narrowly oblong, several seeded . . . . . 72. *G. clavata*
72b Inflorescence racemose, or subcapitate with 2–8 flowers. Legume ovoid-acuminate, 1–2 seeded 73
73a Calyx 2·5 mm or less, lower teeth minute, less than 0·5 mm (Ibiza) 59. *G. dorycnifolia*
73b Calyx longer than 2·5 mm, lower teeth 1 mm or more . . 74
74a All leaves and branches opposite. Inflorescence subcapitate with 2–8 flowers 75
74b Some leaves and branches opposite, others alternate. Inflorescence a lax raceme or an interrupted raceme of opposite and subopposite flowers 77
75a Bracts of the lowermost flowers foliaceous, trifoliolate. Standard uniformly pubescent 76
75b Bracts of the lowermost flowers simple, sometimes trifid. Standard glabrous or with a median strand of sericeous hairs (uniformly pubescent in var. *sericopetala*) . . . . . 53. *G. radiata*
76a Bracteoles 2–3 mm, as long as the calyx tube 54. *G. holopetala*
76b Bracteoles 1 mm or less, shorter than the calyx tube 55. *G. hassertiana*
77a Inflorescence a lax raceme of alternate flowers. 78
77b Inflorescence a raceme of opposite and subopposite flowers . 80
78a Branches, leaves and calyx with dense long patent hairs 58. *G. nissana*
78b Branches, leaves and calyx with short appressed sericeous hairs 79
79a Standard deltate or triangular. All bracts trifoliolate, persisting 57. *G. sessilifolia*
79b Standard broadly angular ovate. Uppermost bracts simple or lacking, fugacious . . . . . 60. *G. ephedroides*
80a Wing petals up to 2/3 the length of the keel. Apex of the standard acute . . . . . 57. *G. sessilifolia*
80b Wing petals subequal to the keel. Apex of the standard rounded 56. *G. aucheri*

Subgenus I *Genista*

Syn.: subg. *Stenocarpus* Spach in Ann. Sci. Nat., ser. 3, 3: 106 (1845).

Spiny and non-spiny shrubs with alternate branching, the spiny species with fertile axillary spines or spiny branches. *Leaves* simple (trifoliolate in 1 species) with the leaf taking 3 vascular traces. *Standard* broadly ovate, glabrous or with sericeous hairs, as long as the keel and wings. *Legume* narrowly oblong, usually compressed, 3 to many seeded.

Distribution: Mediterranean region, Balkan peninsula and Turkey, with two species (*G. tinctoria* and *G. pilosa*) extending into N.W. Europe.

Section 1. *Genista*

PLATE 1. *Genista aucheri* Boiss.

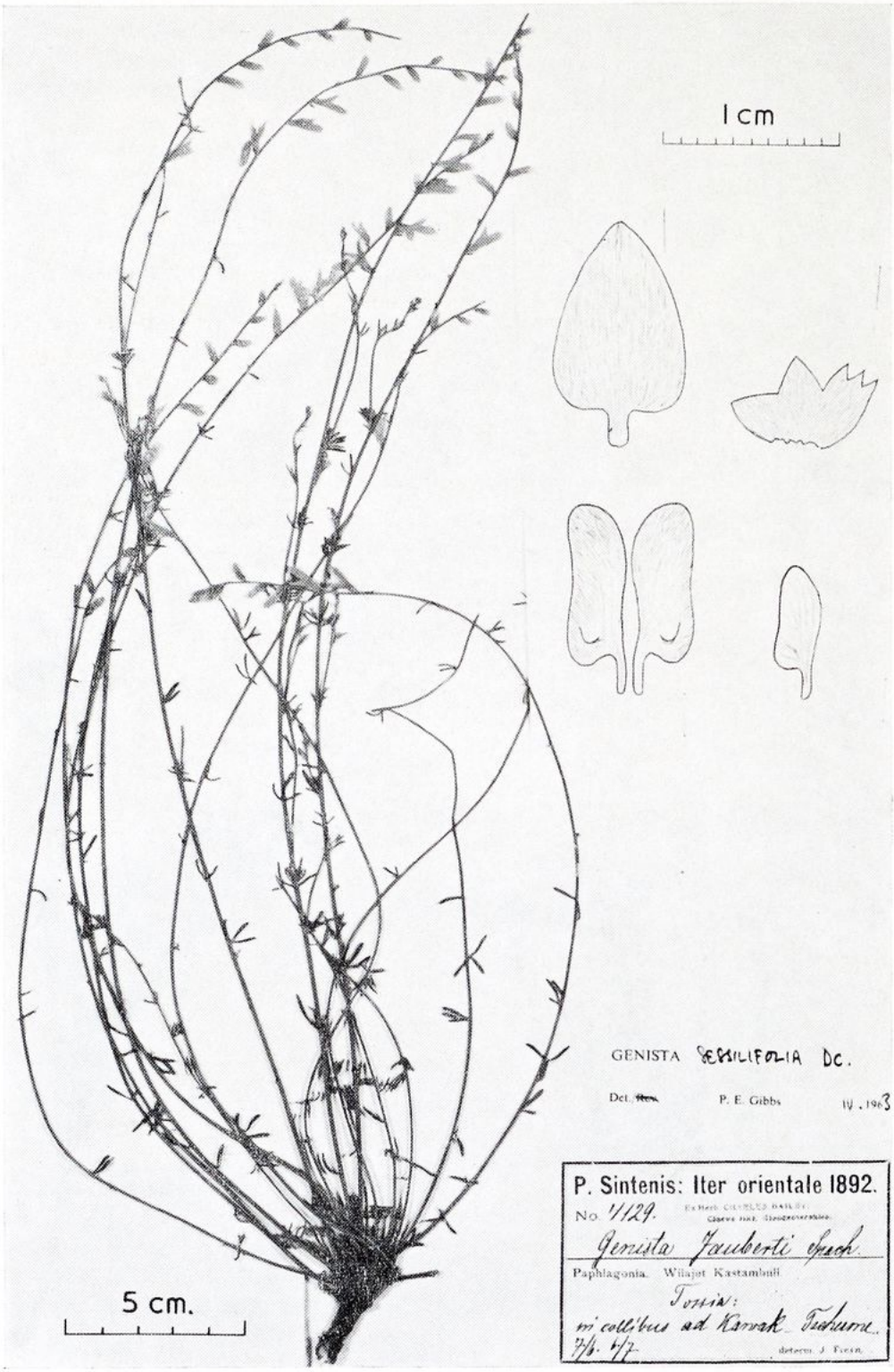


PLATE 2. *Genista sessilifolia* DC.

Non-spiny shrubs, flowers borne in leafy racemes. Corolla glabrous, leaves and calyx usually so.
Distribution: N.W. and C. Europe, Balkan peninsula, Turkey and Syria.

1. G. tinctoria L., Sp. Pl. 710 (1753) *sensu lato*

Possible synonymy:

G. virgata Willd., Berl. Baumz., 160 (1796).
G. ovata Waldst. & Kit., Pl. Rar. Hung. 1: 86, tab. 84 (1802).
G. mantica Poll., Hort. et Prov. Veron. Pl. Nov. 1: 18 (1816).
G. depressa Bieb., Fl. Taur. Cauc. 3: 460 (1819).
G. tetragona Bess., Enum. Pl. Volhyn., 73 (1821–22).
G. perreymondii Loisel., Fl. Gall., ed. 2, 2: 103 (1828).
G. tenuifolia Loisel., Fl. Gall. Suppl., 169 (1828).
G. elata (Moench) Wend. in Linnaea 15: 100 (1841).
G. lasiocarpa Spach in Ann. Sci. Nat., ser. 3, 3: 135 (1845).
G. ptilophylla Spach *loc. cit.*, p. 131.
G. mayeri Janka in Oesterr. Bot. Zeitschr. 9: 41 (1859).
G. nervosa Kit. in Linnaea, 32: 605 (1863).
G. hungarica Kerner in Oesterr. Bot. Zeitschr., 45: 140 (1863).
G. friwaldskyi Boiss., Fl. Or., 2: 45 (1872).

A very variable species. Prostrate to erect, 10–200 cm non-spiny shrub. *Leaves* 5–50 × 4–15 mm, simple, sessile, elliptical, lanceolate or oblanceolate, varying from subglabrous with ciliate margins and veins to uniformly densely pubescent. *Flowers* borne in usually short, simple or compound racemes at the ends of the branches. *Bracts* foliaceous; *bracteoles* 1 mm or less, linear, borne halfway along the pedicel; *pedicels* 1–2 mm. *Calyx* 3–7 mm, glabrous to densely pubescent; lips less than, to longer than the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 8–12 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* 15–25 mm, narrowly oblong, glabrous to densely pubescent, 4–10 seeded. 2n: 48 (Tschechow 1931).
Type material: specimen in the Clifford Herbarium (holo. BM).
Distribution: Throughout most of Europe and extending to Turkey and the Nearer East; southern limit includes N. & N.E. Spain, Sicily but not Corsica, Sardinia or the Greek Islands. Northern limit includes Lithuania and Ukraine, and eastwards to the Ural mountains.

G. tinctoria sensu lato is the most widely distributed taxon within the genus, and it exhibits a complex pattern of variation, particularly in the central area of its distribution; the following treatment should be taken as provisional.

The revision of *Genista* by Spach remains the only previous attempt to study the *G. tinctoria* complex virtually throughout its geographical range, and the combination of great variability in the plant material together with the rather narrow species concept employed by Spach, led to the recognition of some 13 species, all of which have been referred to *G. tinctoria* in the present revision. It is worth noting, however, that only 5 of these 13 species were delimited by Spach, and the lengthy but by no means exhaustive synonymy cited above gives a better indication of the variability of the complex, and of the number of taxa that have been described in attempts to circumscribe this variation adequately.

The variation within the *G. tinctoria* complex can be divided into two main aspects:

1. The presence or absence of a pubescent indumentum on the leaves, calyx and legume.

2. Variation in habit, from low, prostrate plants with the inflorescence consisting of a few flowered raceme, through all stages of intergradation to tall erect plants, up to 2 m, with a compound or paniculate raceme.

The only other characters which tend to vary to any extent are leaf size, to some extent correlated with habit, the nature of the leaves—whether coriaceous or chartaceous in texture, and the lengths of the calyx segments.

Specimens of *G. tinctoria* from various parts of its range with a low, rather prostrate habit, simple, few flowered racemes and leaves not usually exceeding 10 mm have been recognised as distinct species or subspecies such as *G. alpestris*, *G. tinctoria* var. *prostrata*, *G. tinctoria* subsp. *littoralis*.

More erect or decumbent, but still essentially low "bushy" plants with larger leaves, c. 10–25 mm, and laxer, sometimes branched racemes have been recognised as 'typical' *tinctoria*, var. *vulgaris* and *G. campestris;* erect forms with paniculate racemes and large leaves, 20–50 mm, have been described as *G. elata* or subsp. *elatior*.

Likewise, there are a parallel series of taxa for the pubescent conditions. Thus, low, rather prostrate plants similar to var. *prostrata* as above but with appressed or patent hairs on the leaves, calyx and legumes have been described as *G. depressa* or *G. friwaldskyi*. Plants resembling the typical *tinctoria* condition as described above but again with a pubescent indumentum have been referred to *G. ovata*, whilst specimens nearer to the *G. elata* condition have been described as *G. lasiocarpa* or *G. hungarica*.

This situation is further complicated by the following aspects:

1. In the material of *G. tinctoria* s.l. that has been examined, neither the habit nor pubescence characters noted above are really distinctively correlated other than on a very local basis. For example, leaf size exhibits a fairly continuous variation rather than discrete groupings, and all grades of habit from very low plants to tall erect ones are encountered without any sharp discontinuities.

Pubescence also shows a lack of geographical correlation: leaves of specimens show a continuous range from sparsely hairy to densely so; likewise, some specimens have pubescent leaves but glabrous legumes, or more frequently, glabrous leaves but pubescent legumes (cf. *G. mayeri* and *G. mantica*).

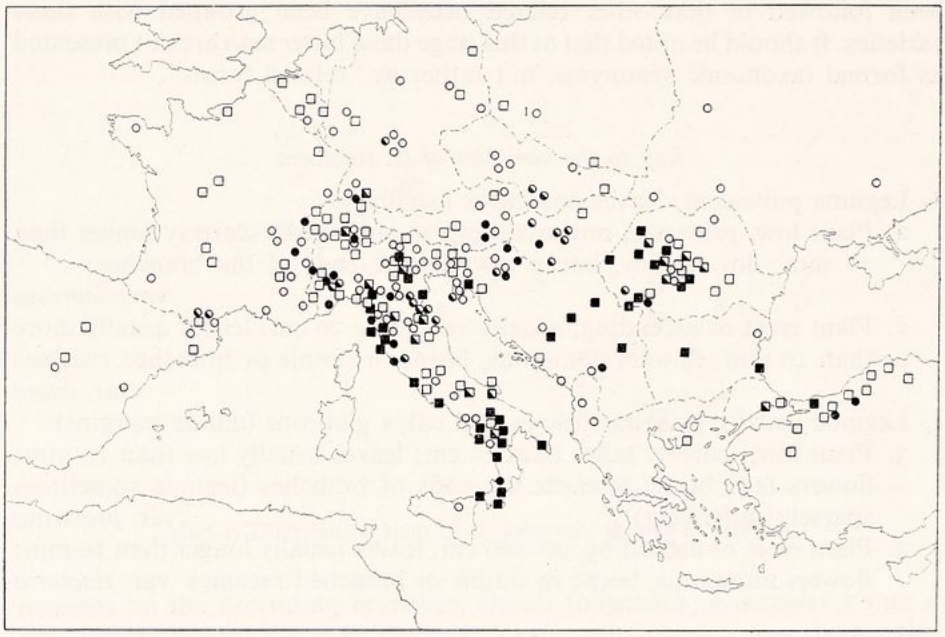
2. In addition, the two character trends, in habit and pubescence, appear to vary independently of one another, with the consequence that taxa described on the basis of one character aspect, e.g. habit and leaf size, can contain several other taxa described on the basis of pubescence, whether the leaves and calyx or legume, or both have sericeous hairs etc.

It is notable that glabrous forms of *G. tinctoria* predominate throughout the peripheral area of the distribution, and that it is in the central area—Romania, Jugoslavia, Italy, and to a lesser extent in S.E. France, N.E. Spain, Bulgaria and Turkey that the pubescent forms occur. Map 1 shows the distribution and variation of glabrous and pubescent forms in this central area: it can be seen that wholly glabrous and wholly pubescent forms occur sympatrically, but that many intermediate specimens occur. In the exsiccatae seen there have been at least three examples of mixed gatherings of glabrous

and pubescent forms, presumably from the same populations: Italy, Ceresole Reale, *Vaccari;* Romania (as Hungary, com. Alba), Kuytávar, 1872, *Tauscher* and France, Aude, près Caux, vii. 1884, *Respaud.* There are many other cases of glabrous and pubescent forms collected from apparently adjacent localities.

Map 1 also shows that the nature of the inflorescence, whether a simple or compound raceme, which is to some extent correlated with habit and leaf size, exhibits no geographical segregation.

Despite this lack of morphological and geographical discreteness of the varying forms of *G. tinctoria*, cultivation of specimens under uniform conditions has shown that such characters as leaf size and habit can be under



Map 1. Variation in *G. tinctoria* s.l. within the central area of distribution.

	pubescent[1]	intermediate[2]	glabrous
simple unbranched raceme:	●	◔	○
branched paniculate raceme:	■	◪	□

genetic rather than environmental control. For example, transplant specimens of var. *prostrata* from the Lizard Peninsula, Cornwall, England, retain their habit when cultivated in the Botanic Garden, and young plants grown from seed collected in this locality also show a markedly prostrate habit. It is possible that widespread phenotypic *and* genotypic variation exists in the complex, so that the former can be obscured by the latter.

In several respects the *G. tinctoria* complex resembles the situation described in *Erigeron andicola* by Solbrig (1962). In this complex some 37 species have been described, mainly based on such characters as pubescent or glabrous achenes, number of heads per scape, presence of and type of indumentum, and shape of the leaves. The parallel may be extended by quoting Solbrig's comments (1962, p. 58) on the *Erigeron andicola* complex,

[1] Leaves, calyx and legume pubescent.
[2] Only one of the above characters pubescent.

thus: "For the present study I have had at my disposal several hundred sheets encompassing the majority of collected specimens. After studying these plants in detail for some time and trying to delimit the taxa in terms of described species, it was evident to me that the plants are very variable, that most species had been based on one, or at the most a few specimens, and, furthermore, that a large number were intermediate between the hitherto accepted taxa."

It seems to the author that these remarks apply most aptly to the *G. tinctoria* complex also, and pending further investigations it is proposed to recognise only one variable species, *G. tinctoria* L., and to delimit several varieties which represent the most prominent variants noted above. A modified form of Solbrig's treatment of the *Erigeron andicola* complex has been followed in that other related taxa have been grouped with these varieties. It should be noted that at this stage these latter taxa are not presented as formal taxonomic synonyms, but rather as "related forms".

Key to the varieties of G. tinctoria

1. Legume pubescent, leaves and calyx usually so
   2. Plant low, prostrate, not exceeding 20 cm; leaves scarcely longer than 10 mm; flowers few, borne towards the ends of the branches var. *depressa*
   2. Plant erect or ascending, usually exceeding 20 cm; leaves usually more than 10 mm; flowers numerous, borne in simple or branched racemes var. *ovata*
1. Legume usually glabrous, leaves and calyx glabrous (ciliate margins)
   3. Plant low, scarcely taller than 20 cm; leaves usually less than 10 mm; flowers few, borne towards the ends of branches (legume sometimes sparsely pubescent) . . . . . var. *prostrata*
   3. Plant erect or ascending, 20–200 cm; leaves usually longer than 10 mm; flowers numerous, borne in simple or branched racemes var. *tinctoria*

1. var. **tinctoria**

Related taxa: *G. elata* (Moench) Wend.; *G. virgata* Willd.; *G. tenuifolia* Loisel.; *G. anxantica* Ten.; *G. campestris* Janka.

Distribution: occurs throughout the range of *G. tinctoria* s.l. as above.

2. var. **prostrata** Bab., Manual Brit. Bot. 70 (1843).

Related taxa: *G. tinctoria* subsp. *littoralis* (Corb.) Rothm.; *G. alpestris* Bert.

Distribution: Occurs in exposed situations (?) throughout most of the range of *G. tinctoria* s.l. Particularly maritime areas, N.W. Europe.

3. var. **ovata** (Waldst. & Kit.) Arcangeli, Fl. Ital., 151 (1882).

Syn.: *G. ovata* Waldst. & Kit., Pl. Rar. Hung., 1: 86 et tab. 84 (1802).

Related taxa: *G. mayeri* Janka, *G. lasiocarpa* Spach, *G. mantica* Poll., *G. hungarica* Kern., *G. perreymondii* Loisel.

Distribution: Mainly in the central area of the distribution of *G. tinctoria* s.l. —Romania, Jugoslavia, Italy, but also extending to Turkey in the east, and S.E. France and N.E. Spain in the west.

4. var. **depressa** (Bieb.) P. Gibbs **stat. nov.**

Syn.: *G. depressa* Bieb., Fl. Taur. Cauc., 3: 460 (1819).

Related taxa: *G. friwaldskyi* Boiss., *G. tetragona* Bess.

Distribution: Jugosalvia (Crna Gora and Makedonija), Greece (Makedhonia) and south-east U.S.S.R.

2. **G. januensis** Viv., Elench. Pl. Horti Bot., 19 (1802).

Syn.: *G. triangularis* Willd., Sp. Pl., 3: 939 (1802).
G. triquetra Waldst. & Kit., Pl. Rar. Hung. 2: 153 (1802).
G. scariosa Viv., Fl. Ital. Fragm., tab. 8 (1808).

Erect or decumbent shrub with stems and branches usually winged-triangular. *Leaves* simple, sessile, variable in shape and size: those of the flowering branches 5–12 × 2–4 mm, elliptical to obovate, those of the sterile branches 5–40 × 3–7 mm, elliptical to lanceolate, both kinds glabrous with the margin hyaline and obscurely denticulate. *Flowers* borne in short

Map 2. Distribution map of *G. januensis* ● and *G. lydia* ▲

racemes on the ascending branches. *Bracts* foliaceous; *bracteoles* 1 mm or less, linear; *pedicel* 1–2 mm. *Calyx* c. 4 mm, subglabrous; lips shorter than the tube, upper teeth as long as the lip, lower teeth subequal to the lip. *Standard* c. 10 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* c. 15 mm, narrowly oblong, glabrous, 3–8 seeded. 2n: 48–50 (Tschechow 1931).

Type material: Not known.

Habitat: Calcareous substrates.

Distribution: Italy (north and central provinces); Jugoslavia (Croatia, Montenegro, Makedonija); Romania; Greece; Turkey? (Map 2).

ITALY: Liguria, Prope Sanolum, v 1888, *Aimori* (MANCH, W); Borghetto, 13 v 1903, *Bicknell & Pollini* (FI); Monterosso al Mare, v 1925, *Montale* (FI); Friuli Venezia Giulia, Trieste, v 1878, *Marchesetti* (FI); Emilia-Romagna, Bononia, 6 v–27 v 1906, *Fiori, Beguinot & Pampanini* (FI); Toscana, Ma sa-Mar, 11 vi 1918, *Fiori* (FI); Pisa, Castiglionello, 12 vi 1916, *Fiori* (FI); Firenze, Sassi Neri, 25 v 1912, *Pampanini* (FI); Abruzzi Molise, Villavallelonga, Difensa, 4 vii 1902, *Grande* (FI); S. Trinita, 12 vi 1911, *Vaccari* (FI); Apulia, Gargano, Maro Stefano, 11 v 1893, *Martelli* (FI); Calabria, Briona, *Parlatore* (FI).

JUGOSLAVIA: Croatia, Montis Hum prope pagum Tüffer, v 1906, *Cetina* (FI, MANCH, W); Montis Gross Kahlenberg, ad Labacum, *Deschmann* 1228 (FI, MANCH, S); Krain bei Kenda Idrija, auf dem berg Tellenk, *Freyer* (MANCH); Lastva Trebinje, 11 v 1905, *Schneider* (W); Bosnia & Hercegovina, Prope Vlasic, vi 1891, *Brandis* (MANCH, S, W); Bei Sarajevo, *Chicic* (FI, W); Srbija, Ad Pirot, vi 1897, *Adamovic* (W); Bela Palanka, viii 1832, *Fovanovic* (W).

ROMANIA: Cluj, Turog, 17 vi 1887, *Barth* (FI, MANCH, W); Bei Talmatsch in Hermanstadt, v 1850, *Kagner* (W); Prope Thorda, iv 1858, *Janka* (FI); Prope Turda, vi 1889, *Wolff* (MANCH); Turog in saxosis ad Hsadek, *Wolff* (MANCH, S, W); Craiova, Banatus, distr. Severin, 19 v 1939, *Borza, Nyarady et al.* (W); Ad fluvium Aries, Buru, *Borza* (S); Montis Domuglets ad Thermas Herculis, vii 1832, *Heuffel* (W).

BULGARIA: Rilo (Klester), 3 vi 1931, *Cyren* (S); Ad Kurilo, v 1921, *Střibřny* (W); Ad Belov, v 1894, *Střibřny* (MANCH, W).

GREECE: Makedhonia, Tsoutsoulianos, c. 4 km S.E. of Siatista, 25 v 1961, *Ball* (LIVU); M. Pecklen, prope Ipek, *Friedrichstahl* (W); Thessalia, Krystallopegal, 19 vi 1932, *Alston* (K); Pindus-Tymphaeus, 27 vi 1896, *Sintenis* 745 (FI, S); Oxya-Zygos, 9 vii 1896, *Sintenis* (MANCH, W).

The names *G. januensis* Viv. (*G. scariosa* is a later illegitimate substitution by Viviani) and *G. triangularis* Willd. were published in the same year (1802), and it has not been possible to establish which was the earlier publication.

Because Willdenow's species was described from Romania (based on specimens sent by Waldstein & Kitaibel, and subsequently published by these authors as *G. triquetra*) whilst Viviani's taxon was described from Liguria, the two epithets have been treated as referring to two distinct species by many workers.

Since it has not been possible to establish which name has priority of publication, the choice of the first author to unite them has been followed. Reichenbach (1830–33) appears to be the first author to treat *G. januensis* and *G. triangularis* as the same species, or at least to indicate that he does so in synonymy, for he cites them *both* as synonyms under *G. scariosa* Viv.—the substitute epithet noted above.

It is argued that since *G. scariosa* is a later substitute for *G. januensis*, then in a strictly taxonomic sense, Reichenbach united *G. triangularis* and *G. januensis* under the latter, and consequently, *G. januensis* has been chosen as the legitimate name for this species.

All specimens from the Balkan peninsula seen by the author which have been determined as G. *spathulata* Spach have been referred to *G. januensis*. A number of such specimens have rather atypical facies (e.g. exsiccatae from Turda, Romania, collected by *Barth, Wolff et al.*) in that the stems and branches are not winged-triangular, and the hyaline margin is poorly developed. The hyaline margin is present on the leaves of most of this material, however, as is the heterophyllous condition which is such a characteristic feature of this species.

Putative isotype material of *G. spathulata*—Olympo Bithynico, Aucher-Eloy 1089—has been seen from the Herbarium at Trinity College, Dublin, and this consists of a mixed collection: some fragments have pilose legumes and are referable to the *G. tinctoria* complex, whilst others are almost certainly specimens of *G. januensis*.

However, the occurrence of *G. januensis* in Turkey is doubtful, since only

one other suspect record is known (Tchairli dagh, vii 1899, *Charrel*—this locality is probably in Bulgaria or Greek Makedhonija) even though the Aucher locality, Olympo Bithynico (i.e. Ulu Dagh, vil. Bursa) has been well collected in recent times.

Until it has been possible to study authentic type material, therefore, the status of *G. spathulata* must remain uncertain; whilst *G. spathulata* auct. from the Balkan peninsula is referable to *G. januensis*, it is possible that *spathulata* sensu Spach may well be a synonym of *G. lydia*.

3. G. lydia Boiss., Diagn. Pl. Or. Ser., 1 (2): 8 (1843).

Syn.: *G. leptophylla* Spach in Ann. Sci. Nat., ser. 3, 3: 127 (1845).

Low prostrate shrub with secondary branches ascending, or erect with lax branching, branches ridged but not winged. *Leaves* 3–10 × 1–3 mm, simple, sometimes fasciculate, narrowly oblanceolate or linear oblong, subglabrous. *Flowers* borne in short raecmes at the ends of branches. *Bracts* foliaceous; *bracteoles* c. 1 mm or less, linear; *pedicel* 1–2 mm. *Calyx* 3·5–5 mm, glabrous, lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* c. 10 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* 15–20 mm, narrowly oblong, glabrous, 3–8 seeded.

Type material: "In montibus Lydiae, prope Smyrnam, in Sipyle et Tmolus ad Bozdagh, *Boissier*" (syn. E, LIVU, W). Sipylus ad Magnesiam, *Balansa* 191 (syn. W).

Distribution: Turkey, W. vilayet; Greece, Thessalia; Bulgaria.

Two varieties are recognised:

1. var. **lydia**

Plant low, prostrate, usually less than 30 cm, with ascending flowering branches.

Distribution: Turkey, Greece, Bulgaria.

GREECE: Makedhonia, Perindagh, viii 1874, *Pichler* (K); Monte Pangeon (Purnar Dagh), 26–27 vi 1936, *Rechinger fil.* (S).

BULGARIA: Ad Luzam, 14 v 1899, *Střibřny* (E, FI, MANCH); Haskova, 20 v 1899, *Střibřny* (E, S).

TURKEY: Istanbul, Konstantinopal, Aidos-Dagh, 10 v 1896, *Nemetè* (W); Bursa, Ulu Dağ, 13 ix 1947, *Davis* 14842 (E); Çanakkale, M. Ida, in sylvis montis Kapu Dağ, vii 1883, *Sintenis* 533 (E, MANCH); Renkoi, 1883, *Sintenis* (W); Izmir, Mont Sipyle, in regione alpini et subalpini, 10 vi 1906, *Bornmüller* 9245 (E); Smyrna, *Whittall* (E); Bolu, Mudurnu, E. of Sircali, 1 viii 1958, *Kühne* (E); Caglikdere, 15 vi 1957, *Kühne* (E); Kastamonu, Kure-Inebolu, 7 vi 1954, *Davis* 21597 (E).

2. var. **rumelica** (Velen.) Bornm. in Mitt. Thüring. Bot. Ver., s. 31 (1908).

Syn.: *G. rumelica* Velen. in Sitzung. Bohem. Gesell. Wiss., 43 (1890) et Fl. Bulg., 125 (1891).

Plant erect, 30–100 cm with lax branching.

Type material: "In rupestribus aridis collis Dzendem Tepe ad Philippop. supra Staminaka et Dermendere" *Velenovsky* (Herb. ?) n.v. Staminaka, viii 1890, *Velenovsky* (iso. BM?).

Distribution: Greece and Bulgaria.

GREECE: Thraki, c. 8 km E. of Xanthi, 16 v 1961, *Ball & Wagstaffe* 292 (LIVU).

BULGARIA: Ad Filipopel (Plovdiv), iv 1901, *Střibřny* (MANCH); Supra Staminaka, v 1894, *Střibřny* (MANCH).

Turrill (1957) commented on the difficulty of distinguishing *G. lydia* from the species group *G. januensis*, *G. spathulata* and *G. rumelica*, and he speculated that the future monographer of the genus would make *G. lydia* an eastern subspecies of *G. januensis*.

In the present revision virtually all the exsiccatae which have been determined as *G. spathulata* Spach have been referred to *G. januensis* (see discussion under that species) and *G. rumelica* has been united with *G. lydia*. From this viewpoint, *G. lydia* with its small, linear-oblong leaves and ridged but terete branches is fairly distinct from *G. januensis* which has heterophyllous leaves and winged-triangular branches, although the specimens of *G. januensis* from the Balkan peninsula (*G. spathulata* sensu auct.) are low prostrate plants with ascending flowering branches and thus approach the habit of *G. lydia*.

The majority of specimens of *G. lydia* which have been seen are low rather prostrate plants, and this is the condition of material in cultivation at The Royal Botanic Gardens, Kew (cf. Turrill, 1957), Edinburgh and elsewhere (P. Ball, verbal communication). At least some specimens, however, e.g. Sipylus supra Magnesiam, *Balansa* 191, appear to be erect, laxly branched plants.

G. rumelica is indistinguishable from *G. lydia* except that it is described as a tall, erect, laxly branched shrub (specimens collected near Xanthi by Ball are from plants 1–2 m high). In view of the fact that *G. lydia* can approach this erect habit, it is proposed to follow Bornmüller and treat *G. rumelica* as a variety of *G. lydia*.

4. G. libanotica Boiss., Diagn. Pl. Or. Ser. 1 (9): 3 (1849).

Low compactly branched shrub. *Leaves* 3–5 × 2 mm, simple, sessile, elliptical or obovate, with sparse sericeous hairs. *Flowers* in short racemes. *Bracts* foliaceous; *bracteoles* up to 1 mm, borne just below the calyx. *Pedicel* 1–2 mm. *Calyx* c. 4 mm, subglabrous; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* c. 9 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* not seen, ovary glabrous.

Type material: Syria—circa Zebdaine prope Damascus; in sabulosis aquiloni obversis montis Garbi loco "Berberis" dicto alto 5000 ped., 4 vi 1855, *Kotschy* (iso. E. TCD).

Distribution: Syria. Only known from the type specimen.

Section 2. *Spartioides* Spach in Ann. Sci. Nat., sér. 3, 3: 113 (1845).

Non-spiny shrubs with alternate branching. Leaves simple, pulvinules present and sometimes prominent. Standard broadly ovate, usually with sericeous hairs, keel always pubescent. Legume narrowly oblong, several seeded, with sericeous to lanate hairs.

Type species: *G. ramosissima*.

Distribution: Predominantly Mediterranean, although *G. pilosa* occurs throughout most of N.E. and central Europe, and the species *G. albida* and *G. involucrata* occur in E. Central and S. Turkey and the Crimean peninsula.

G. ramosissima is the first species given by Spach in sect. *Spartioides*, and since it is fairly typical of the section, and no other taxon has superior claims to be considered, it has been chosen as the type species of the section.

5. G. ramosissima (Desf.) Poiret, Encycl. Méth. Bot. Suppl. 2: 715 (1811).
Syn.: *Spartium ramosissimum* Desf., Fl. Atl. 2: 132 (1800).

Erect shrub, 30–100 cm with lax flexuous branches. *Leaves* c. 5 × 2 mm, simple, sessile, elliptical; lower surface with sericeous hairs, upper glabrous. Leaves of the older branches fasciculate and obovate. *Flowers* borne singly, paired or in fascicles in racemes on the main branches or on short (5–15 mm) lateral branches. *Bracts* foliaceous; *bracteoles* c. 1 mm, borne just below the calyx; *pedicel* c. 1 mm. *Calyx* c. 6 mm, with dense appressed sericeous or subpatent hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 10–12 mm, broadly ovate, with dense appressed sericeous or subpatent hairs, apex shortly retuse or entire. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, narrowly oblong with dense subpatent hairs, 3–6 seeded.
Type material: "habitat in Atlante prope Tlemsen" Herb. Desfontaines (P) ? n.v.
Habitat: Arid hillsides and lower mountain slopes.
Distribution: S.E. Spain, Algeria.
SPAIN: Almería, Ravins á Vera, 14 iv 1851, *Bourgeau* (LIVU, G); Inter Vera et Sorbas, 19 iv 1925, *Lacaita* (MA); Granada, La Sagra, 2 vii, *Jerónimo* (MA).
ALGERIA: El Kantara, 28 v 1896, *Chevallier* (MANCH); Entre Bossnet et Le Telagh, 7 iv 1926, *Faure* (MANCH); Tlemcen, 15 vi 1907, *Faure* (MA); Environs de Lamoriciere, 17 vi 1923, *Faure* (K); Tlemcen, 16 iv 1858, *Kralik* (K).
MOROCCO: Environs de Tinissen, 18 vi 1931, *Faure* (K, MA); Tehira Bel Abbes, iii 1858, *Munby* (K).

6. G. cinerea (Vill.) DC. in Lam. & DC., Fl. Fr., ed. 3, 4: 494 (1805).
Syn.: *Spartium cinereum* Vill. Prosp. Pl. Dauph., 40 (1779).

Erect shrub with flexuous branches. *Leaves* 4–10 × 1–3 mm, sessile, narrowly elliptical, oblanceolate or obovate, leaves of older branches fasciculate. *Flowers* borne singly, paired or in fascicles, in long racemes. *Bracts* foliaceous and fasciculate; *bracteoles* c. 1 mm; borne half-way along the pedicel; *pedicel* 2–3 mm. *Calyx* 5–7 mm, with short sericeous hairs, lips subequal to the tube, upper teeth as long as the tube, lower teeth less than half the lip. *Standard* 10–12 mm, broadly ovate, glabrous or with sparse to uniformly sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, with dense sericeous hairs, 2–5 seeded.
Type material: not known.
Distribution: France: Mediterranean area of the south-east; Spain (including Mallorca); Italy: Piemonte and Liguria; Algeria and Tunisia.

Two subspecies are recognised:

Branches with sparse sericeous hairs; mature leaves usually larger than 5 × 2 mm . . . . . subsp. *cinerea*
Branches with a dense white appressed sericeous to pseudofarinose indumentum . . . . . subsp. *leptoclada*

1. subsp. **cinerea** var. **cinerea**

FRANCE: Drôme, Près Beaufort, 5 vi 1895, *Mouillefarine* (G); Isère, Isles de Champagne, 9 vi 1849, *Verlot* (G); Hautes Alpes, Environs de Gap, v-vii 1854, *Blanc* (G, S); Basses Alpes, Fugeret, 8 vi 1888, *Reverchon & Derbez* (MANCH); Alpes Maritimes, Fontan, 17 vi 1886, *Reverchon* (MA); Var, Estérel près Fréjus, iv 1852, *Grenier & Godron* (G); Vaucluse, Serignan, 22 vi 1879, *St. Lager* (G); Bouches-du-Rhône, Col du Bartaque, 20 vi 1914, *Adamson* (MANCH); Lot, Près St. Pantelon, 2 vi 1854, *Irat* (G, S); Aude, Baga, 15 vi 1908, *Coste* (MA); Pyrénées Orientales, Prats de Mollo, 12 vi 1846, *Irat* (G).

SPAIN: Gerona, Olot, v 1879, *Vayreda* (MANCH); Barcelona, Santa Cecilia de Voltrega, 15 v 1923, *Gonzalo* (G, MA); Huesca, Bielsa, *Chouard* (MA); Santander, Mts. Reynosa, vii 1862, *Leresche* (G); Segovia, Puerto de Guadarrama, 6 vii 1854, *Bourgeau* (G); Soria, Neguilla, 16 vi 1935, *Vicioso* (MA); Teruel, Near Sarrión, 30 v 1962, *Brummitt, Gibbs & Ratter* (BM, E, LIVU); Castellón, Entre Morella y Castell de Cabres, *Pau* (MA); Madrid, Cercedilla, 22 vi 1950, *Roivainen* (S); Avila, Sierra de Gredos, Puerto del Pico, 9 vii 1952, *Vicioso* (MA); Salamanca, Peña de Francia, La Alberca, 4 viii 1946, *Caballero* (MA); Cáceres, Guadalupe, Las Villuecas, 22 vi 1948, *Caballero* (MA); Murcia, Mazaron, coto de las Minas de Pena Roya, 18 v 1921, *Gros* (MA); Almería, Cabo de Gata, 23 iv 1932, *Kretschner* (G); Granada, Sierra Nevada, 1837, *Boissier* (G); Barranco de Rio Segura, vi 1906, *Reverchon* (G, MA); Jaén, Sierra de Mágina, 14 viii 1925, *Cuatrecasas* (MA); Córdoba, Cabra, 4 v 1918, *Vicioso* (MA); Sevilla, Sevilla, *Abat* (MA); Málaga, Sierra de Ronda, 19 vi–16 vii 1889, *Reverchon* (MA); Cádiz, Grazalema, 25 v–15 vii 1890, *Reverchon* (LIVU, MANCH, S).

ITALY: Piemonte, Hillside below Tende, 17 viii 1911, *Bicknell* (G); Supra Stroppo, presso il porte della Ceiva, vii 1910, *Ferrari & Goli* (S); Liguria, Prope Bordighera, 24 v 1905, *Bicknell* (S).

ALGERIA: Beni Souik, valley de l'Oued-Abi, 3 vi 1853, *Balansa* (K); Tlila, entre Djelfa et Boucada, v 1858, *Kralik* (K).

TUNISIA: Guctus el Kesra, Djebel Belloufa, 1 vi 1884, *Letourney* (K); Djebel Semata, 21 v 1887, *Letourney* (K).

subsp. **cinerea** var. **cinerascens** (Lange) P. Gibbs **stat. nov.**

Syn.: *G. cinerascens* Lange, Pug. 358 (1863).
G. cinerea forma *cinerascens* (Lange) Laguna, Fl. forest. españ. 2: 329 (1890).

Standard with dense sericeous hairs.

Type material: In sylvis ad Escorial, 16 vi 1851, *Lange* (holo. C, iso. MA).

SPAIN: Madrid, Somosierra, vi 1926, *Aterido* (MA); Cercedilla, 8 vi 1948, *Ceballos* (MA); Miraflores de la Sierra, 20 vi 1854, *Isern* (MA); Segovia, Coca, 30 v 1933, *Ceballos* (MA); Avila, Hoyos del Espino, *Cuatrecasas* (MA); Salamanca, Las Butuecas, *Ceballos* (MA).

PORTUGAL: Beira Alta, Sierra de Estrella, viii 1882, *Ferreira* (G).

2. subsp. **leptoclada** (Willk.) P. Gibbs **stat. nov.**

Syn.: *G. cinerea* var. *leptoclada* Willk., Ind. Pl. Vasc. Balear., in Linnaea 40: 539 (1876); Willk. & Lange. Suppl., 253 (1893).

Branches with dense appressed white sericeous to pseudofarinose indumentum. Mature leaves not usually larger than 4 × 2 mm.

Type material: "In rupest. calc. reg. mont. et inf. in tracta Sierra int. alt. 100–900 m" (Willkomm *loc. cit.*) Herb. Willkomm (COI) ? n.v.
SPAIN: Mallorca, Barranco de Saller, 1 vi 1881, *Barbey* (G); Près Puig de Corella, 16 v–19 vi 1869, *Bourgeau* (G); Puig de Galatzo et Monte Coman, 17 v 1885, *Porta & Rigo* (MANCH); Lluch, 9 iv 1933, *Sennen* 8616 (MA); Murcia, Sierra de Algezares, près Murcia, 28 iv 1852, *Bourgeau* (G); Puerto de la Cadena, 14 v 1936, *Wall* (S); Sierra de Espuña, 15 v 1946 ? (S).

Specimens of subsp. *leptoclada* from Mallorca are quite distinctive, but material of *G. cinerea* from the south-east of Spain (Prov. Murcia) is intermediate between the two subspecies.

7. G. valentina (Willd. ex Spreng.) Steudel, Nomencl. Bot., ed. 2, 671 (1841).
Syn.: *Spartium valentinum* Willd. ex Sprengel, Syst. Veg. 3: 176 (1826).
Genista oretana Webb ex Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3: 434 (1877).

Erect shrub with flexuous branches. *Leaves* 2–5 × 0·8–1·5 mm, simple, sessile, elliptical; lower surface appressed sericeous, upper glabrous. *Inflorescence* racemose, flowers borne singly. *Bracts* foliaceous simple, especially at base of inflorescence, becoming reduced above; *bracteoles* c. 1–2 mm, slender. *Calyx* 2·5–5 mm, glabrate to sparsely sericeous; lips subequal to tube, upper teeth as long as the lip, lower teeth less than half length of lip. *Standard* 8–12 mm, broadly ovate sericeous. *Keel and wings* as long as the standard, keel sericeous, wings glabrous. *Legume* 12–15 mm, narrowly oblong, with sericeous hairs, 2–5 seeded.
Type material: Not known.
Distribution: Endemic to East and S.E. Spain; Teruel, Valencia, Castellón, Jaén, Murcia, Granada.
SPAIN: Valencia, Sierra de Chiva, 7–11 vi 1897, *Pau* (G, MA, MANCH); Sierra de Fuente Higuera, 8 vi 1801, *Porta & Rigo* (MA, MANCH); Albacete, Almansa, *Pau* (fide Vicioso); Murcia, Sierra de Espuña, 28 v–2 vii 1928, *Jerónimo* (MA); Almería, Cabo de Gata, *Porta & Rigo* (fide Vivioso); Jaén, Sierra Cazorla, above Casa Forestal de Liganillos, 1 vii 1951, *Heywood* 1142 (LIVU).

8. Genista florida L., Syst. Nat., ed. 10, 1157 (1759).
Syn.: *G. polygaliphylla* Brot., Fl. Lusit. 2: 56 (1804).
G. polygalifolia DC., Prodr. 2: 151 (1825).
G. leptoclada Gay ex Spach in Ann. Sci. Nat., ser. 3, 3: 121 (1845).

Erect shrub with lax flexuous branches. *Leaves* 5–25 × 2–4 mm, simple, shortly petiolate to subsessile, both surfaces with appressed sericeous hairs, upper sometimes sparsely so. *Flowers* borne singly in long racemes. *Bracts* of the lowermost flowers foliaceous, uppermost reduced; *bracteoles* c. 1 mm, borne halfway along the pedicel; *pedicel* 1–2 mm. *Calyx* 4–6 mm, with sericeous hairs; lips longer than the tube, upper teeth as long as the lip, lower teeth 1/3–1/2 the lip. *Standard* 10–12 mm, broadly ovate, subglabrous or with sparsely sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 20 mm, narrowly oblong, pubescent, 3–8 seeded. 2n: 48 (Santos, 1945).
Type material: Specimen no. 892.15 (Savage Catalogue, 1945) in the Linnaean herbarium. (holo. LINN).
Distribution: Spain, Portugal, Morocco.

SPAIN: Huescar, Bielsa, Gèdre, vi–viii, *Bordère* (MANCH, S); Navarra, Villafranca, 9 vi 1928, *Cyrén* (S); Logroño, Monts. Reynosa, 28 vii 1921, *Leresche* (G); Lumbreras, 2 vii 1953, *D. Webb* (MANCH, TCD); Burgos, Viloria de Rioja, 14 vii 1921, *Elias* (Sennen 4333), (G, MA, S); Cilleruelo, *Salcedo* (MA); Santander, Monte Salcedillo, *Espada* (MA); Espinama, 7 ix 1944, *Martin & C. Vicioso* (MA); Palencia, Cevera de Pisuerga, *Font Quer* (MA); *Léon*, Puerto de Pajares, 22 vii 1928, *Lacaita* (G); Budongo, 13 vii 1892, *Lomax* (MANCH); Ponferrada, 8 v 1933, *Rothmaler* (MA); Oviedo, Cangas de Tineo, 30 v–25 vi 1864, *Bourgeau* (G); Puerto de Leitariegos, 10 vi–23 vii 1864, *Bourgeau* (MA); Prope Pajares, 15 vii 1852, *Lomax* (MA); Oseja de Sajambre, 2 vii 1945, *C. Vicioso* (MA); Lugo, Inter Betazos et Lugo, 15 vii 1928, *Lacaita* (MA); Becerra, 2 vii 1953, *D. Webb* (LIVU, TCD); Orense, Pinor, vi 1904, *Bescansa* (MA); Segovia, Somosierra, vii 1856, *Isern* (MA); Soria, Oncala, 15 vii 1935, *Ceballos* (MA); Covaleda, 2 vii 1935, *Ceballos & C. Vicioso* (MA); Teruel, Orihuela, S. de Albarracin, *Asso & Zapater* (MA); S. de Noguera, vi 1898, *Reverchon* 201 (MA, MANCH, S); Cuenca, Serrania de Cuenca, vi 1898, *Gandoger* (MANCH); Toledo, Montes de Toledo, vii, *Reuter* (MA); Madrid, S. de Guadarrama, 19 vii 1854, *Bourgeau* (G); Navacerrada, Escorial, 8 vii 1862, *Leresche* (G, S); Avila, Navarredonda, 7 viii 1852, *Isern* (MA); Hoyo del Espino, 24 vi 1915, *Villar* (MA); Salamanca, La Alberca, 1 vii 1946, *Caballero* (MA); Cáceres, Las Villuercas, Guadalupe, 21 vi 1948, *Caballero* (MA); Badajoz, Ad Badajoz, vi 1876, *Melvill* (MANCH); Granada, Puebla de Don Fadrique, 20 vi 1849, *St. Lager* (G).

MOROCCO: Arround, 22 vi 1936, *Balls* 2886 (K); Taddent, 5 vi 1936, *Balls* 2561 (K); Grand Atlas, Gontafa, 8 vi 1935, *Gattefosse* (K); Grand Atlas, Amizmiz, *Hooker* (K); Djebel Galla-Aziza, 1883, *Ibrahim* (K); Grand Atlas, ad fluv. Reraia, pr. pag. Asmi, 30 v 1926, *Linberg* (K); Ait Messane, 9 vi 1926, *Linberg* (K).

9. G. obtusiramea Gay ex Spach in Ann. Sci. Nat., sér. 3, 3: 116 (1845).

Erect compactly branched shrub, branches with short internodes, c. 5–10 mm and prominent pulvinules, some bearing spinescent stipules. *Leaves* 4–8 mm, sessile, narrowly elliptical, lower surface with sericeous hairs, upper glabrous. Leaves of the older branches obovate with the apex retuse. *Flowers* solitary, one or two borne subterminally on the ultimate at the ends of the branches. *Bracts* foliaceous; *bracteoles* absent; *pedicel* 1–2 mm. *Calyx* c. 5–6 mm with sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 12–14 mm, broadly ovate, with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* 15–20 mm, narrowly oblong, with dense sericeous hairs, 2–5 seeded.

Type material: Spain, fl. Pico de Canellas, 29 vii, fruct. Pico de Arvas, 27 viii 1835, *Durieu* (Pl. Astur. Exsicc. no. 346) (iso. K).

Distribution: Endemic to N.W. Spain: Galicia, Asturias, Santander, Léon, Zamora, Palencia.

SPAIN: Santander, Peña Labra, 26 vii 1894, *Gandoger* (MA); Palencia, Cevera de Pisuerga, *Levier & Leresche* (fide Vicioso); Léon, Puerto de Ponton, 13 vii 1927, *Lacaita* (MA); Oviedo, Pico de Arvas, vii–viii 1878, *Boissier* (G); Puerto de Leitariegos, 22 vi–viii 1864, *Bourgeau* (G, MA); Supra pagum Arvas, 15 vii 1892, *Lomax* (LIVU, MA, MANCH).

Lacaita (1929) commented on the publications by Gay relating to the collections of Durieu. In 1835 Durieu de Maisonneuve explored the then botanically unknown western Asturias; his collections were studied by Jacques Gay and standard sets of exsiccatae were published and distributed in 1836 with labels drawn up by Gay.

In 1836 (Ann Sci. Nat., ser. 2, 5) the beginning of an account by Gay of Durieu's journey was published which was unaccountably never completed. In this account Gay listed plants collected by Durieu, giving the names of new species but without diagnoses, and these are, therefore, *nomina nuda* although quoted by several authorities such as the compilers of Index Kewensis (1893) and Willkomm (1877).

Spach in his revision of the genus cited Gay as the authority for *G. obtusiramea* and *G. leptoclada*, and he also provided the first published diagnoses of these taxa, so that "Gay ex Spach" as given above is the correct citation for the two species of *Genista* recognised by Gay in the Durieu Asturian exsiccata.

10. G. pseudopilosa Cosson, Not. Pl. Crit. 3: 102 (1851).

Syn.: *G. cazorlana* Deb. & Rev. ex Hervier Excurs. Bot., 211 (1904).
G. cinerea sensu Reverchon.

Low, sprawling or decumbent shrub, young branches with appressed or patent sericeous hairs. *Leaves* 4–12 × 1–4 mm, sessile, elliptical to oblanceolate, lower surface with sericeous or patent sericeous hairs, upper glabrous, margins inrolled. *Flowers* borne in more or less lax terminal racemes. *Bracts* of lowermost flowers foliaceous, reduced towards the apex; *bracteoles* 1 mm or less, borne halfway along the pedicel; *pedicel* 1–3 mm. *Calyx* 5–6 mm, with dense sericeous to patent hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 9–12 mm, very broadly ovate with sericeous hairs, apex retuse, base usually truncate. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong, 3–5 with dense patent hairs, 3–5 seeded.

Type material: Regni. Murcia (*sic.* i.e. Jaén) Sierra de Segura, *Bourgeau* Pl. d'Espagne exsicc. no. 984 (syn. BM). Royaume de Jaén: Cuesta Carnicera, 1894, *Blanco* exsicc. no. 276 (syn. BM).

Habit: Hillside slopes, beside sandy tracks, etc.

Distribution: Spain, south-eastern provinces; Morocco, Haut Atlas and Moyen Atlas.

SPAIN: Murcia, Sierra de Tercia, N.E. of Lorca, 3 v 1928, *Ellman & Sandwith* (G, K); Sierra de Carrascoy, 10 v 1851, *Guiro* 1132 (G); Almería, Savinal, Cabo de Gata, 20 iv 1896, *Gandoger* (MA); Albacete, Sierra de Alcaraz, Riopar to Pico de Almentara, 8 vii 1961, *Heywood* (LIVU); Jaén, Sierra de Segura, Pantones–Hornos, 10 viii 1963, *Gibbs* (LIVU); Sierra de Cazorla, Los Rasos, 2 vii 1948, *Heywood & Davis* 542 (BM, LIVU); Sierra de Segura, 10 vii 1891, *Porta & Rigo* 424 (MANCH); Granada, Sierra de Sagra, vi 1907, *Reverchon* (MA); Sierra de Grimona, vii 1907, *Reverchon* (MANCH).

MOROCCO: Djebel Ghat, Soisal, 10 vii 1936, *Balls* 3054 (K); Moyen Atlas, vallée de Senoual, 18 vi 1924, *Jahandiez* 650 (MA); Haut Atlas, Amizmiz, 23 vi 1925, *Maire* (MA); Moyen Atlas, Bekrit, 3 vi 1924, *Jahandiez* 527 (MA).

11. G. teretifolia Willk., Sert. Fl. Hisp., 38 (1851).

Low shrub, young branches with appressed sericeous hairs. *Leaves*

6–9 × 2 mm, simple, sessile, narrowly oblanceolate with sericeous hairs on both surfaces. *Flowers* borne in lax terminal racemes. *Bracts* of lowermost flowers foliaceous, uppermost reduced; *bracteoles* c. 0·5 mm, borne just below the calyx; *pedicel* 1–2 mm. *Calyx* c. 5 mm, with sericeous hairs; lips longer than the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 9 mm, broadly ovate with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong, with sericeous hairs, 3–6 seeded.

Type material: Spain (Navarra): in pascuis siccis pr. urbem Pamplona in consortio G. tinctoriae ad alt. c. 450 mm, vi 1850, *Willkomm*. Herb. Willk. (COI) ? n.v.

Distribution: A rare endemic species known only from a few localities in Navarra, N.W. Spain. (See also Allorge, 1941).

SPAIN: Navarra, Olazagutía, 26 vi 1958, *Laínz* (BM); Don Pedro de Avila, inter Eugui et Olagüe, 18 vi 1880, *Laguna* (fide Allorge, 1941).

12. G. sakellariadis Boiss. & Orph., Diagn. Pl. Orient. ser. 2, 6: 42 (1859).

Low shrub. *Leaves* 7–12 × 2 mm, narrowly elliptical, both surfaces with long appressed sericeous to patent hairs. *Flowers* borne singly in terminal racemes. *Bracts* foliaceous; *bracteoles* subtending the calyx and c. 3 mm or more; *pedicel* c. 5 mm, slender. *Calyx* c. 6 mm, with sericeous hairs; lips longer than the tube, upper teeth equal to the lip, lower teeth less than half the lip. *Standard* c. 10 mm, with sericeous hairs, broadly ovate. *Keel* as long as the standard, sericeous, *wings* somewhat shorter than the standard, glabrous. *Legume* linear oblong, with sericeous hairs, 2–4 seeded.

Type material: Greece: In regione media montis Olympis Thessaliae, alt. 5000 ft, 16–28 vii 1857, *Orphanides* Fl. Graec. exsicc. no. 597. (iso. MANCH).

Distribution: Known only from the type material. Endemic to Mount Olimbos, Thessaly.

13. G. sericea Wulf. in Jacq., Collect. Bot. 2: 167 (1789).

Syn.: *Cytisus sericea* Vis., Fl. Dalm. 3: 269 (1852–3).

Much branched shrub. *Leaves* 5–25 × 2–5 mm, sessile, narrowly elliptical, oblanceolate or obovate; lower surface with appressed sericeous hairs, upper glabrous, margins inrolled, apex with a short mucro. *Flowers* in congested terminal racemes, flowering branches often slender and flexuous. *Bracts* foliaceous; *bracteoles* c. 1 mm or less, borne halfway along the pedicel; *pedicel* 1–3 mm. *Calyx* 4–7 mm, with sericeous or patent hairs; lips longer than the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 10–14 mm, broadly ovate, with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* 10–15 mm, narrowly oblong with dense patent hairs, 3–8 seeded.

Type material: not known.

Distribution: Italy: Trentino—Alto Adige, Veneto, Friuli Venezia Giulia. Jugoslavia: Slovenia, Croatia, Bosnia and Hercegovina, Montenegro, Srbija.

ITALY: Trentino-Alto-Adige, Val d'Arsa, 19 vi 1873, *Brown* (S); Sud de Roveredo, 19 vi 1873, *Leresche* (G); Veneto, Prope San Orso, 22 v 1880, *Porta & Rigo* (MANCH); Friuli Venezia Giulia, Udine, 27 viii 1842, *Rigo* (MANCH); Opcine bei Trieste, 27 vi 1935, *Engelhardt* (S); Scorcola, Trieste, viii 1923, *Meebold* (K).

JUGOSLAVIA: Slovenija, Monte Spaccato, 15 v–vi 1862, *Tomasini* (G, MANCH, S); Croatia, Gravosa, 7 v 1897, *Baenitz* (MANCH); Bei Fiume, v *Noë* (G, MANCH, S); Dubrovnik, 12 v 1930, *Wyatt* (K); Crna Gora, Orli-Suta, 6 vi 1898, *Baldacci* (K); Ad Kistac, 8 vii 1890, *Baldacci* (G); Dikali, 11 vii 1900, *Baldacci* (G); Cetinje, vi 1900, *Sagorski* (S); Srbija, M. Kopaonik, 1856, *Pančić* (S).

BULGARIA: M. Ali-Batusch, 10 vi 1920, *Stojanoff & Stefanof* (K).

Specimens collected in Greece by Zahn (Laconia, in faucibus Taygeti Langanda dictis inter Spartans et Kalmata, 22 vi 1899) were subsequently distributed as a new species, *G. halacsyi*, in Heldreich's Herb. Graec. Normale no. 1526. Although this material shows somewhat distinctive facies—the plants are low to sprawling in habit and the flowers are mostly paired at the ends of the branches—these specimens are clearly allied to *G. sericea*, and unless further collections are made in the area which show the above facies, the Heldreich exsiccatae are probably best referred to this latter species.

14. G. subcapitata Pančić, Fl. Princ. Serb., 224 (1874) *in clavi.*

Low much branched shrub. *Leaves* 5–10 × 2–3 mm, sessile, narrowly elliptical to oblanceolate, lower surface with appressed sericeous hairs, upper glabrous. *Flowers* in terminal clusters. *Bracts* foliaceous; *bracteoles* 2–3 mm subfoliaceous; *pedicel* lacking. *Calyx* c. 5 mm with appressed sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* c. 13 mm, broadly ovate, with appressed sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong, with sericeous hairs, 3–5 seeded.

Type material: Suva Planina prope Niš, vi 1884, *Petrovic* (lecto. G).

Distribution: Jugoslavia. Apparently restricted to the Suva Planina in Srbija.

JUGOSLAVIA: Srbija, Niš, Suva Planina, 1800 m, kalk, vi 1891, *Adamovíc* (G, S); Suva Planina, 1700–1900 m, 1 vii 1894, *Fovanovic* (G).

G. subcapitata is very similar morphologically to *G. sericea*, differing only in two characters: the capitate inflorescence and the leafy bracteoles.

15. G. millii Heldr. ex Boiss., Fl. Or. Suppl., 160 (1888).

Low much branched shrub. *Leaves* 4–6 × 1·5–3 mm, elliptical to obovate, both surfaces with appressed sericeous hairs, the upper sparsely so. *Flowers* borne in pairs at the ends of branches. *Bracts* foliaceous; *bracteoles* minute, borne halfway along the pedicel; *pedicel* 1–3 mm. *Calyx* c. 4 mm, with sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth less than half the lip. *Standard* c. 9 mm, broadly ovate with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* not seen, ovary pubescent.

Type material: Greece (Evvoia): in subalpinis montis Delphi, 1876, *Pichler* Pl. Graec. Exsic. (iso. MANCH).

Distribution: known only from the type material, and perhaps conspecific with **G. sericea.**

16. G. villarsii Clementi in Atti Terza Riun. Sci. Ital., 517 (1841), teste Aschers. & Graebn. Syn. Mitt.-Eur. Fl. 6 (2): 252 (1907).

Syn.: *G. villarsiana* Jordan, Obs. Pl. Crit. 6: 76 (1847).
Cytisus villarsii Vis. Fl. Dalm. 3: 517 (1852).

Low, much branched shrub, usually non-spiny but sometimes forming spinescent hummocks. *Leaves* 2–9 × 1·5–3 mm, narrowly elliptical with long sericeous to patent hairs on both surfaces. *Flowers* borne in congested subterminal racemes. *Bracts* foliaceous; *bracteoles* lacking; *pedicel* 2–5 mm. *Calyx* 4–5·5 mm with dense sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth less than 1/3 the lip. *Standard* 9–11 mm, broadly ovate with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong with dense sericeous hairs, 2–6 seeded.
Type material: not known.
Distribution: S.E. France (Drôme, Hautes Alpes, Basses Alpes, Vaucluse, Aveyron, Aude, Bouches-du-Rhône). Jugoslavia: Croatia.
FRANCE: Drôme: Bas Dauphine, calc., vi–vii 1850, *Borel* (K); Mont St. Angel, près Uyons, 7 vii 1872, *Burle* (S); Hautes Alpes, Près Serres, Mont St. Genis, v 1896, *Brachet* (G); Mont Rongnoso sur Ribiers, 7 vii 1873, *Reverchon* (LIVU, MANCH); Basses Alpes, Sisteron, 1847, *Requien* (G); Vaucluse, Mont Ventoux, 8 vi 1899, *Saulses* (CLF); Bouches-du-Rhône, Mont St. Victoire, *Le Brun* (fide Mathon, 1948); Aveyron, Millau, à la Baraque, 21 vii 1902, *Faures* (CLF, S); Cause de Severac, 19 vi 1900, *Soulier* (G, LIVU, MANCH); Aude, Mont Alaric, entre Capendu et Moux, 4 vi 1887, *Copineau* (LIVU); Mattefagine, 14 vi 1885, *Mirçais* (LIVU).
JUGOSLAVIA: Croatia, Insula Pago, Dalmatia, 1829, *Biasletto* (G, S); "Dalmatia", *Petter* (G).

G. villarsii has a disjunct distribution, occurring in montane areas of S.E. France and also in Jugoslav Croatia. The Jugoslav specimens are indistinguishable from Provençal material.

G. x martinii is a naturally occurring hybrid between *G. villarsii* and *G. scorpius* recorded from S.E. France (cf. Verguin & Soulié 1910).

17. G. albida Willd., Sp. Pl. 3: 942 (1802).
Syn.: *G. armeniaca* Spach in Ann. Sci. Nat., sér. 3, 3: 118 (1845).
G. montbretii Spach, *loc. cit.*, p. 119.

Low compactly branched shrub tending to form matts or hummocks. *Leaves* 3–7 × 1·5–3 mm, sessile, elliptical to obovate, with dense patent or sericeous hairs on both surfaces or the lower surface only. *Flowers* borne singly or paired in short racemes. *Bracts* foliaceous; *bracteoles* reduced or lacking; *pedicel* 1–3 mm. *Calyx* 5–7 mm, with dense patent or sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth half the lip or less. *Standard* 9–12 mm, broadly ovate with dense sericeous to subpatent hairs. *Keel and wings* as long as the standard, keel sericeous wings glabrous. *Legume* narrowly oblong, densely pubescent, 3–8 seeded.
Type material: not known.
Distribution: U.S.S.R.: Crimean Peninsula. Turkey: Antalya, Adana, Kayseri, Maraş, Tunceli, Elâziğ, Amasya.

Two varieties are recognised:

1. var. **albida**

Indumentum of patent hairs.
U.S.S.R.: Crimean Peninsula, Bei Sudak, 13 v 1896, *Callier* 58 (E, MANCH, S); Distr. Yalta, above Nikita, 2 vi 1959, *Davis* 33348 (E, K); Distr. Alushta, Alushta-Nikita, 4 vi 1959, *Davis* 33348 (E); Prope Sympheropol, *Steven* (E).

TURKEY: Antalya, 'Lycia', *Forbes* (K); Adana, Distr. Saimbeyli, Bozoglan Dagh above Obruk, 7 vii 1952, *Davis* 19771 *Dodds & Cetik* (E); Maraş, Distr. Göksun, Binboga Dagh, on Isik Dagh, 14 vii 1952, *Davis* 19980 *Dodds & Cetik* (E); Kayseri, Bakir Dagh, near Akeluk Y., above Kisge, 29 vi 1952, *Davis* 19528, *Dodds & Cetik* (E); Tunceli, above Pertek, 13 vii 1957, *Davis* 31055 *& Hedge* (E); Pertek-Tunceli, 27 mls from Elaziğ, 6 vi 1957, *Davis* 29133 *& Hedge* (E).

2. var. **godetii** (Spach) Boiss. Fl. Or. 2: 42 (1872).

Syn.: *G. godetii* Spach in Ann. Sci. Nat. sér. 3, 3: 118 (1845).

Indumentum of appressed sericeous hairs.

Type material: Tauria saxosis, v 1828, *Godet* (iso. G).

U.S.S.R.: Crimean Peninsula, Prope pagum Debetkui, 6 v 1900, *Callier* 842 (E, MANCH, S); Bei Karasubazar, 15 vi 1896, *Callier* (E, MANCH); Tauria, *Steven* (K).

TURKEY: Amaysa, Amasya, 12 vi 1889, *Bornmüller* (MANCH); Antalya, Elmali, 19 iv 1936, *Tengwall* (K); Mara, Mara, 30 iv 1934, *Balls* 909 (E, K); Ahir Dagh, above Maraş, 2 v 1957, *Davis* 27484 *& Hedge* (E); Sardagi, near Elbistan, 7 v 1957, *Davis* 27648 *& Hedge* (E); Kayseri, Pinarbaşi, 25 v 1960, *Stainton & Henderson* 5143 (E); Tunceli, Pertek-Tunceli, 6 vi 1957, *Davis* 29160 *& Hedge* (E); Kharput, Kisil Tepe, v 1899, *Sintenis* 229 (E); Erzincan, Sipikeni Pass, Erzincan-Koze, 26 vi 1934, *Balls* 9096b (E).

Spach recognised three species, *G. godetii*, *G. armeniaca* and *G. montbretii*, which have been referred to *G. albida* in the present revision. The Herbarium at the Royal Botanic Garden, Edinburgh, has a fairly comprehensive collection of specimens of the *G. albida* complex from Turkey and the Crimean Peninsula and detailed studies have been made on this material with the following conclusions:

1. Two main types of indumentum are found, patent or appressed sericeous hairs. The indumentum condition is most easily seen on the leaves, but plants with appressed sericeous leaves tend to have a similar calyx indumentum, and the same applies for the patent haired condition.

It is difficult to decide to which type some specimens should be assigned, and there is at least 1 mixed collection: the sheet *Davis* 27648 *& Hedge*, 7 v 1957, from Sardagi near Elbistan (Turkey, vil. Maraş) has five plant fragments, three of which (A, D & E—labelled by the author) have appressed sericeous hairs, the remaining two (B & C) having patent hairs. There is no difference in the floral parts of these specimens.

2. Whilst some specimens have leaves with appressed or patent hairs on both surfaces, others have the upper surface glabrous or subglabrous. Again, there is only a marked distinction between the extremes of this condition, and sparsely pubescent intermediate forms occur.

3. There is no correlation between any of the above character variations and geographical distribution: patent and appressed haired forms, specimens with glabrous or pubescent upper surfaces of the leaves all occur in the Crimean Peninsula and in various localities in Turkey.

Because of the lack of marked character correlations, and particularly in view of the number of intermediate specimens, all the taxa recognised by Spach have been referred to a single rather polymorphic species *G. albida*. Since, however, the nature of the indumentum is quite striking, Boissier's treatment has been adopted, and *G. godetii* has been retained as a variety.

18. G. involucrata Spach in Ann. Sci. Nat., sér. 3, 3: 120 (1845).

Low compactly branched shrub, very similar to *G. albida* var. *albida*. Inflorescence a capitate head of 2–8 flowers.

Type material: In Cappadocica, *Aucher & Coquebert de Montbret* (iso. TCD ?).

Distribution: Turkey, vil. Konya, Merşin.

TURKEY: Konya, Phrygia, S.E. of Ouchak, 19 vi 1857, *Balansa* 1214 (TCD); Tauros mountains, near Ereğli, *Brown* (K); Kagiraki, v 1895, *Siehe* (E); Nach Cicilien, 1895, *Siehe* 121 (K); Merşin, Cicilien Tauros, Bügük Egri Dag, 7 vi 1934, *Balls* (E, K).

The Aucher-Eloy specimen noted above (TCD) is numbered 1089, and this is the number cited by Boissier (1872) for *G. albida* var. *montbretii* (Spach). As in several other instances (see under *G. januensis*) the numbering of the Aucher-Eloy exsiccatae is unreliable (at least in the TCD set) and it is necessary in critical cases to attempt to see the actual set of specimens worked on by the author.

G. involucrata is very similar morphologically to *G. albida* var. *albida* as noted above, and can only be distinguished by the capitate inflorescence. Several specimens of *G. albida* have been seen with congested terminal clusters of flowers which approach the *G. involucrata* condition.

19. G. pilosa L., Sp. Pl., 710 (1753).

Low prostrate to erect shrub. *Leaves* 5–12 × 3–4 mm, simple, shortly petiolate or subsessile, oblanceolate; lower surface with appressed sericeous hairs, upper subglabrous. *Flowers* in lax racemes on ascending branches. *Bracts* foliaceous, fasciculate; *bracteoles* lacking; *pedicel* 1–2 mm. *Calyx* 4–5 mm, with sericeous hairs, lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/3 of the lip. *Standard* c. 8 mm, broadly ovate with sericeous hairs. *Keel and wings* subequal to the standard, keel with sericeous hairs, wings glabrous. *Legume* 15–20 mm, narrowly oblong, with dense sericeous hairs, 3–8 seeded. 2n: 24 (Tschechow, 1931).

Type material: Specimen in the Clifford Herbarium (holo. BM).

Distribution: Widely distributed in western and central Europe extending to S. Sweden, C. Italy and Macedonia.

Section 3. *Erinacoides* Spach in Ann. Sci. Nat., sér, 3, 3: 109 (1845).

Shrubs with spiny branches and alternate branching; leaves usually simple (one species with trifoliolate leaves) with prominent pulvinules. Standard broadly ovate, usually with sericeous hairs, as long as the wings and keel. Legume narrowly oblong, with sericeous hairs, 2–8 seeded.

Type species: *G. lobelii*.

Distribution: Predominantly west Mediterranean, with one species in Greece.

Sect. *Erinacoides* consists of a very homogeneous group of eight species. The choice of type species for this section must be made from one of the three species listed by Spach, namely, *G. aspalathoides*, *G. lobelii* and *G. baetica*.

G. aspalathoides is rather untypical of the section as a whole since it is the only species with trifoliolate leaves; consequently, although it is the first species given by Spach in sect. *Erinacoides*, *G. aspalathoides* has been rejected as type species.

G. lobelii has been selected as the type species, and this choice is supported by the supposition that Spach was probably influenced in his choice of name

for the section by the specific epithet of *Spartium erinaceoides* Lois., a synonym of *G. lobelii* DC.

It should be noted that Spach's taxonomic treatment of *G. lobelii* was to some extent unsatisfactory since he failed to distinguish *G. salzmannii* with paired or fascicled flowers as specifically distinct from *G. lobelii* with solitary flowers.

There has been considerable confusion by previous workers with regard to most of the species of this section; this applies particularly to the taxa *G. lobelii*, *G. pumila*, *G. salzmannii*, *G. baetica* and *G. aspalathoides*, which have all been referred to the single species "*G. aspalathoides* Poiret" or *G. lobelii* DC.

This confusion has probably been due in part to De Candolle's erroneous citation of *G. lobelii* from Corsica as well as Provence in the original description, and even in the later Prodromus (1825) where *G. salzmannii* is also listed. In addition the authors of several Floras, e.g. Grenier & Godron (1850), Ascherson & Graebner (1907) and Nyman (1878), have reduced *G. lobelii* (and *G. salzmannii*) to a synonym of *G. aspalathoides* Lam., or Poiret. Briquet (1913) distinguished between these latter two species, but failed to separate *lobelii* and *salzmannii*.

Vierhapper (1919) clearly distinguished between *G. salzmannii*, *G. lobelii* and *G. pumila*, and also delimited several other taxa in the group. Heywood (1957) has drawn attention to this neglected paper, and also to the anomalous treatment of *G. lobelii* in the revision of the Spanish *Genisteae* by Vicioso (1953) (see under *G. lobelii*, below).

In the course of the present revision most of the available exsiccatae for sect. *Erinacoides* have been examined. In general, the proposed treatment agrees with that of Vierhapper (i.e. of those species of the section considered by Vierhapper, although several new taxa which he proposed have been rejected (see under *G. pumila*, below). Examination of the species *G. hystrix* and *G. polyanthos* not treated by Vierhapper has revealed several problems which are discussed under those species.

20. G. lobelii DC. in Lam. & DC., Fl. Fr., ed. 3, 4: 499 (1805) *excl. loc. Cors.*

Syn.: *Spartium erinacoides* Lois., Fl. gall. 2: 401 (1807).
Genista erinacoides (Lois.) Vierhap. in Verh. Zool. Bot. Gesell. Wien 69: 176 (1919).
G. longipes Pau in Bol. Soc. Arag. Cien. Nat. 3: 282 (1904).
G. baetica var. *tejedensis* Porta & Rigo, *in schedis*, exsicc. no. 546 (1879).
G. aspalathoides sensu auct. non Lam.

Low, much branched spiny shrub 15–40 cm, with prominent leaf pulvinules. *Leaves* c. 3·5 × 1·2 mm, simple, sessile, elliptical, oblanceolate or obovate; lower surface with appressed sericeous hairs, upper glabrous, involute, fugacious. *Flowers* borne singly, rarely paired. *Bracts* fasciculate, foliaceous; *bracteoles* 1 mm or less, borne halfway along the pedicel; *pedicels* usually long, slender (2–)4–9(–11– mm. *Calyx* c. 4–6 mm, with short, sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 8–10 mm, broadly ovate, with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* 10–15 mm, with sericeous hairs, narrowly oblong or lanceolate ovate, 1–5 seeded.

Type material: Apparently the fragment of *G. lobelii* in the De Candollean herbarium (Mont Ventoux, *Requien*) is dated 1810 and is, therefore, ineligible for consideration as a type specimen; other available sources for typification clearly indicate that *G. lobelii* is of Provençal origin (fide Heywood, 1957, pp. 516–518).

Habitat: 1800–2000 m on calcareous substrates.

Distribution: S.E. France, S.E. Spain. (Map 3).

FRANCE: Bouches-du-Rhône, Col du Bartaque, 10 vi 1914, *Adamson* (MANCH); Sommet de Mont Piget, near Toulon, *Billot* (BM, MANCH); Mont Faron, 9 vi 1848, *Bourgeau* (LIVU, TCD); Mont St. Victoire, 23 v 1904, *Delmas* (CLF, FI, MANCH); Ste. Baume, 18 v 1868, *Shuttleworth* (K). SPAIN: Alicante, Sierra de Alicante, *Borja* (K, MA); Sierra de Aitana, 30 vi 1904, *Pau* (FI, MA); Sierra de Espuña, 23 vi 1947, *Vicioso* (MA); Almería, Cerro la Alfhara, near María, 11 viii 1963, *Gibbs* (LIVU); Jaén, Sierra de Maimon, vi 1890, *Reverchon* (BM, CLF); Sierra de Mágina, 6 vii 1925, *Cuatrecasas* (K); Sierra de Alcaraz, vii 1848, *Funk* (K); Sierra de Cazorla, vi 1948, *Heywood* (BM, LIVU); Sierra de Segura, El Calarejo Grande, 1 vii 1955, *Heywood* 3127 (LIVU); Sierra de Cabrilla, vi 1905, *Reverchon* (BM, MA, MANCH, S, W); Granada, Sierra de Sagra, 6 vi 1851, *Bourgeau* (FI, LIVU, MANCH); Málaga, Sierra de Tejeda, 23 vi 1879, *Huter, Porta & Rigo* (E, FI, K, MANCH).

Vicioso (1953, pp. 42 & 84) confused *G. pumila* for *G. lobelii* and hence all the exsiccatae cited by him under *G. lobelii* should be referred to *G. pumila*.

Because of this confusion of identities, Vicioso regarded the Spanish populations of *G. lobelii* as a distinct species, *G. tejedensis* (Porta & Rigo ex Herv.) Vicioso; influenced mainly by the legume length, Vicioso placed *G. tejedensis* in a new section—*Cytisospartium*—together with the species *G. haenseleri* Boiss.

The legumes of some specimens of *G. lobelii* are not unambiguously of the narrowly oblong shape which is normally found in sect. *Erinacoides* and subg. *Genista*. However, Vicioso has apparently been influenced by this one character aspect to the extent of creating a completely heterogenous grouping: *G. lobelii* has a broadly ovate standard, as long as the wings and keel, together with in many cases an oblong, several seeded legume (fig. 4.1). In addition, the alternate, spiny branching and sericeous haired standard[1] refer this species to sect. *Erinacoides* of subg. *Genista*. On the other hand, *G. haenseleri* must be placed in subg. *Spartocarpus* (see discussion the latter species).

Heywood (1957) recognised the Spanish populations of *G. lobelii* as a distinct subspecies, *longipes* (Pau), with the legume 1–2 seeded, 9–10 mm long, ovate oblong in shape, and with the pulvinules bidentate, as opposed to the legume 3–4 seeded, 13–15 mm, lanceolate oblong and the pulvinules not bidentate in subsp. *lobelii*.

The paucity of specimens with mature legumes in the exsiccatae available makes an evaluation of these taxa difficult; the pulvinule character is unreliable, but certainly some specimens of *G. lobelii* from Spain have a short legume with only 1 seed (e.g. specimens collected from the Sierra de Aitana by Pau). However, at least one specimen with a short 1–seeded legume has

[1] By some error the illustration of *G. tejedensis* in Vicioso 1953, lám. vi, p. 43 depicts a subglabrous standard petal.

been seen from France (Aix, Vallon de Chicalon, *Bruyas*); also specimens of *G. lobelii* collected by the author from the Sierra de María (Prov. Almería) in S.E. Spain have narrowly oblong legumes, c. 15 mm, with 2–5 seeds.

Because of this apparent breakdown in the geographical correlation of the key characters it is proposed not to recognise infraspecific taxa within *G. lobelii*.

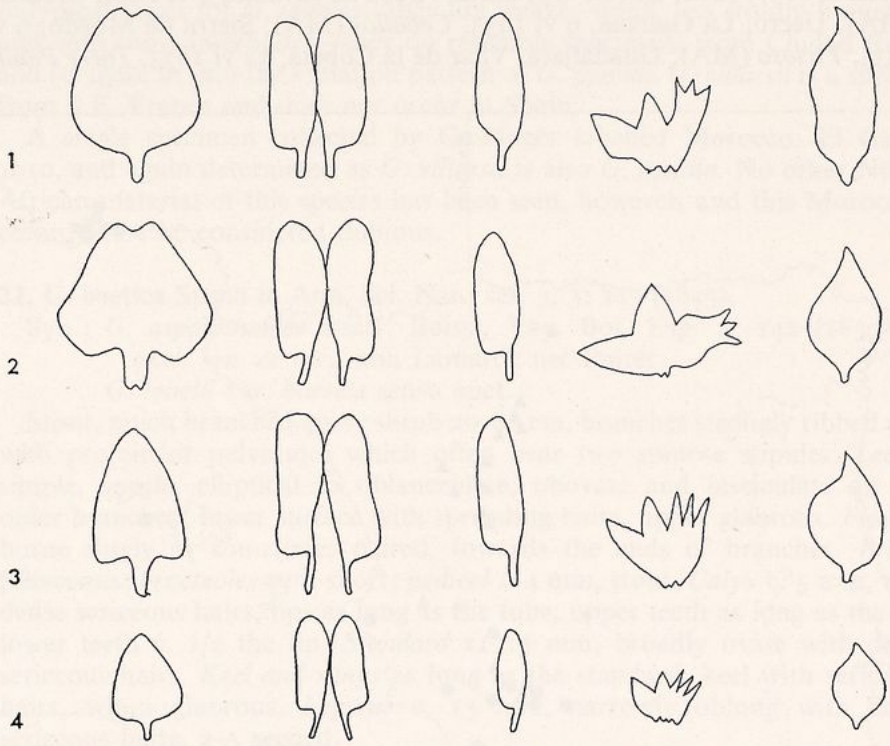


FIG. 4. Corolla and legume morphology of 1, *G. lobelii;* 2, *G. haenseleri;* 3, *G. lucida;* 4, *G. micrantha.*

21. G. pumila (Deb. & Rev.) Vierhapper in Verh. Zool.-Bot. Gesell. Wien 69: 181 (1919).

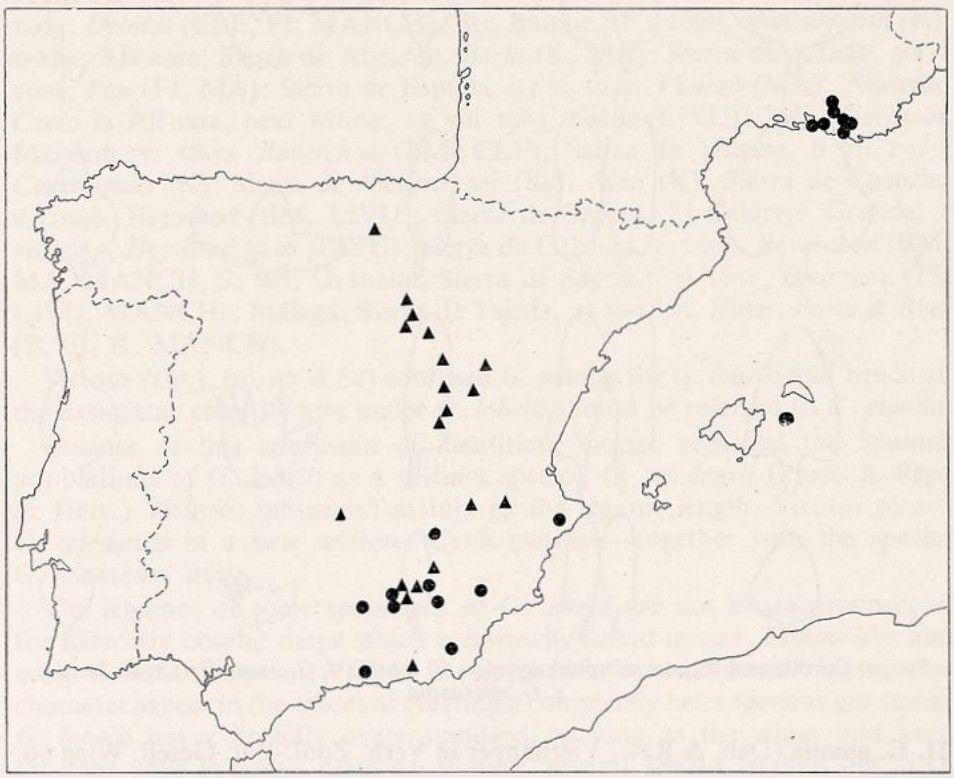
Syn.: *G. baetica* var. *pumila* Deb. & Rev. in Hervier, Bull. Acad. Int. Bot. 15: 65 (1905).
G. lobelii var. *pumila* (Deb. & Rev.) Deg. & Herv. in Hervier *ibid* 17: 34 (1907).
G. mugronensis Vierhap. *loc. cit.*, p. 180.
G. rigidissima Vierhap. *loc. cit.*, p. 182.

Low, compactly branched spiny shrub with stout branches and prominent pulvinules. *Leaves* 2–5 × 1–2 mm, simple, sessile, elliptical or obovate, lower surface with appressed sericeous hairs, upper glabrous. *Flowers* borne singly, rarely paired. *Bracts* foliaceous; *bracteoles* 1 mm or less, borne halfway along the pedicel; *pedicel* (1–)3–4(–6) mm, rather stout. *Calyx* c. 5 mm, with coarse short hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 8–10 mm, broadly ovate, with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 12–15 mm, narrowly oblong, with dense sericeous hairs, 3–5 seeded.

Type material: Spain, Sierra de Cazorla, v 1901, *Reverchon* 163 (sub. *G. baetica* forma *pumila*) (holo. W, iso. MANCH).

Distribution: Spain, south, south-east and east-central sierras: Albacete, Almería, Burgos, Guadaljara, Cuenca, Ciudad Real, Jaén, Soria, Valencia. (Map 3).

SPAIN: Burgos, Sierra de Obarenes, Pico de la Union, 2 vii 1913, *Elias* (Sennen 1637) (BM, LIVU, W); Soria, Arcos de Javalón, 4 vi 1934, *Ceballos* (MA); Ucero, La Galiana, 9 vi 1933, *Ceballos* (MA); Sierra de Moedo, 9 vi 1935, *Vicioso* (MA); Guadaljara, Vilar de la Cobeta, 12 vi 1873, *Torre Pando*



Map 3. Distribution of *G. lobelii* ● and *G. pumila* ▲

(FI); Teruel, Monreal del Campo, vii 1894, *Benedicto* (MA); Orihuela de Tremedal, *Pau* (MA); Valencia, Monte Palomera, 20 vi 1906, *Pau* (MA); Mont Puig-Campana, 7 v 1891, *Porta & Rigo* (BM, K, MANCH); Cuenca, Solán de Cabras, 13 vi 1932, *Caballero* (MA); Pinar de Betita, 8 vii 1932, *Caballero* (K, MA); Serranía de Cuenca, vii 1898, *Gandoger* (K, MA); Ciudad Real, Ciudad Real, Rio Florar, 4 v 1933, *Albo* (MA); Almazon, 7 v 1927, *Lacaita* 70.72 (BM); Albacete, Alredores de Sta. Elena de Ruidesa, 10 vii 1934, *Albo* (MA); Monte Mugrón, vi 1890, *Porta & Rigo* (K, MANCH); Jaén, Soerra de Cazorla, v 1901, *Reverchon* (MANCH); Almería, Sierra de Castella, 10 vi 1890, *Porta & Rigo* (MANCH).

G. pumila as recognised above includes two species described by Vierhapper, *G. mugronensis* and *G. rigidissima*. Each of these was based on only one herbarium specimen, and distinguished from *G. pumila* on rather general facies.

Isotype material of these taxa has been examined, and also a wider range of exsiccatae of *G. pumila* than Vierhapper had available, and it is considered that *mugronensis* and *rigidissima* fit quite satisfactorily within the range of variation shown by *G. pumila*.

Also included in *G. pumila* are specimens collected by Elias from the Sierra de Obarenes (Burgos/Logroño) which were determined as *G. villarsii* and accepted as such by Vierhapper. Although these specimens have rather untypical facies for *G. pumila*—they are weakly spiny, less stoutly branched and with short internodes—they do resemble specimens from Ciudad Real, and so again fit into the variation pattern of *G. pumila*. *G. villarsii* is a species from S.E. France and does not occur in Spain.

A single specimen collected by Gandoger labelled Morocco, El Garb, 1910, and again determined as *G. villarsii* is also *G. pumila*. No other North African material of this species has been seen, however, and this Moroccan record must be considered dubious.

22. G. baetica Spach in Ann. Sci. Nat., ser. 3, 3: 113 (1845).

Syn.: *G. aspalathoides* auctt: Boiss., Voy. Bot. Esp. 2: 141 (1839–45) *excl. syn. et var.*, non Lamarck nec Poiret.
G. lobelii var. *baetica* sensu auct.

Stout, much branched spiny shrub 20–80 cm, branches strongly ribbed and with prominent pulvinules which often bear two spinose stipules. *Leaves* simple, sessile, elliptical to oblanceolate, obovate and fasciculate on the older branches; lower surface with spreading hairs, upper glabrous. *Flowers* borne singly or sometimes paired, towards the ends of branches. *Bracts* foliaceous; *bracteoles* very short; *pedicel* 1–4 mm, stout. *Calyx* c. 5 mm, with dense sericeous hairs, lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 11–13 mm, broadly ovate with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, narrowly oblong with dense sericeous hairs, 2–5 seeded.

Type material: Sierra Nevada, 5500–8000′, *Boissier* (iso. F, K, MA, W).

Habitat: *G. baetica* is one of the co-dominant species of the Association *Genisteto-Juniperetum nanae* (*G. baetica*, *Juniperus nana*). Quézel (1953) in a detailed study of the vegetation of the Sierra Nevada localises this Association at c. 1900–2700 m.s.m. on outcrops of siliceous schists.

Distribution: endemic to the Sierra Nevada range.

SPAIN: Granada, Sierra Nevada, Trevenque, 26 v 1851, *Ball* (E); Sierra Nevada, Peñon de San Francisco, vii 1879, *Huter, Porta & Rigo* (K, MANCH); Almería, Cerro de Almirez, Sierra de Jinana, 20 vi 1929, *Gros* (MA); Sierra de Abracena, 30 vi 1929, *Pau* (FI).

23. G. Salzmannii DC., Prodromus 2: 147 (1825).

Syn.: *G. lobelii* DC., in Lam. & DC., Fl. Fr. 4: 449 (1805) solo loc. Corsica.

Lax or compactly branched spiny shrub. *Leaves* 3–8 × 1–3 mm, simple, sessile, narrowly elliptical, oblanceolate or obovate; lower surface appressed sericeous, upper glabrous or sparsely sericeous. *Flowers* paired or in fascicles of 3–4 in racemes. *Bracts* foliaceous; *bracteoles* 1 mm, or less, borne half-way along the pedicel; *pedicel* 1–4 mm. *Calyx* 5–6 mm, sericeous; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 lip.

Standard c. 10 mm, broadly ovate, with sparse sericeous hairs or subglabrous. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong with sericeous hairs, 3–8 seeded.
Type material: Au-dessus de la Villa, Corse, 1822, *Philippe Thomas* Her. DC. (G) fide Heywood (1957).
Distribution: Italy—Liguria, Elba, Sardinia. Corsica.
FRANCE: Corsica, Evisa, vi 1921, *Alleizette* (CLF); Sestri, 1849, *Agardh* (TCD); Portoveccio, 18 v 1857, *Cadeceau* (MANCH); Portovesme, 6 v 1894, *Martelli* (FI, MPU); Sartène, Serra di Scopamene, 1 vi 1879, *Reverchon* (K); Evisa, 24 v–17 vii 1855, *Reverchon* (BM, CLF, FI, MANCH, S, W).
ITALY: Emilia-Romagna, Alvealo ?, 1 viii 1919, *Minio* (FI); Liguria, Chiavari, supra La Croce, vi 1868, *Delpino* (FI); Passo del Bracco, 26 v 1961, *Heywood* (LIVU); La Spezia-Rappallo, 22 vi 1951, *Wall* (S); Elba, Monte Vottearago, 29 iv 1863, *Beccari* (FI); Capanne, 3 v 1936, *Pichi-Sermolli* (FI); Sardinia, Vitte di Limpara, 4 vi 1891, ? (FI); M. Ala, *Martelli* (FI); Aritzo, 1935, *Porru* (F); Monte Limbardo, 26 vi 1882, *Reverchon* 251 (F, K, MANCH).

24. G. parnassica Halácsy in Magyar Bot. Lapok. 11: 136 (1912).

Low, much branched shrub with spiny branches. *Leaves* 2–4 × 1–2 mm, simple, sessile, narrowly oblanceolate or obovate, with short appressed cinerous sericeous hairs on both surfaces. *Flowers* borne in pairs or fascicled in axillary clusters. *Bracts* foliaceous; *bracteoles* minute, borne halfway along the pedicel; *pedicel* 3–5 mm. *Calyx* c. 4 mm, with short sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* c. 9 mm, broadly ovate, with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* narrowly oblong, with sericeous hairs, 3–5 seeded.
Type material: Phokis, Delphi-Liwadhi, über kalkboden, *Halácsy* (iso. BM).
Distribution: Parnassos-Levadhia area of prov. Sterea Hellas, Greece.

Depauperate specimens from Samothraki (*Rechinger* 9899) may also belong to this taxon. G. parnassica is possibly not specifically distinct from *G. salzmannii*.

25. G. hystrix Lange, Descr. Icon. Ill. 1: 2, tab. 2 (1864).

Erect spiny shrub, younger branches long and flexuous, older branches rigid; pulvinules sometimes with two spinose stipules. *Leaves* 3–5 × 1–3 mm, simple, sessile, elliptical to oblanceolate, sometimes fasciculate; lower surface usually with appressed hairs, upper subglabrous. *Flowers* borne in pairs or fascicled. *Bracts* foliaceous; *bracteoles* c. 1 mm or less, borne halfway along the pedicel; *pedicel* 2–5 mm. *Calyx* 2·5–7 mm, with sericeous hairs; lips variable in length, upper teeth as long as the lip. *Standard* c. 10 mm, broadly ovate, glabrous or with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, narrowly oblong with sericeous hairs, 3–8 seeded.
Type material: Spain, Léon: Sierra de Manzanal, inter pagos La Torre et Prado del Rey, 10–16 vi 1852, *Lange* (holo. C, iso. MANCH).
Distribution: North-west provinces of Spain: Léon, Lugo, Orense, Oviedo, Zamora, Salamanca. North Portugal: Tras-os-Montes, Douro.

Two subspecies are recognised:

1. subsp. **hystrix**

An erect plant up to c. 1 m, with lax branching and pulvinules without

(sometimes with reduced) spinose stipules. *Calyx* 2·5–5 mm, lips 1/2 the tube, lower teeth short, c, 1/3 the lip, with short patent hairs. *Standard* glabrous, or with a median ridge of sericeous hairs, or uniformly sparsely pubescent. Grazed specimens have a compactly branched, 'spiky' appearance.
Distribution: as above excluding Oviedo province.
SPAIN: Léon, Prado del Rey, Sierra de Manzanal, 12 vii 1935, *Font Quer & Rothmaler* (K, MA, S); Astorza, 16 vii 1928, *Lacaita* 32169 (BM); Rio del Marqués, 27 v 1873, *Torre Pando* (FI); Puerto de Manzanal, 2 vii 1953, *Webb* (LIVU, TCD); Lugo, La Guardia, v 1899, *Merino* (K, MANCH); Orense, Puente de Domingo Flores, 14 vi 1958, *Bellot & Casaseca* (LIVU); Zamora, Sierra Secundera, 19 vii 1928, *Lacaita* 32168 (BM); Salamanca, Mozarbez, 31 v–12 vii 1956, *Lainz* (K); Robleda, 1 vi 1957, *Lainz* (K).
PORTUGAL: Tras-os-Montes, Serra de Estrella, 1879, *Lange* (C); Ad Douro, Pinhao, 10 vi 1889, *Murray* (BM); Douro, Alto Douro, Regna, 13 vi 1939, *Rothmaler & Silva* (S).

2. subsp. **legionensis** (Pau) P. Gibbs **comb. et stat. nov.**
Syn.: *Genista aspalathoides* var. *legionensis* Pau in Cavanillesia 1: 61 (1928).
G. legionensis (Pau) Laínz in Bol. Inst. Est. Asturianos, suppl. C, 10: 194 (1964).

Low, compactly branched plant up to 30 cm, most pulvinules with spinose stipules. *Calyx* 3·5–7 mm, lips usually longer than the tube, lower teeth half as long to subequal to the lip, with long appressed sericeous hairs. *Standard* with a median ridge of sericeous hairs.
Type material: Spain (Oviedo): Rondiella en Los Picos de Europa, 19 vii 1927, *Lacaita* (holo. MA).
Distribution: Restricted to Oviedo province and mainly occurring in the Picos de Europa range.
SPAIN: Oviedo, Picos de Alïva, Puerto de Aliva, 14 vii 1879, *Boissier, Leresche & Levier* (FI); Super Los Lagos, Covodonga, vi 1935, *Gourlay & Gilbert Carter* (CAM); Picos de Europa, Puerto de Cebollera, 25 vii 1928, *Lacaita* (BM); Picos de Europa, 1958, *Dresser* (E).

Lange recognised two *formae* of *G. hystrix* in the original diagnosis of this species, and through the courtesy of the Director of the Botanical Museum and Herbarium, Copenhagen, I have been able to examine the type material of these.

Specimens labelled "forma *glabra*" correspond to both the extreme phenotypes described for subsp. *hystrix* above. There is also a fragment labelled "forma *vestita*" which is obviously the specimen used for the drawing of forma *villosa* in Lange's *Icones* tab. 2. This latter forma was differentiated from *glabra* by having leaves pubescent on both surfaces, calyx hirsute, and the standard retuse, with a median dorsal sericeous ridge of hairs, as opposed to leaves glabrous above, calyx with sericeous hairs, and the standard entire and glabrous. Vicioso accepted these formae, raising them to varietal level.

These taxa are unsatisfactory, however, since on the material that has been seen, the characters are not at all correlated as indicated by Lange: no sharp distinction can be drawn between leaves with subglabrous to pubescent upper surfaces and young leaves particularly tend to have pubescent upper surfaces on all specimens. Similarly, there is a more or less continuous gradation of standard pubescence from glabrous to uniformly sericeous hairs. Consequently, the formae of Lange must be rejected.

Populations occur in the Cantabrian Cordillera, particularly at the Picos de Europa, which were referred to *G. hystrix* var. *villosa* by Laínz (1961) and which have been recently raised to species status (*G. legionensis* (Pau) Laínz) by the same author (Laínz, 1964).

The specimens from this area are fairly distinctive (cf. the characters noted in the diagnoses above), but there is, nevertheless, some morphological overlap with other material of *G. hystrix*. Consequently it is proposed to treat these northerly populations as a subspecies of *G. hystrix*; Pau (1928) recognised these plants from the Picos de Europa as a distinct variety, but of "*Genista aspalathoides* Poiret". The correct combination is therefore given above.

26. G. polyanthos B. de Roem. ex Willk., *Enum.*, 20 (1852).

Erect spiny shrubs up to 2 m, pulvinules usually with spinose stipules. *Leaves* c. 3–5 × 1–2·5 mm, simple, sessile, oblanceolate or obovate; lower surface with sericeous hairs, upper subglabrous. *Flowers* borne singly, paired or fascicled. *Bracts* foliaceous, obovate; *bracteoles* 1 mm or less, borne halfway along the pedicel; *pedicel* 2–5 mm. *Calyx* 2·5–5 mm, with sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth very short. *Standard* c. 10 mm, with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, narrowly oblong with dense sericeous hairs, 3–8 seeded.

Type material: Portugal, "montium algarbiensum inter Silves et Monachique" 12 ii 1846, *B. de Roemer* 185 (Herb. ?) n.v.

Distribution: Spain, south and south-western provinces. South Portugal.

SPAIN: Jaén, Despeñaperros, *Ceballos* (fide Vicioso); Andújar, 17 iv 1952, ***Ceballos & Rodriguez*** (MA); Córdoba, Lagunas de Ruidera, 14 vii 1883, *Nilsson* (LD); Cerros de Toril y Plaza de Armas, 14 v 1920, *Pau* (MA); Sevilla, Guadalcanal, *Vicioso* (fide Vicioso); Amadén de la Plata, *Bolós* (fide Vicioso); Villanueva de las Minas, *Bolós* (fide Vicioso); Huelva, Belmonte y Montes de Andévalo, *Bolós* (fide Vicioso); Cumbres mayores, La Nava, 30 iii 1953, *Rivas Goday* (K).

PORTUGAL: Baixo Alentejo, Torrão, 13 iv 1949, *Fernandes & Sousa* 3109 (K); Mertola, iv 1888, *Moller* (BM, W).

Most of the characters listed by Lange to differentiate *G. polyanthos* and *G. hystrix* namely, 'thick' branches, sericeous hairs on the standard, fasciculate leaves and short calyx in fact are common to both species. Although the two taxa tend to be distinguishable when a number of specimens of each are compared, they are sufficiently closely related for individual specimens to be virtually identical in morphological facies.

G. polyanthos is described as a tall plant, 0·5–2 m, as opposed to *G. hystrix* rarely exceeding 50 cm, but this character cannot be ascertained from herbarium material and it is not known whether height is a useful character to distinguish these taxa.

It is proposed to treat *G. hystrix* and *G. polyanthos* as distinct species rather than subspecies despite this overlap in morphological characters since they are geographically isolated: *G. hystrix* is confined to the north-west of the Iberian peninsula, and *G. polyanthos* to the south and south-west. In addition, the flowering period of *G. polyanthos* is March-April-(early May), whilst that of *G. hystrix* is (late May)-June-July.

27. G. aspalathoides Lamarck, Encycl. Méth. Bot. Suppl., 2: 620 (1788).
Syn.: *G. aspalathoides* Poiret, Voy. Barb. 2: 209 (1789).
Spartium aspalathoides Desf., Fl. Atl. 2: 36 (1800).
Spartium gymnopterum Viv., Append. Fl. Cors., 6 (1825).

Erect spiny shrub. *Leaves* 3–12 × 1–3 mm, usually trifoliolate, some simple; leaflets narrowly oblanceolate with short appressed hairs on both surfaces, inrolled, somewhat fugacious. *Flowers* borne in pairs or fascicles, in lax racemes on the young branches. *Bracts* foliaceous; *bracteoles* c. 2 mm, usually 2–3, final pair borne just below the calyx; *pedicel* 2–4 mm. *Calyx* 5–6 mm, with sericeous hairs; lips longer than the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 10–12 mm, broadly ovate, with sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 12–15 mm, narrowly oblong, with dense sericeous hairs, 2–5 seeded.
Type material: Tunisia—"Barberie, vers Tunis" *Poiret* (Herb. ?) n.v.
Distribution: Sicily, Pantellaria, Algeria (La Calle), Tunisia.
ITALY: Sicily, Mazzara, *Todaro* 329 (BM, F. K. MANCH); Pantelleria, ii 1855, *Pavillon* (F, W).
ALGERIA: La Calle, *Durieu* (F); Cap Rosa, in *Quercetum suberis* ad lacum salsum (melah), 28 vi 1931, *Maire* (FI).
TUNISIA: Kessera, entre Kairouan—Lekef—Teldf-el-Saka, 1883, *Cosson et al.* (K); Hammam el Lif, iv 1907, *Pitard* (MA); Ain Draham, iv 1920, *Pitard* (MA).

G. aspalathoides has trifoliolate leaves, a character which is anomalous to sect. *Erinacoides* (and subg. *Genista*) but which is common to a number of species of sect. *Spartocarpus*. Some specimens of *G. ephedroides* of sect. *Spartocarpus* (also a Sicilian species) show a striking resemblance to *G. aspalathoides*.

All the specimens of *G. aspalathoides* that have been seen, however, possess the characters of spiny branches, pubescent standard equal in length to the wings and keel, and a narrowly oblong, several seeded legume which refer this species to sect. *Erinacoides*.

Section 4. *Scorpioides* Spach in Ann. Sci. Nat., sér. 3, 3: 106 (1845).

Shrubs with axillary spines and alternate branching; flowers usually borne on the spines (not *G. corsica*). Leaves simple or trifoliolate, pulvinules not prominent. Standard broadly ovate, usually glabrous, as long as the keel and wings. Legume narrowly oblong, glabrous or pubescent, many seeded.
Type species: *G. scorpius*.
Distribution: Predominantly western Mediterranean, with species occurring in S.E. France, E. Spain, Cyrno-Sardinia and North Africa.

Sect. *Scorpioides* includes six species, of which two, *G. morisii* and *G. ferox* are trifoliolate. The species *G. scorpius*, *G. corsica* and *G. myriantha* form a closely related group of vicariant taxa.

28. G. scorpius (L) DC. in Lam. & DC., Fl. Fr. 4: 498 (1805).
Syn.: *Spartium scorpius* Linn., Sp. Pl. 708 (1753).
Genista spiniflora Lam., Encycl. Méth. Bot., 2: 621 (1789).

Erect spiny shrub with stout axillary spines. *Leaves* 3–11 × 1·5–2 mm, simple, sessile, narrowly elliptical to narrowly oblanceolate or obovate; lower surface with sparse sericeous hairs, upper subglabrous. *Flowers* borne singly, paired or in fascicles on short lateral branches which are borne on

the spines. *Bracts* foliaceous; *bracteoles* c. 1 mm, borne just below the calyx; *pedicel* 2–5 mm. *Calyx* 3–5 mm, glabrous or very sparsely pubescent; lips shorter than the tube, upper teeth as long as the lip, lower teeth less than half the lip. *Standard* 7–12 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* 15–40 mm, narrowly oblong, subglabrous, 2–8 seeded. 2n: 40 (Lorenzo & Garcia, 1951), 48 (Favarger & Contandriopoulos, 1961).

Type material: not known.

Habit: macchie or garrigue vegetation.

Distribution: S.W. France, as far north as Dept. Isère; E. Spain, including the western limit of the Iberic mountains and the Sierra de Gredos, and as far south as Prov. Granada.

Isotype material of var. *campylocarpa* Willk. has been seen and it is considered that this variant is not worth formal recognition.

No material has been seen of *G. melia*, described by Boissier (1849), but from the description this taxon would appear to be another species of sect. *Scorpioides*. The single specimen cited by Boissier is: "Hab. in insula Melos, Archipelagi, Herb. *Fauche*", and the diagnosis given for this species is as follows: "*Affinis G. scorpio L. cujus indumentum adpressum nec crispo subglandulosum, spinae longiores ramosae, folia oblongolanceolata, glomeruli multiflori, calycis labii inferioris dens medius elongatus, legumen elongatum sesquipollicare nec* 8–11 *lin. longum.*"

29. G. corsica (Lois.) DC. in Lam. & DC. Fl. Fr. 5: 548 (1815).

Syn.: *Spartium corsicum* Lois. Fl. Gall., ed. 1, 2: 440 (1807).

Erect spiny shrub, branches with stout axillary spines, 0·5–1·5 cm. *Leaves* 2–5 × 1–3 mm, simple, sessile, narrowly obovate, subglabrous on both surfaces. *Flowers* borne in congested racemes of 2–5 on short lateral branches which are not borne on the spines. *Bracts* foliaceous, fasciculate; *bracteoles* c. 1 mm; *pedicel* 2–4 mm. *Calyx* 3–5 mm, with very sparce sericeous hairs; lips subequalling the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 9–11 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* 12–20 mm, narrowly oblong, glabrous, 3–8 seeded. 2n: 48 (Favarger & Cotandriopoulos, 1961).

Type material: "Hab. in arenosis marit. Corsicae c. Ajaccio"—specimen in Herb. Loiseleur ? n.v.

Habitat: A constituent of the "maquis haut" with the co-dominants *Arbutus unedo*, *Erica arborea*, *Quercus ilex* and *Cistus villosus* var. *corsicus*.

Distribution: Endemic to Corsica and Sardinia.

CORSICA: Vallée de Moulin, près Ajaccio, 29 ii 1848, *Bourgeau* (BM,G); Cedoza, 2 vi 1885, *Reverchon* (BM, CLF, E, G, LIVU, MANCH, S); Bastélica, 20 vi 1878, *Reverchon* (E, MANCH, S); Evisa, 20 vi–22 vii 1851, *Reverchon* (BM, G, MANCH).

SARDINIA: Prope Cagliari, iii 1829, *Müller* (E, S); St. Elia, iv 1854, *Pavillon* (G); Insula Maddalena, 8 iv 1905, *Vaccari* (BM, E).

30. G. myriantha Ball in Journ. Bot. Lond. 11: 303 (1873).

Erect shrub with stout axillary spines. *Leaves* c. 3 × 2 mm, simple, sessile, obovate, lower surface with sparse sericeous hairs, upper glabrous. *Flowers* borne in congested racemes on short lateral branches which may be borne on the spines. *Bracts* foliaceous; *bracteoles* c. 1 mm, borne just below the

calyx; *pedicel* 0·5–2 mm. *Calyx* c. 3–4 mm, glabrous; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 8–10 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* not seen, ovary glabrous.

Type material: Morocco (Haut Atlas): in convalle Amizmiz, c. 1300 m, *Ball* (holo. K).

Distribution: Endemic to the Haut Atlas, Morocco.

MOROCCO: Convalle Urika, 10–11 v 1871, Ball (K); Ihberm n'Ougdhal, 9 vi 1936, *Balls* 2760 (K); Grand Atlas, vallée de l'Imini, près Amerzgane, 14 ii 1936, *Gattefossé* (K); Grand Atlas, Amizmiz, v 1871, *Hooker* (K); Atlas, Ourika, 10 v 1871, *Maw* (K); South side of High Atlas, El Kelaa, El M'Gouan, 11 ii 1960, *Richard & Whiting* (K).

31. G. carpetana Leresche ex Lange in Kjoeb. Vidensk. Meddel., 237 (1877–78).

Low shrub with axillary spines, branches somewhat winged. *Leaves* 3–10 × 1·5–3 mm, simple, sessile, narrowly elliptical to narrowly oblanceolate; both surfaces with sericeous hairs, the upper sparsely so. *Flowers* borne singly or in clusters on the branches and spines. *Bracts* foliaceous; *bracteoles* minute; *pedicel* c. 1 mm or less. *Calyx* 4–6 mm, with short sparse sericeous or subpatent hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 8–15 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* c. 12–15 mm, narrowly oblong with sericeous hairs, 3–5 seeded.

Type material: In montibus castellanis Sierra de Gredos, inter lacumum et Hoyo de Pino, 21 vii 1862, *Leresche* (iso. G, K).

Distribution: Spain: Avila (Sierra de Gredos) and Léon. Morocco.

Two subspecies are recognised:

1. subsp. **carpetana**

Leaves 4–6 × 2 mm, *calyx* c. 4 mm, both with sparse sericeous hairs. *Standard* 8–11 mm.

Distribution: Spain: Avila, Léon.

SPAIN: Léon, Torrebarrio, 20 vi 1960, *Laínz* (K); Millaró, ad 1200 m, siliceo, 18 v 1961, *Laínz* (K); Puerto de la Magdalena, vi 1923, *Pau* (MA); Avila, Near Club Alpino, Sierra de Gredos, 2000 m, granite, 24 vii 1960, *Dresser* (E); Sierra de Gredos, Hoyos del Espino (loc. class.), 2 vii 1960, *Laínz* (E, K); Sierra de Gredos, Prado del Pozo, 30 vi 1927, *Wilmott & Lacaita* (BM).

2. subsp. **nociva** (Pau & Font Quer) Laínz & Vicioso in Bol. Inst. Est. Astur., sér. C, 1: 19 (1960) *excl. loc. leonese*.

Syn.: *Genista nociva* Pau & Font Quer, Iter Morocc., 1927, exsicc. no. 276 *in schedis*.

Leaves 8–10 × 2·5–3 mm, *calyx* 4–6 mm, both with dense sericeous hairs. *Standard* 10–15 mm.

Type material: Atlante rhiphano: Isaguen, 1600 m, 7 vii 1927, *Pau & Font Quer* Iter Morocc., no. 276 (holo. BC).

Distribution: Rif mountains, Morocco.

MOROCCO: Atlas Rifain, llano de Isaguen, 1600 m, 20–22 vi 1933, *Sennen & Mauricio* 8738 (BC).

G. carpetana was cited by Vicioso (1953) as endemic to the Sierra de Gredos, but the species also occurs in the Cantabrian Cordillera of Léon: there is a specimen in the Herbarium of the Jardin Botánico, Madrid (MA

58992) labelled "*G. aspalathoides* Lamk. var. *legionensis* Pau" from the Puerto de la Magdalena, Mtns. Cantabriques[1] which is clearly a specimen of *G. carpetana*, and Laínz has recently made collections from several other localities in Léon.

In a complicated series of papers (in the form of notes on Asturian species) Laínz (1960, 1961 & 1962) has drawn attention to the occurrence of *G. carpetana* in Léon province, and also to the relationships of this taxon with the neglected species *G. nociva* Pau & Font Quer. *Genista nociva* was given a diagnosis *in schedis* with the distributed exsiccatae of the Pau & Font Quer *Iter Moroccanum* 1927 as follows: *G. scorpio simillima sed specifice juxta tricuspidatum. Spinae robustae, pungentes,* 10 *mm long., monophyllae, stipulis acicularibus. Inflorescentia in ramulis foliosis parvis,* 1–3 *flora. Labii superioris dentes inferiori subaequantes, triangulares, legumen multoties breviores.*

This taxon is apparently a rare endemic of the Rif mountains in Morocco.

According to Laínz & Vicioso (1960) the Leonese populations of *G. carpetana* together with the Pau & Font Quer species noted above comprise a distinct subspecies (subsp. *nociva* Laínz & Vicioso) of *G. carpetana*, with the 'typical' subspecies restricted to the Sierra de Gredos. The distinguishing characters of these two subspecies are not clearly stated by Laínz (1960, 1961), but they are apparently corolla length, habitat preference (siliceous substrate for subsp. *carpetana* and calcareous for subsp. *nociva*) and also unspecified biochemical differences. In a subsequent paper however, (Laínz, 1962), new localities of *G. carpetana* in Léon were reported which are non-calcareous and a locality at Millaró has also been noted to be of a siliceous nature (Laínz, exsiccata details). Presumably, therefore, the ecological differences are no longer claimed for these taxa.

Only two specimens of *G. nociva* from Morocco have been examined (both at the Instituto Botánico, Barcelona), but the differences in morphology between these and specimens of *G. carpetana* from the Sierra de Gredos are fairly striking: the Moroccan specimens tend to be larger plants, particularly in leaf, calyx and corolla length, and they are also much more densely pubescent than the Gredos specimens.

Material of *G. carpetana* collected by Laínz in Léon province has also been examined, and whilst the corolla length of a number of these specimens certainly exceeds the upper limit of the range shown by the Sierra de Gredos populations, the Leonese plants are, nevertheless, much more comparable with these latter specimens in calyx and leaf length, and sparsely sericeous indumentum, than with the material from Morocco.

Consequently, in the present revision, whilst the recognition of *G. nociva* as a subspecies of *G. carpetana* has been accepted, specimens of *G. carpetana* from Léon have been referred to the typical subspecies together with the material from the Sierra de Gredos.

32. G. morisii Colla, Herb. Pedemon. 2: 65 (1833).

Low weakly spiny shrub, young branches with patent pubescence. *Leaves* 3–9 × 1–2 mm, sessile, trifoliolate; leaflets narrowly oblanceolate, the median leaflet somewhat longer than the laterals, both surfaces with sparse, long subpatent hairs. *Stipules* spinescent, persisting. *Flowers* borne singly in short racemes at the ends of branches. *Bracts* foliaceous, lowermost trifoliolate, uppermost simple. *Bracteoles* linear lanceolate, as long as or

[1] This locality is at the union of the valley of the rio Sil with that of the rio Orbigo.

longer than the calyx tube. *Pedicel* 1–2 mm. *Calyx* 5–8 mm, with sparse patent hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* c. 10 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* c. 20 mm, narrowly oblong, with dense patent hairs, c. 3–5 seeded.
Type material: not known.
Distribution: Endemic to Sardinia.
ITALY: Sardinia, 'Sardaigne', 1826 *Balbis* (MANCH); Prope Cagliari, 8 iv 1894, *Martelli* (G, MANCH); Prope Decimputzu et Antioco, iv, *Müller* (E, S).

33. G. ferox (Poiret) Poiret, Encycl. Méth. Bot. Suppl. 2: 718 (1812).
Syn.: *Spartium ferox* Poiret, Voy. Barb., 206 (1789).
Erect shrub with stout axillary spines. *Leaves* 5–12 × 2–3 mm, sessile, trifoliolate or simple, narrowly oblanceolate or obovate with the apex acuminate; upper surface subglabrous, lower surface with sericeous hairs. *Stipules* spinescent. *Flowers* borne singly in racemes at the ends of the branches. *Bracts* foliaceous, simple; *bracteoles* c. 1 mm, borne just below the calyx; *pedicel* c. 3 mm. *Calyx* 5–6 mm, with sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* c. 12 mm, broadly ovate, glabrous. *Keel and wings* as long as the standard, glabrous. *Legume* c. 15 mm, narrowly oblong with sericeous hairs, 3–6 seeded.
2n: 48 (Tschechow, 1931).
Type material: "montagnes de la Numidie" (Herb. Poiret ?) n.v.
Distribution: Morocco (Atlantic coast), Algeria, Tunisia.
MOROCCO: Mogador, iv–v 1871, *Hooker* (K); Shedma, iv–v 1871, *Hooker* (K); Environs de Mogador et de Cap Tafelney, 31 ii 1948, *Sauvage* (K).
ALGERIA: Rehaia, iv 1837, *Bové* (K); Environs d'Alger, vi 1855, *Durando* (MANCH); Maison Carée, 31 v 1834, *Gallerand* (K); Le Gouraya de Bougie, v–vii 1896, *Reverchon* (MANCH); Fort Genois, Bône, 23 iv 1866, *Tribout* (K).

Subgenus II *Phyllobotrys* Spach in Ann. Sci. Nat., sér. 3, 3: 103 (1845).
Syn.: subg. *Camptolobium* Spach, loc. cit., p. 102.
series *Campylocarpae* Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3: 428 (1877).
Shrubs with sterile axillary spines. Leaves simple or trifoliolate. Standard broadly ovate, triangular, or ovate with an acute apex, usually shorter than the keel. Legume falcate, inflated, many seeded, or ovoid-acuminate, 1–2 seeded. Leaf taking one vascular trace.
Type species: *G. anglica*.
Distribution: Mainly centred in the west of the Iberian peninsula, but with two species, *G. anglica* and *G. germanica* extending into north and central Europe, and other species in North Africa, Jugoslavia, Sicily, Mallorca and W. Turkey.

Section 5. *Phyllobotrys*.
Leaves simple, sometimes fascicled. Standard glabrous, ovate with an acute apex. Legume falcate, inflated, many seeded.
Distribution: Atlantic element type of distribution. *G. falcata* and *G. berberidea* are restricted to the N.W. of the Iberian peninsula whilst *G.*

anglica extends throughout Atlantic Europe as far north as Prov. Halland in Sweden.

34. G. anglica L., Sp. Pl. 710 (1753).

Erect to sprawling shrub with axillary spines; branches glabrous. *Leaves* 3–7 × 1–2 mm, simple, sessile, often fasciculate, lanceolate or elliptical, glabrous. *Flowers* borne singly in short racemes at the ends of branches. *Bracts* foliaceous, fasciculate; *bracteoles* minute or lacking; *pedicels* 1–2 mm. *Calyx* 2–3·5 mm, glabrous; lips somewhat longer than the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 6–8 mm, ovate with an acute apex, glabrous. *Keel* longer than the standard, glabrous, *wings* as long as the standard, glabrous. *Legume* c. 15 mm, falcate, inflated, glabrous, 4–12 seeded. 2n: 48 (Santos, 1945).

Type material: Holo. in Herb. Cliff. (BM).

Distribution: *Genista anglica* has a typical Atlantic element type of distribution: W. Europe, extending eastwards to W. Germany and S. Sweden. Isolated populations also occur in Calabria, Italy.

1. Variants of *G. anglica* lacking in spines occur throughout the range of the species, particularly in Scotland and central France. Such specimens should be referred to var. *inermis* Rouy.

2. The isolated occurrence of abundant populations of *G. anglica* in Calabria (the species is not present elsewhere in Italy or Sicily) is of considerable phytogeographical interest. Several other species share a similar disjunct distribution (e.g. *Ranunculus omiophyllus*), and the presumed ancestral connection is via North Africa rather than the (geologically recent) Appenine chain.

35. G. falcata Brot., Phyt. Lusit. 1: 52 (1800).

Erect shrub with stout axillary spines; young branches with dense sericeous hairs, older glabrous. *Leaves* 6–14 × 1·5–5 mm, simple, sessile, narrowly elliptical or narrowly oblanceolate; lower surface with sparse sericeous hairs, especially margins and midrib, upper glabrous. Most leaves subtending spines (fasciculate) or congested on flowering branches. *Flowers* in clusters 2–5, at the ends of short lateral branches. *Bracts* and *bracteoles* minute or absent; pedicel 0·5–2 mm. *Calyx* c. 5 mm, glabrous to sparsely pubescent, lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/3 lip. *Standard* c. 9 mm, ovate with a rather acute apex, glabrous or with a narrow median ridge of hairs. *Keel* c. 10 mm, glabrate with few hairs along ventral suture; wings glabrous, equal to the standard. *Legume* 10–25 mm, rhomboid-falcate, inflated, glabrous, 5–18 seeded. 2n: 36 (Santos, 1945).

Type material: "Hab. in solo raro, subumbroso, c. Conimbicam et alibi Beira et Estremadura". (Herb. Brotero, LISU ?) n.v.

Habitat: restricted to siliceous soils (cf. Vicioso 1953).

Distribution: provinces of W. Spain, N. Portugal.

SPAIN: Léon, San Pedro de los Montes, *Poirret* (fide Vicioso); Lugo, Crillas del Rio Cave, *Merino* (fide Vicioso); Orense, Verin, *Merino* (fide Vicioso); Zamora, Sierra Segundera, *Losa* (fide Vicioso); Avila, S. de Gredos, *Reuter* (fide Vicioso); Madrid, San Martin de Valdeiglesias, *Ceballos* (fide Vicioso); Salamanca, Monsagro, *Laguna* (fide Vicioso); Villafranca del Vierzo, 14 vii 1852, *Lange* (MANCH); Cáceres, Puerto de San Martin de Trebejo, *Laguna* (fide Vicioso); Huelva, Almonaster, *Laguna* (fide Vicioso).

PORTUGAL: Tras-os-Montes, Serra de Nogueira, 28 ix 1905, *Gandoger* (G); Avintes, R. Douro, 3 iv 1881, *Johnston* (MANCH); Estremadura, Coimbra, 4 iv 1910, *Chodat* (G); Conimbrae, *Moller* (G, MANCH).

36. G. berberidea Lange, Descr. Icon. Ill. 1: 1, t. 1 (1864).

Erect shrub with axillary spines; young branches with dense patent hairs. *Leaves* 5–12 × 1·5–3 mm, simple, sessile, narrowly elliptical, glabrous; usually subtending the spines or congested on flowering branches. *Flowers* borne in clusters 2–5, at the ends of short lateral branches. *Bracts* foliaceous, *bracteoles* c. 1 mm, *pedicel* 0·5–1 mm. *Calyx* 5–6 mm, with dense patent hairs; lips twice as long as the tube, upper teeth as long as lip, lower teeth half the lip. *Standard* 8–10 mm, glabrous; ovate with an acute apex. *Keel* 8·5–11 mm, glabrous; *wings* c. 6 mm, glabrous. *Legume* 5–15 mm, falcate, inflated with few hairs along the sutures, 4–6 seeded.

Type material: In pratis ad Santiago de la Compostella, 21 viii 1852, *Lange* (holo. C).

Distribution: N.W. Spain: Lugo, Pontevedra, La Coruña. N. Portugal.

SPAIN: Lugo, Sierra de Meira, ix 1852, *Lange* (C); La Coruña, Santiago de la Compostella, *Lange* (fide Vicioso); Pontevedra, Salcidos y Tuy, *Merino* (fide Vicioso).

PORTUGAL: Douro, Oporto, 1889, *Johnston* (LIVU).

Section 6. *Voglera* (Gaertn., Mey. & Schreb.) Spach in Ann. Sci. Nat., sér. 3, 2: 257 (1844).

Syn.: *Voglera* Gaertn., Mey. & Schreb. Fl. Wett. 2: 500 (1800).

Leaves simple or trifoliolate; standard glabrous or sericeous; legume ovoid-acuminate, 1–2 seeded.

Type species: *G. germanica*.

Distribution: Mainly in the south west of the Iberian peninsula and North Africa, but with isolated species in Mallorca, Sicily, Jugoslavia and Turkey.

G. germanica was the only species included in *Voglera* by Gaertner *et al.* and this taxon must, therefore, be regarded as the type species of *Genista* sect. *Voglera* Spach.

Spach was apparently so impressed by the non-spiny condition of *G. carinalis* (which he recognised as *G. gracilis*) that he placed it in a separate section, *Leptospartum*. Such separation seems unnecessary, however, in view of the over-riding similarity of *G. carinalis* (and *G. micrantha*) in all other facies to the other species of sect. *Voglera*.

31. G. micrantha Ortega, Hort. Mat. Descr., 68, t. 10 (1800).

Syn.: *G. tenella* Willk. in Bot. Zeit. 5: 426 (1847).

Low non-spiny shrub with slender branches and sprawling habit. *Leaves* c. 12 × 2 mm, simple, sessile, narrowly elliptical, subglabrous. *Flowers* borne singly in racemes. *Bracts* c. 2 mm, narrowly elliptical; *bracteoles* up to 2 mm, borne just below the calyx; *pedicel* c. 1 mm. *Calyx* 2·5–5 mm, glabrous; lips longer than the tube, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 5–7 mm, triangular, glabrous, base truncate to obtuse. *Keel* c. 1 mm longer than the standard with sparse sericeous hairs along the ventral suture; *wings* as long as the standard, glabrous. *Legume* c. 6 mm, ovoidacuminate, with sericeous hairs, 1–2 seeded.

Type material: not known.

Distribution: Endemic to the north-west of the Iberian peninsula. Spain: Soria, Logroño, Burgos, Santander, Palencia, Léon, Oviedo, Lugo, La Coruña, Orense. Portugal: Tras-os-Montes.

SPAIN: Soria, Covaleda, 12 vii 1935, *Ceballos & Vicioso* (MA); Abejar, 2 vii 1958, *Sandwith* (K); Sierra de Moncayo, vii 1850, *Willkomm* (K,MANCH); Logroño, Source of the Ebro, 29 vii 1862, *Leresche* (K); Burgos, Cubilla, 8 vii 1909, *Elias* (MA, MANCH); Cardenadijo, c. Burgos, 21 vi 1914, *Font* Quer (MA); Santander, Reinosa, vii 1858, *Boissier & Reuter* (MA); Barreda, 28 v 1927, *Leroy* (MA); Palencia, Pena Redonda, vii 1898, *Gandoger* (MA); Léon, Puerto de Manzanal, 12 vii 1935, *Font Quer & Rothmaler* (MA); Puerto de Leitariegos, *Font Quer* (fide Vicioso); Oviedo, Arvas, *Lagasca* (MA); Puerto de Piedrafita, 23 vii 1852, *Lange* (MANCH); Lugo, Entre Ber y Las Cortes, 1900, *Merino* (MA); La Coruña, Furelos y Mellid, *Merino* (fide Vicioso); Orense Ste. Maria de Mugares, 2 vi 1909, *Bescansa* (MA).

PORTUGAL: Tras-os-Montes, Mont Alegre, Veiga ad Monte Crasto, 15 vi 1943, *Cabral & Pedro* (MA); Fiaes, 13 vii 1908, *Sampaio* (MA).

G. micrantha was placed by Willkomm (1877) in sect. *Genistoides* (i.e. with *G. tinctoria* etc.) of subg. *Stenocarpus* (subg. *Genista*) and Vicioso (1953, p. 111) retained it there.

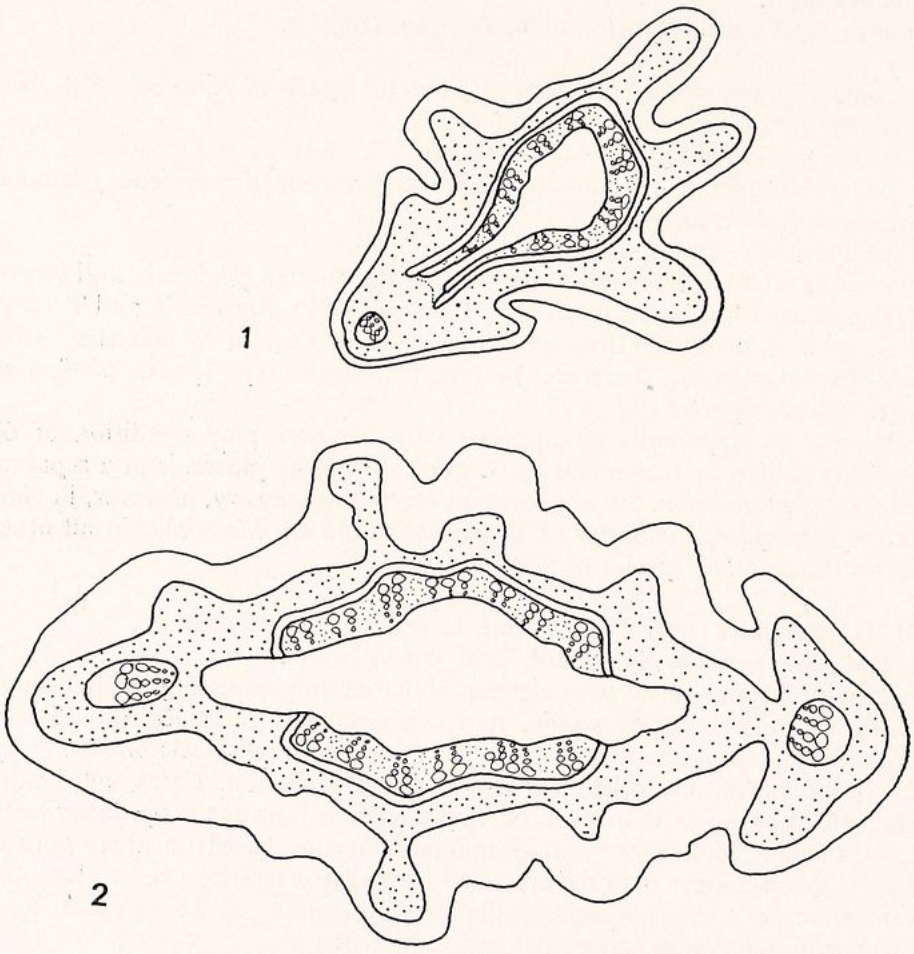


FIG. 5. Transverse sections from the nodal region of stems of 1, *G. micrantha;* 2, *G. lucida.*

However, a number of characters, such as the triangular standard petal shorter than the keel and the ovoid-acuminate 1-seeded legume (fig. 4.4) together with the single vascular trace to the leaf (fig. 5.1) clearly refer this species to sect *Voglera* of subg. *Phyllobotrys*.

G. micrantha from N.W. Spain and Portugal is very similar morphologically to *G. carinalis* from the Balkan Peninsula and N.W. Turkey. This similarity is in fact so striking that if the two taxa occupied adjacent allopatric areas they would certainly have been regarded as subspecies. *G. carinalis* and *G. micrantha* provide an example, therefore, of East-West Mediterranean vicarious taxa. (See also discussion under *spines* in the section on taxonomic characters).

38. G. carinalis Griseb., Spicil. Fl. Rumel. 1: 3 (1843).

Syn.: *G. gracilis* Spach in Ann. Sci. Nat., sér. 3, 2: 256 (1844).

Very similar to *G. micrantha*, differing only in a few characters: leaves usually linear-oblong, standard c. 2 mm shorter than the keel with the base cordate-truncate.

Type material: "In penins. Hagii—Oros pr. St. Lavra; in reg. media mont. Cortasch pr. Salonichi, leg. *Fried.*, *Frivald.*" Herb. ? n.v.

Distribution: Greece: Thessalia, Makedhonia, Thraki. Bulgaria: southern provinces, Rhodope Planina. Turkey: Istanbul, Bursa.

GREECE: Thessalia, Athos peninsula, 5 vii 1936, *Grebenchikoff* (K); Makedhonia, M. Kortiati, vii 1906, *Adamović* (K); Angkathotou, 13 vi 1932, *Alston & Sandwith* 825 (K); West of Kavalla, 22 v 1961, *Ball & Wagstaffe* 616 (LIVU); Near Hortiac aqueduct, 29 v 1918, *Kench & Tidy* (BM, LIVU); Montes Karadagh, between Thessaloniki and Serrai, 8 vi 1936, *Rechinger K. H.* (G); Thraki, c. 20 km west of Alexandroupolis, 18–20 v 1961, *Ball & Wagstaffe* 375 (LIVU); Xanthi, 31 v 1930, *Tedd* (K); Ins. Thasos, Theologos, 31 v 1891, *Sintenis & Bornmüller* 617 (G, MANCH).

BULGARIA: Sofiva, Pr. Vakarel, 9 vii 1927, *Stojanoff & Stefanoff* (K); Blago-Evgrad, Melnik, 10 vii 1958, *Kojoucharovik & Kouzmanov* (K); Mt. Pirini, in Crna-Mojne vii 1929, *Stojanoff, Stefanoff & Geofieff* (K); Plodiv, Staminaka, 1892, *Charrel* (MANCH); Bela Cerkova, 12 viii 1893, *Střibrny* (G, MANCH); Mt. Rhodope, 16 vii 1898, *Střibrny* (G).

TURKEY: Istanbul, Aydos, Istanbul, 31 v 1950, *Baytop & Berk* (G); Belgrade forest, 4 vi 1935, *Balls* 2393 (E); Bursa, Yaila de Bozdagh (Tmolus), 18 vii 1854, *Balansa* (G); Tmoli, vi 1842, *Boissier* (G); Mnt. Ida, pr. Kareikos, 23 vi 1883, *Sintenis* 534 (E).

See discussion under *G. micrantha* above.

39. G. sylvestris Scop., Fl. Carn., ed. 2,2 53 (1772).

Syn.: *Genista dalmatica* Bart., in Wendl. & Bartl., Beitr. 2: 74 (1824–25).
G. arcuata Koch, Syn. Fl. Germ., 154 (1835).
G. michelii Spach in Ann. Sci. Nat., sér. 3, 2: 259 (1844).

Low, weakly spiny or spinescent suffruticose shrub, non-flowering branches usually with simple or branched axillary spines. *Leaves* 10–20 × 1–2 mm, simple, sessile, narrowly oblong, lower surface puberulent. *Flowers* in terminal racemes. Lowermost *bracts* foliaceous, uppermost reduced, setaceous; *bracteoles* c. 2 mm, subtending the calyx; *pedicel* 1–2 mm. *Calyx* 5–7 mm, with sparse sericeous hairs; upper lip subequal to the lower, upper teeth as long as the lip, lower teeth c. 2/3 as long as the lip. *Standard* 7–8 mm,

subglabrous, triangular; base sub-cordate, claw short, less than 1/4 as long as the standard, 1 mm or more in width. *Keel* longer than the standard, subglabrous; *wings* as long as the standard, glabrous. *Legume* c. 6 mm, ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded.
Type material: not known.
Distribution: Italy: Marche, Venezia, Apulia. Jugoslavia: Crotia, Črna Gova, Hercegovina, Albania.
ITALY: Venezia, Inter Montefalcone et Trieste, 5 vi 1960, *Patzak* (LIVU, MANCH, W); Marche, Balzo del Monte San Vicino, 4 vii 1867, *Bucci* (FI); Apulia, Gargano, San Marco, 15 vi 1898, *Fiori* (FI); Monte Ossero, 29 v 1934, *Lusine* (FI).
JUGOSLAVIA: Croatia, Cravosa, 23 v 1897, *Baenitè* (G, MANCH); Istria, S. Canzio, 20 vi 1923, *Fiori* (FI); Ragusa (Dubrovnik), 21 v 1867, *Huter* (MANCH); Peninsular Zaperl, 26 vi 1910, *Peterfi* (FI); Divača, 27 vi 1905, *Romieux* Fiume, v 1827, *Smith* (FI); Hercegovina, Traupča, vii 1907, *Adamovíc* (K); Preslica planina, 28 vi 1908, *Maly* (F, G); *Crna Gora*, Ad Cafa Gorzde ? 2 vii 1898, *Baldacci* (F, G); Saha Gruda, 10 vi 1900, *Baldacci* (G); Rizzom et Debra, 1 vii 1918, *Kümmerle* (K); Inter Gornji Lukmsir, distr. Kaujic, 30 vii 1956, *Ritter* (K).

40. G. aristata C. & J. Presl, Del. Prag. 34 (1822).

Low spiny shrub, young branches with dense patent hairs. *Leaves* 5–12 × 1–3 mm, simple, sessile, narrowly elliptical or lanceolate, both surfaces with sparse patent hairs. *Flowers* in terminal racemes. *Bracts* of lowermost flowers foliaceous, uppermost reduced; *bracteoles* c. 3 mm, subtending the calyx; *pedicel* 1–2 mm. *Calyx* c. 5 mm, with dense patent hairs; upper lip c. 1/2 the lower, upper and lower teeth as long as the lips, lower teeth subequal to the lip, median segment longer than the laterals by 1 mm or more. *Standard* 6–8 mm, triangular, glabrous, base truncate, claw long, c. 1/3 or more of the standard and less than 1 mm wide. *Keel* longer than the standard, subglabrous, *wings* as long as the standard, glabrous. *Legume* c. 6 mm, ovoid-acuminate, sparsely pubescent, 1–2 seeded.
Type material: "Hab. in pascuis siccis montium Nebrodium Siciliae" (Presl *loc. cit.*) Herb. ? n.v.
Distribution: Endemic to Sicily, where the species is restricted to the Madonie mountain range in Prov. Palermo.
ITALY: Sicily, Montis Nebrodum, Madonie supra Isnello, 15 vi 1840, *Heldreich* (G); Collesano, vii 1889, *Lanza* (LIVU); Mistretta, 3 vi 1868, *Legucusa* (FI); Montaspro, vi *Lojacono Pojero* (LIVU); Boschi di Valdemona, *Todaro* (FI, LIVU).

G. aristata has been treated as subspecies of *G. sylvestris* by several authors; the two species resemble each other in general facies but the shape of the standard, particularly the length of the claw, and the nature of the calyx teeth are fairly distinctive for each species.

41. G. hispanica L., Sp. Pl. 711 (1753).

Low to erect shrub with axillary spines. *Leaves* 6–10 × 3–5 mm, simple, sessile, elliptical, lanceolate or oblanceolate; lower surface with dense appressed sericeous or patent hairs, upper subglabrous. *Flowers* in congested subterminal racemes. *Bracts* and *bracteoles* lacking; *pedicel* lips as long as or longer than the tube, upper teeth as long as the lip, lower teeth 1/3–1/2

the lip. *Standard* 6–10 mm, broadly ovate, glabrous, apex slightly retuse. *Keel* as long as or longer than the standard, subglabrous; *wings* as long as the standard. *Legume* c. 10 mm, ovoid-acuminate with sparse sericeous hairs, 1–2 seeded.

Type material: Specimen no. 892.24 (Savage Catalogue, 1945) in the Linnaean herbarium (holo. LINN).

Habitat: Hillsides, lower mountain slopes.

Distribution: S. France and N. Spain.

Two subspecies are recognised:

1. subsp. **hispanica.**

Syn.: *G. hispanica* var. *hirsuta* Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3: 427 (1887).

Branches and leaves with patent hairs; standard 6–8 mm.

Distribution: S.E. France, E. Pyrenees and E. Spain.

FRANCE: Hautes Alpes, Ribiers, 29 v 1873, *Reverchon* (MANCH); Basses Alpes, Aurot, 29 v 1874, *Reverchon* (MANCH); Alpes Maritimes, Près Fréjus, 19 iv 1801, *Bourgeau* (FI); Var, Draguinan, v 1910, *Girod* (G); Vaucluse, Bois de Ventoux, 23 v 1877, *Reverchon* (MANCH); Bouches-du-Rhône, Roquefaron près Faron, 17 v 1847, *Kralik* (MANCH); Gard, Alzon, vii 1863, *Le Jolis* (FI); Lozère, 21 km N. of Sévérac, 27 v 1962, *Brummitt, Gibbs & Ratter* (BM, E, LIVU); Aveyron, Vallée de la Jonte, 30 v 1932, *Meylan* (G); Lot, Ste. Alansie, 31 v 1910, *Bach* (FI); Haute Garonne, Mont Coudon, 5 v 1870, *Metz* (FI); Pyrenées Orientales, Leruns, *Ball* (FI). SPAIN: Gerona, Figueras, v 1847, *Bourgeau* (G); Barcelona, Montserrat, 13 vi 1898, *St. Lager* (G); Teruel, Valacloche, *Reverchon* (G); Valencia, Sierra de Espadan, ? (G, MANCH).

2. subsp. **occidentalis** Rouy in Rouy & Foucaud, Fl. Fr. 4: 226 (1897).

Syn.: *G. hispanica* var. *villosa* Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3: 427 (1887).

Branches and leaves with appressed sericeous hairs; standard 8–11 mm.

Type material: France: de Laruns a Gabas, et montagne de Beost, *Rouy* (Herb. ?) n.v.

Distribution: S.W. France, W. Pyrenees and N. Spain.

FRANCE: Basses Pyrenées, Eux Chaudes, 3 vii 1899, *Coste* (MANCH); St. Jean-Pied-de-Port, vi 1907, ? (G, LIVU, MANCH); Hautes Pyrenées, Lourdes, *Bordère* (MANCH); Gedre, 19 vi–10 ix 1877, *Bordère* (FI, MANCH). SPAIN: Navarra, Erro, 24 v 1927, *Lacaita* (G); Vizcaya, Ondarroa, 27 vii 1927, *Guinea* (G, LIVU); Bilbao, 18 x 1852, *Lange* (FL); Burgos, Miranda-Pancorbo, 29 v–4 vii 1906, *Sennen & Elias* (MANCH); Oviedo, Gijón, 14 iv 1864, *Bourgeau* (G); Picos de Europa, 8 vii 1878, *Levier* (FI); Soria, Agreda, Moncayo, 30 v 1934, *Vicioso* (G).

Willkomm described two varieties of *G. hispanica*: var. *villosa* and var. *hirsuta*. Rouy (1897) raised var. *villosa* to a subspecies, *occidentalis*,[1] whilst Vicioso (1953) retained the two varietal epithets of Willkomm.

In the exsiccatae of *G. hispanica* that have been examined the characters ascribed to the two infrsapecific taxa are quite distinctive, and are correlated geographically as indicated by Rouy and Vicioso. The correlation of characters is not absolute, however, since separation on flower size is not always

[1] Given in binomial or "bispecific" form, as are all subspecies in Rouy & Foucaud (cf. Heywood 1958). Thus, Vicioso cited "*G. occidentalis* Rouy" as a synonym of var. *villosa* Willk.

possible, and in the central Pyrenees the indumentum type may be ambiguous. The status of subspecies, therefore, seems to be most suitable for these variants.

In the protologue of *G. hispanica* Linnaeus referred in synonymy to Bauhin's *Pinax* and *Prodromus* but not to any earlier Linnaean works. There seems to be no reason, therefore, why the specimen of *G. hispanica* in the Linnaean herbarium should not be considered as the type specimen for this species. This specimen has a patent indumentum and a corolla of c. 6 mm, and is clearly referable to subsp. *hispanica* sensu Rouy, (var. *hirsuta* of Willkomm), so that subsp. *occidentalis* Rouy, the earliest name at subspecific level, is the correct name for the western variant.

42. G. germanica L., Sp. Pl. 710 (1753).

Syn.: *Voglera spinosa* Gaertn., Mey & Schreb., Fl. Wett. 2: 500 (1800).

Erect shrub with axillary spines. *Leaves* 8–20 × 4–5 mm, simple, sessile, elliptical or lanceolate, lower surface and margins with long subpatent hairs, upper subglabrous. *Flowers* in lax terminal racemes. *Bracts* c. 0·5 mm; *bracteoles* lacking; *pedicel* 1–2 mm. *Calyx* c. 5 mm, with long sericeous hairs, particularly on the teeth; lips as long as the tube, upper teeth as long as the lip, lower teeth 1/3–1/3 the lip. *Standard* c. 8 mm, ovate with an acute apex, glabrous or with very sparse sericeous hairs. *Keel* longer than the standard, with sericeous hairs, *wings* as long as the standard, glabrous. *Legume* c. 10 mm, ovoid-acuminate, subglabrous, 1–2 seeded. 2n: 48 (Reese 1952).

Type material: Specimen 892.21 (Savage Catalogue, 1945) in the Linnaean herbarium (holo. LINN ?).

Distribution: from S.W. France to C. Russia and from S. Sweden to C. Italy and Bulgaria.

For *G. germanica* Linnaeus cited "Roy. Lugd., 371, Gort. gelr., 417 and Bauh. Pinax 395" and repeated the diagnosis given by Van Royen. It is quite possible, therefore, that the *holotypus* for this species is located in Van Royen's herbarium at Leyden.

Occasional unarmed plants have been referred to var. *inermis* Koch.

43. G. hirsuta Vahl, Symb. Bot. 1: 51 (1790).

Syn.: *Genista lanuginosa* Spach in Ann. Sci. Nat. sér. 3, 2: 264 (1844).

Erect shrub with stout axillary spines, young branches with dense patent hairs. *Leaves* 6–15 × 1·5–5 mm, simple, sessile, lanceolate, lower surface and particularly the margins with a few, long patent hairs, upper surface glabrous. *Flowers* borne in congested terminal racemes. *Bracts* c. 8–10 mm, borne towards the apex of the pedicel; *bracteoles* 3–5 mm, subfoliaceous, borne just below the calyx; *pedicel* 1–2 mm. *Calyx* 9–12 mm, tube sparsely pubescent to glabrate, teeth with long silky hairs. Upper lip longer than the tube, upper teeth equal to the lip, slender, lower lip equal to or somewhat longer than the upper, lower teeth subequal to lip, linear. *Standard* 9–14 mm, broadly ovate with an acute apex, glabrous to uniformly pubescent, claw c. 1/4 total length. *Keel* longer than the standard, with sericeous hairs. *Wings* as long as the standard, glabrous. *Legume* c. 6 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: not known.

Habitat: hillsides and lower mountain slopes, non-calcareous substrates.

Distribution: W. Spain and S. Portugal.

SPAIN: Avila, Montes de Guisando, *Heraso* (fide Vicioso); Valle de Alberche, *Ceballos* (fide Vicioso); Madrid, Casa de Campo, *Laguna* (fide Vicioso); Torrelodones, *Rivas* (fide Vicioso); Toledo, Montes de Toledo, *Laguna* (fide Vicioso); Cáseres, Prvs Plasencia, 22 v 1863, *Bourgeau* (E, G, LD); Badajoz, Sierra Morena, *Laguna* (fide Vicioso); Córdoba, S. de Córdoba, 10 vii 1926, *Linberg* (LD); Obejo, 13 iv 1887, *Rouy* (E); Sevilla, Morón de la Frontera, 25 iv 1933, *C. Vicioso* (G); Carmona, *Broussonet* (fide Vicioso); Jaén, Despeñaperros, *Rivas Goday* (fide Vicioso); Málaga, Marbella et Estepona, v 1837, *Boissier* (E, G); S. de Grazalema, 19 vi 1890, *Reverchon* (E, G, MANCH); Cádiz, Sanlucar de Barremeda, 11 iv–18 v 1849, *Bourgeau* (E, G, TCD); Jerez de la Frontera, 9 vi 1895, *Porta & Rigo* (LD, MANCH); Huelva, El Conquero, 30 iv 1953, *Bellot & Casaseca* (G).

PORTUGAL: Baixo Alentejo, Odemira, iv–v 1886, *Daveau* (E, G, LD); Mertola, iv 1888, *Moller* (E, LD); Algarve, Faro, 10 v–6 vi 1853, *Bourgeau* (E, G, LD); Cabo de St. Vincente, *Chodat* (G); Prope Sagras, 25 v 1938, *Rothmaler* (G); Lagos ad Villa de Bispo, 4 iv 1951, *D. Webb* (TCD).

MOROCCO: Fes, ii 1910, *Gandoger* (LD); M. Edres, ii 1910, *Gandoger* (LD).

G. lanuginosa was delimited by Spach who cited the following exsiccatae: "Webb! Boissier! In Baeticae, ad colles Marbella et Estepona".

Boissier exsiccatae labelled as above, and determined as "*G. hirsuta* Vahl var. *cuspidata*" have been examined from the Herbaria at Genève and Edinburgh, and these are considered to be syntype specimens of *G. lanuginosa*. These syntype specimens are comparable in all characters with material of *G. hirsuta* Vahl and must be referred to this species.

Vicioso (1953, p. 61) followed Willkomm in recognising *G. lanuginosa* as a distinct species, so that there is the problem, if *G. lanuginosa* Spach is synonymous with *G. hirsuta*, is there a distinct species *G. lanugonisa* sensu Willkomm and Vicioso? The following considerations tend to eliminate this possibility.

Vicioso's key to *G. lanuginosa* and allied species is unsatisfactory, since in leads 27 and 28 (p. 23–24) the same character (spines tenuous or robust) is used partly to separate *G. tournefortii*[1] from *G. hirsuta* and *G. lanuginosa*, and then as a distinguishing character between these latter two species. Again (lead 28), *G. lanuginosa* is characterised as having short, "sub-capituliforme" racemes, as opposed to *G. hirsuta* with long racemes, although Vicioso describes var. *algarbiensis* DC. of *G. hirsuta* (p. 61) as having "inflorescencia corta, sub-capituliforme"!

The other differential characters given by Vicioso for *G. lanuginosa* and *G. hirsuta* are tabulated below:

hirsuta	*lanuginosa*
1. Upper surface of the leaves glabrous.	1. Upper surface of the leaves pubescent.
2. Bundles of fibres absent in the cortex.	2. Bundles of fibres present in the cortex.

[1] *G. tournefortii* is correctly characterised (lead 27) as having the bract at the base of the pedicel, as opposed to *G. hirsuta* and *G. lanuginosa* with the 'bract' at the apex of the pedicel; the illustration of *G. lanuginosa* in Vicioso lám. xii., however clearly depicts the bract at the base of the pedicel.

None of the material cited for *G. lanuginosa* by Vicisio which has been seen has a pubescent upper surface to the leaves although the dense patent hairs along the margins of the leaves, together with the longitudinal inrolling, especially of the younger leaves gives a superficial impression of a pubescent upper surface.

The character of fibrous tissue in the cortex is taken from the anatomical survey by Pellegrin; as noted in the Introductory section, in this case as in several other instances. Pellegrin appears to be in error in believing he has an anatomical character which is correlated with morphological taxonomy. Transverse sections have been made of the stem from a number of herbarium specimens determined as *G. hirsuta* and *G. lanuginosa* (including syntype material of the latter) and no differences have been detected between these with respect to fibrous tissue.

On a point of typification it is not clear from the citations given after *G. lanuginosa* by Vicioso whether he had seen the syntype material noted above, since he cites: "Málaga, entre Marbella y Estepona (Boiss. ex Spach)" with no "!" mark. In a note below, however, he commented: "Boissier, al parecer, consideró como *G. hirsuta* var. *cuspidata* DC. no solamente la *G. lanuginosa*, sino también algunas formas de la *G. hirsuta* que poseen la inflorescencia corta, porque el ejemplar existente en el citado herbario y etiquetada por el sabio suizo como *G. hirsuta* var. *cuspidata* DC., no es *G. lanuginosa*, sino *G. hirsuta*. Probablemente estará en el mismo caso le que en Portugal se cita como *G. lanuginosa*, y ello motivó que Pereira Coutinho la subordinase como subespecie a la *G. hirsuta*; ambas especies son netamente diversas e inconfundibles, y la *G. lanuginosa*, en la provincia de Málaga está localizada en los terrenos peridóticos de su parte S.W.

It seems, therefore, that Vicioso agrees that the syntype material of *G. lanuginosa* (i.e. the specimen collected by Boissier at Marbella and Estepona and determined by him as *G. hirsuta* var. *cuspidata*) is *G. hirsuta* without realising that it is in fact type material of the former species.

A further consideration is that all the material cited by Vicioso under *G. lanuginosa* is sympatric with *G. hirsuta* for a number of localities in Málaga province, such a Sierra Bermeja, Estepona, Marbella, Igualeja and Sierra de la Alpujata (i.e. the total distribution given for *G. lanuginosa*) and both species are said to occur in similar habitats "terrenos peridóticos" (Vicioso *op. cit.*, pp. 60 & 62). From evolutionary considerations, it is unlikely that two closely related yet poorly differentiated species should have arisen, or should co-exist, in such conditions.

44. G. tricuspidata Desf., Fl. Atl. 2: 138, t. 183 (1790).

Syn.: *G. duriaei* Spach in Ann. Sci. Nat. sér. 3, 2: 271 (1844).

Erect shrub with stout axillary spines, branches with sericeous hairs. *Leaves* 4–12 × 1·5–4 mm, simple, elliptical, oblanceolate or obovate; lower surface with sericeous hairs, upper subglabrous. *Flowers* borne in terminal racemes or in clusters on lateral branches. *Bracts* c. 3 mm subfoliaceous, with sericeous hairs, borne at the base of the pedicel; *bracteoles* 1–2 mm, linear, borne c. half-way along the pedicel; *pedicel* c. 2 mm. *Calyx* c. 5 mm, with sericeous hairs; lips as long as or longer than the tube, upper teeth as long as the lip, acute, lower teeth c. 1/2 the lip, linear. *Standard* 6–9 mm, broadly ovate or triangular, glabrous or with a sparse median ridge of hairs. *Keel*

longer than the standard, with sparse sericeous hairs, *wings* as long as the standard, glabrous. *Legume*, c. 7–10 mm, ovoid-acuminate with patent hairs 1–2 seeded.

Type material: "Algeria in collibus incultis" *Herb. Desfontaines*, (P ?) n.v.

Distribution: Morocco, Algeria and Tunisia.

MOROCCO: Martimprey-du-Kiss, 10 vi 1931, *Faure* (G, K); Djebel Igueragaiden, 7 ii 1929, *Font Quer* (G); Tetuan, 1910–11, *Gandoger* (LD); Près Mogador, 24 iv 1926, *Gattefossé* (K); Grand Atlas, Siksoua, *Hooker* (K); Grand Atlas, Bin el Ouidine, 28 iii 1923, *Jahandiez* 56 (K); Melilla, Barco de Hidum, 27 ii 1923, *Mauricio* (Sennen 8743) (G); Imoger, 55 km from Agadir, 1 iii 1936, *Trethewy* (K); Beni Snassene, 16 v 1928, *Welzek*, *Briquet*, *Dutoit & Emberger* (K).

ALGERIA: Oran, Sta. Cruz, 24 iv 1953, *Alleizette* (G, LD); Maison Carrée, v 1887, *Battandier & Trabut* (G, LD); Constantine, Djebel Ouach, 14 iii 1948, *Dubius & Faure* (K); Env. de Alger, 1859, *Durando* (E, G, K, LIVU); l'Oued Kerma, 1851, *Jamin* (K); Kerrata, vii 1897, *Reverchon* (E, G, LD, MANCH); Monts Babors, Kabylie, vii 1896, *Reverchon* (E, G, LD, MANCH).

TUNISIA: El Tedja (Puchleta), *Cosson* (K); Ain Draham, 7 vi 1903, *Murbeck* (LD); Hammam-el-Lif, 9 v 1903, *Murbeck* (LD); Djebel bou Kornein, près Tunis 6 vi 1904, *Romieux* 46 (G).

45. G. erioclada Spach in Ann. Sci. Nat., sér. 3, 2: 264 (1844).

Syn.: *Genista atlantica* Spach, *loc. cit.*, p. 265.

Erect shrub with stout axillary spines, young branches with patent hairs. *Leaves* 5–12 × 3–4 mm, simple, sessile, lanceolate or narrowly elliptical, lower surface with appressed sericeous to patent hairs, upper surface subglabrous. *Flowers* of congested terminal racemes. *Bracts* c. 5 mm, subfoliaceous, borne at the base of the pedicel; *bracteoles* 2–3 mm, subtending the calyx; *pedicel* c. 1 mm. *Calyx* 5–7 mm, with dense sericeous to patent hairs; lips as long as the tube, upper teeth as long as the lip, acute, lower teeth c. 1/2 lip. *Standard* 8–9 mm, broadly ovate, with sericeous hairs; apex subacute, base truncate. *Keel* longer than the standard, with sericeous hairs; *wings* as long as the standard, glabrous. *Legume* c. 8 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: "Mauritania prope Oran", *Durieu*, *Bové* syn. herb. ? n.v.

Distribution: Morocco and Algeria.

MOROCCO: Berkane, 22 iv 1928, *Briquet* (G); Beni Snassene, *Taforalt*, 26 iv 1930, *Faure* (LD); Beni Selman, 8 vi 1930, *Font Quer* (G); Hassi Berkan, 9 iv–30 v 1929, *Font Quer* (G); Tetuan, *Gandoger* (LD); Beni Snassene, 22 iv 1925, *Jahandiez* 54 (E); Cada de Debdou, 28 v 1929, *Jahandiez* 329 (G); Beni Snassene, pr. Taforalt, 2 v 1925, *Maire* (G);

ALGERIA: Oran, Djebel Murdjadje, v 1921, *Alleièette* (LD); Oran, Djebel Santo, 10 iv 1852, *Balansa* (E); Oran, Sta. Cruz, v 1888, *Battandier & Trabut* 426 (G); Oran, 1849, *Boissier & Reuter* (G); À Nemours, 6 v 1856, *Bourgeau* (G); Hassi Amour, près Oran, 1883, *Cosson* (G); Batterie espagnol, Oran, 9 v 1852, *Cosson* (G, LD); Oran, *Debeaux* (LD, MANCH); Montagne des Lions, East of Oran, 1 v 1928, *Emberger* (G); Sta. Cruz, 17 iv 1928, *Faure* (E, G, LD, MANCH); Oran, *Munby* (E, K, MANCH).

46. G. ulicina Spach in Ann. Sci. Nat. sér. 3, 2: 268 (1844).

Erect shrub with axillary spines, flowering branches usually with dense patent pubescence. *Leaves* 6–15 × 1·5–5 mm, simple, sessile, elliptical to lanceolate, lower surface with a few patent hairs, upper glabrous, or with a few hairs on midrib. *Flowers* in terminal racemes (sometimes intercalary). *Bracts* 6–8 mm, subfoliaceous, borne towards the apex of the pedicel; *bracteoles* c. 4 mm, subtending the calyx; *pedicel* c. 1 mm. *Calyx* c. 10 mm, tube subglabrous, teeth with patent hairs; upper lip subequal to the tube, upper teeth equal to the lip, lower lip twice as long as the upper one, lower teeth subequal to the lip, median segment exceeding the laterals. *Standard* c. 12 mm, broadly ovate, glabrous, apex entire, base truncate. *Keel* longer than the standard subglabrous; *wings* as long as the standard, glabrous. *Legume* c. 8 mm, ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded.

Type material: "Numidia, prope La Calle", *Bové* (syn. K); "Numidia, La Calle", *Durieu*; "Numidia, Stora", *Durieu*; "Numidia, Bona", *Steinheil* (syn.) n.v.

Distribution: Morocco, Algeria and Tunisia.

MOROCCO: Moyen Atlas, prope Azrou, 24 vi 1926, *Linberg* 4115 (K); Moyen Atlas, Ain Senh, 13 v 1924, *Jahandiez* 267 (K).

ALGERIA: Philippeville, iv 1853, *Choulette* (LD); Djebel-el-Ouach, pres Constantine, v 1857, *Choulette* (LD); Bône, v 1864, *Dukerly & Reboud* (LD); Kerrata, maquis, v 1897, *Reverchon* (MANCH); Hauts Babors, v 1896, *Reverchon* (E, LD, MANCH); Bône, Fort Genois, 18 iv 1865, *Tribout* (MANCH).

TUNISIA: Bugrand ?, vii 1945, *Chenoud* (G); Sedjenar, 29 iv 1926, *Chenoud* (G).

47. G. tournefortii Spach in Ann. Sci. Nat., sér. 3, 2: 269 (1844).

Syn.: *Genista decipiens* Spach, *loc. cit.*, p. 270.

Erect shrub with axillary spines, flowering branches usually only spinescent. *Leaves* 8–18 × 2·5–5 mm, simple, sessile, lanceolate, lower surface sparsely hairy with long patent hairs, upper glabrous, or with few hairs. *Flowers* borne in congested, terminal racemes, sometimes subcapitate. *Bracts* 3–8 mm, foliaceous, borne at the base of the pedicel; *bracteoles* minute; *pedicel* c. 1 mm. *Calyx* 8–10 mm, with dense appressed sericeous to subpatent pubescence. Upper lip as long as the tube, upper teeth as long as the lip, acute; lower lip twice as long as the upper, lower teeth c. 1/2 the lip. *Standard* 9–11 mm, broadly ovate, subglabrous, apex rather retuse, base truncate, claw c. 1/3 total length of the standard. *Keel* longer than the standard, with sparse sericeous hairs; *wings* as long as the standard, glabrous. *Legume* c. 8 mm, ovoid-acuminate, with a few patent hairs, 1–2 seeded.

Type material: "Circa Bellas in Extremadura, nec non prope Cintram", *Webb* (syn. FI).

Habitat: rocky hillsides and mountain slopes.

Distribution: Spain: Avila, Salamanca, Toledo, Ciudad Real. Portugal: Beira Litoral, Estremadura. Morocco.

SPAIN: Salamanca, S. de Francia, 12 vi 1904, *Gandoger* (G); Toledo, Montes de Toledo, *Laguna* (fide Vicioso); Cáceres, Guadalupe, *Barnades* (fide Vicioso); Jaén, Despeñaperros, *Laguna* (fide Vicioso); La Alsieda, Miranda, *Rivas Goday* (fide Vicioso).

PORTUGAL: Beira Litoral, Buarcos, iv 1885, *Carvalho* (E, G); Ribatejo, Prope Tomar, 30 iv 1935, *Mendouca & Sousa* (LD); Estremadura, Cascais, *Chodat* (G); Serra d'Ossa, 31 iii 1910, *Chodat* (G); Prope Sintra, iv 1897, *Couthino* (MANCH); Près Bellas, v 1885, *Daveau* (E, G, LD, MANCH); S. de Alfaruel, v 1888, *Daveau* (MANCH); Entre Merces & Sintra, v 1888, *Moller* (LD); Sintra, v 1888, *Murray* (MANCH); Alcainca, 29 iv 1946, *Rainha* (G); Lisboa, collibus prope Bellas, 2 v 1958, *Rothmaler* (G); S. de Arrabida, 22 iv 1939, *Rothmaler & Silva* (G); S. de Sintra, v 1840, *Welwitsch* (G).

MOROCCO: Mazalla, supra Talle, 12 v 1929, *Font Quer* (G); Moyen Atlas, prope Arzou, 24 vi 1926, *Linberg* (LD); Moyen Atlas, supra Taza, 18 vi 1925, *Maire* (G); In Atlante Rifano, Souk-et-Tuine, 20 vi 1926, *Maire* (G); Supra Beszout et Rbatia, 17 iv 1926, *Wilczek & Dutoit* (G).

48. G. lucida Cambess., Mem. Mus. Paris 14: 231, t. 5 (1827).

Syn.: *Genista pomelii* Marés & Vigin, Cat. Pl. Balear., 70 (1880).
G. acanthoclada var. *fasciculata* Knoche, Fl. Balearica 59 (1920).

Erect shrub with stout axillary spines. *Leaves* 3–8 × 2–3 mm, simple, sessile, narrowly elliptical, fugacious, lower surface with sericeous hairs, upper glabrous. Pulvinules with spinose stipules. *Flowers* borne in terminal racemes. *Bracts* foliaceous; *bracteoles* minute, borne half-way along the pedicel; *pedicel* 1–3 mm. *Calyx* c. 5 mm, with sericeous hairs: lips as long as the tube, upper teeth as long as the lip. *Standard* c. 10 mm, ovate with a sub-acute apex, subglabrous. *Keel* longer than the standard, with sericeous hairs, *wings* as long as the standard, glabrous. *Legume* ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded.

Type material: "In collibus petrosis c. Artam, in ins. Majore", Cambessedes (Herb. ?) holo.; n.v. Majorque, ii 1827, *Cambessedes* (iso. K ?).

Habitat: rocky hillsides.

Distribution: Endemic to Mallorca.

SPAIN: Mallorca, Puig de Ronda, 14 iv–1 vii 1914, *Bianor* (Sennen, 1938) (CLF); Bendinat to Portals, 30 iii 1930, *Kennedy* (K); San Pousa, 21 v 1885, *Porta & Rigo* (K, MANCH); Prope Artá, 28 vi 1885, *Porta & Rigo* (MANCH).

Genista lucida was placed in section *Scorpioides* of subgenus *Stenocarpus* by Spach, possibly on the basis of a depauperate specimen since he does not describe the keel, and certainly he had not seen mature legumes. Willkomm listed *G. lucida* under *species inquirendae* and the revision by Vicioso does not include the Balearic species.

As with *G. micrantha*, above, *G. lucida* has all the characters of sect. *Voglera*, namely, triangular standard petal shorter than the keel, ovoid-acuminate 1-seeded legume (fig. 4.3) and leaves with a single vascular trace (fig. 5.2).

49. G. anatolica Boiss., Diagn. Pl. Or. Nov., 1, 2: 8 (1843).

Syn.: *G. oliveri* Spach in Ann. Sci. Nat., ser. 3, 2: 266 (1844).
G. orientalis Spach, *loc. cit.*, p. 267.

Low to erect shrub with axillary spines, young branches with patent pubescence. *Leaves* 5–10 × 2–3 mm, simple, sessile, narrowly elliptical; lower surface with appressed sericeous to subpatent hairs, upper surface

subglabrous. *Flowers* in short terminal racemes, the flowering branches terminated by a spine. *Bracts* 2–3 mm, foliaceous; *bracteoles* c. 5 mm, just below the calyx; *pedicel* 1–2 mm. *Calyx* c. 6 mm, with sericeous or subpatent hairs; lips as long as the tube, upper teeth acute to linear, as long as the lip, lower teeth linear, as long as the lip. *Standard* c. 8 mm, broadly ovate, subglabrous, apex retuse. *Keel* longer than the standard, with sericeous hairs, *wings* as long as the standard, glabrous. *Legume* c. 9 mm, ovoid-acuminate, with sericeous hairs, 1-seeded.

Type material: Smyrne colles, vi 1842, *Boissier* (syn. E); In collibus Lysiae circa Smyrnam, *Aucher* 1086 (syn. G).

Habitat: dry hillsides, uncultivated slopes.

Distribution: Bulgaria, Turkey-in-Europe, W. Turkey.

TURKEY: Izmir, Environs de Smyrne, 20 v–2 vii 1854, *Balansa* (E, G); Sinus Smyrnacus, in regione pinetum montis Yamanlar Dagh, 22 v 1906, *Bornmüller* 9244 (E, G); Smyrna, *Whittall* 414 (E); Muğla, Muğla-Kale, 28 v 1962, *Dudley* 35071 (E).

G. anatolica is very similar morphologically to such North African and Iberian species as *G. erioclada*, *G. tricuspidata*, *G. hirsuta*, etc. and should be regarded as another example of East-West Mediterranean vicarious taxa.

50. G. triacanthos Brot., Phyt. Lusit. 1: 130 (1800).

Syn.: *G. scorpioides* Spach in Ann. Sci. Nat., sér. 3, 2: 276 (1844).

Erect shrub with axillary spines, young branches sparsely pubescent. *Leaves* 3–25 × 1–2·5 mm, trifoliolate, sessile, leaflets narrowly oblanceolate, subglabrous. *Flowers* borne in lax terminal or sometimes intercalary racemes. *Bracts* subtending the lowermost flowers, simple, oblanceolate; *bracteoles* 1–3 mm, borne just below the calyx; *pedicel* 1–2 mm. *Calyx* 2·5–5 mm, glabrous; lips as long as the tube, upper teeth as long as the lip, lower teeth 1/2–2/3 the lip. *Standard* 5–7 mm, triangular, glabrous. *Keel* longer than the standard, glabrous, wings as long as the standard, glabrous. *Legume* c. 7 mm, ovoid-acuminate, with very sparse sericeous hairs, 1–2 seeded.

Type material: "In solo raro ad sylvas, et in clivis montium c. Conimbricum et alibi in Beira; etiam c. Setubal in Marateca." Herb. Brotero, LISU ? n.v.

Distribution: W. & S.W. Spain, Portugal, Morocco, Algeria.

Two subspecies are recognised:

1. subsp. **triacanthos.**

Calyx 2·5–4 mm, lips as long as the tube, upper teeth acute. *Leaves* 3–7 mm.

Distribution: Spain, Portugal, Morocco.

SPAIN: Pontevedra, Vigo, 8 viii 1910, *Bicknell* (MANCH); Porriño, *Ceballos* (fide Vicioso); La Coruña, Santiago de la Compostella, *Bellot* (fide Vicioso); Salamanca, Agallas y Monsagro, *Laguna* (fide Vicioso); Badajoz, Alconchel, *Villalobos* (fide Vicioso); Sevilla, Castillo de las Guardas, *C. Vicioso* (fide Vicioso); Málaga, S. de Estepona, 1000–4500 ft., v 1837, *Boissier* (G); Cádiz, Alcalá de los Gazules, 22 iv 1849, *Bourgeau* (G); Prope San Roque et prope Chiclana, v 1895, *Porta & Rigo* 613 (MANCH); S. de Palma, près Algeciras, 25–29 vii 1887, *Reverchon* 150 (G, MANCH); Inter Chiclana et Conil, 1847, *Willkomm* (G); S. de Palma, Algeciras, 19 iv 1876, *Winkler* (K).

GIBRALTAR: Queen of Spain's Chair, v 1848, *Hurst* (MANCH).

PORTUGAL: Douro, Oporto, vi 1891, *Buchtien* (MANCH); Beira Litoral, Sever d'Vouga, 8 vii 1946, *Sehra, Fontes & Rainha* (G); Alto Alentejo, Serra d'Ossa, 20 iii 1910, *Chodat* (G); Baixo Alentejo, Odemira, S. Teotonis, 24 v 1954, *Rainha* 4530 (G); Estremadura, Lisboa, inter Caparica et Aveiro, 10 v 1938, *Rothmaler* (G); Seixal, iv 1840, *Welwitsch* (G); Algarve, Monachique, 2 vi 1853, *Bourgeau* (G, MANCH); Serra do Malhao, 23 v 1938, *Rothmaler* (G).

MOROCCO: Tanger, 1849, *Boissier & Reuter* (G); Cap Spartel, 20 iv 1911, *Pitard* (G); Tetuan, 7 vi 1851, *Ball* (K).

2. subsp. **vepres** (Pomel) P. Gibbs **stat. nov.**

Syn.: *G. vepres* Pomel, Nouv. Mat. Fl. Atl., 319 (1874).
G. kabylica Coss. ex Batt. in Bull. Soc. Bot. Fr. 36: 225 (1889).

Calyx 3–5 mm, lips usually shorter than the tube, upper teeth obtuse. *Leaves* 5–25 mm.

Type material: "Collines schisteuses, Djebel Goufi" Herb. ? n.v.

Distribution: Algeria, coastal ranges.

ALGERIA: Kabylia minor, Ras Aokas, 1 iv 1865, *Paris* (LD); Monts Babors á Kerrata, v 1896, *Reverchon* (MANCH).

A problem occurs with the species pair *G. triacanthos—G. scorpioides* which is curiously similar to the situation with regard to *G. hirsuta—G. lanuginosa* outlined above.

It has not been possible to see type material of *G. triacanthos*, and only putative type of material of *G. scorpioides* has been examined. Nevertheless, in the exsiccatae which have been studied, variously determined as *G. triacanthos* or *G. scorpioides*, no constant differential characters have been found which would warrant the recognition of two species. It is porposed, therefore, to treat *G. scorpioides* as a synonym of *G. triacanthos*. This treatment is supported by the following considerations:

In the original description of *G. scorpioides* Spach included "*G. triacanthos* Boissier ! (ex parte)" in synonymy, and the specimens cited were: "crescit in Baetica, Webb ! Boissier ! (in montibus Sierra de Estepona)." On the following page, under *G. triacanthos* var. *tournefortiana* (the 'typical' form) Spach cited: "in sylvis et montosis circa Coimbram et alibi in Beira—Brotero!" (i.e. the material cited by Brotero and also, "nec non in Baeticae montibus Sierra d'Estepona (Boissier !)".

As far as the author is aware, there is only one Boissier collection involved here: Sierra de Estepona, 1000–4500 ft., v 1837, *Boissier*. A specimen of this collection has been seen from the General Herbarium, Genève.

It would seem, therefore, unless there are other collections involved, that Spach had seen duplicate specimens of this Boissier collection, some of which he accepted as *G. triacanthos* Brot., but other specimens he considered to be specifically distinct and which he described as *G. scorpioides*.

Under these circumstances it is obviously desirable to see all the material seen by Spach in order to attempt to typify *G. scorpioides* accurately, and this has not been possible. Nevertheless, the Boissier specimen from Genève, and all the specimens cited under *G. scorpioides* by Vicioso (1953, p. 53) must be referred to *G. triacanthos*.

The differential characters given by Vicioso *loc. cit.* for these two species are tabulated below.

G. triacanthos	*G. scorpioides*
Spines slender, branched.	Spines stout, simple.
Flowering branches spiny.	Flowering branches non-spiny.
Upper teeth of the calyx c. 2x the tube length.	Upper teeth of the calyx equal to the tube length.
Standard 1/2 the length of the keel.	Standard 1/3 the length of the keel.

Distribution and habitat data given for these taxa by Vicioso is as follows:

G. triacanthos	*G. scorpioides*
W. & S.W. provinces of Spain and Portugal: Galicia, Salamanca and Badajoz to Sevilla, Málaga and Cádiz.	S.W. Spain: Cádiz and Málaga.
"Matorrales y bosques de los pisos inferior y montano formando el subvuelo de alcornoques, quejigos y pinos."	"Igual que la de *G. triacanthos*."

In the material seen all the morphological characters tabulated are certainly variable, particularly the nature of the spines, but this variation is not at all correlated as indicated above, nor is there any correlation between any characters and geographical distribution. None of the specimens examined had a standard petal less than half the length of the keel, and the upper teeth of the calyx scarcely reach twice the length of the tube.[1]

Again, as with *G. hirsuta* and *G. lanuginosa* noted above, the total area of *G. scorpioides* is apparently included within the S.W. limit of the distribution of *G. triacanthos*, and both 'species' occupy the same ecological habitat. From an evolutionary viewpoint, the existence of distinct but closely related species in such circumstances is unlikely.

G. vepres Pomel from Algeria is very similar morphologically to *G. triacanthos*, differing mainly in its larger leaves. Since it is difficult to decide to which of the above taxa some North African specimens should be assigned, *G. vepres* has been treated as a subspecies of *G. triacanthos* in the present revision.

51. G. cupanii Guss., Cat. Pl. Boccad., 9 (1821).

Low shrub with axillary spines, young branches rather angled, with dense patent hairs. *Leaves* 4–10 × 0·8–1·5 mm, trifoliolate, sessile; leaflets narrowly elliptical, subglabrous or with a few patent hairs. *Flowers* borne in lax terminal racemes, flowering branches sometimes terminated by a spine. *Bracts* c. 2 mm, linear; *bracteoles* c. 1·5 mm, linear, subtending the calyx; *pedicels* 1–2 mm. *Calyx* 4–5 mm, with sparse patent hairs, particularly the teeth; lips subequal to the tube, upper teeth as long as the lip, acute, lower teeth 2/3 the lip, linear. *Standard* c. 8 mm, triangular, glabrous. *Keel* longer than the standard, subglabrous; *wings* as long as the standard, glabrous. *Legume* c. 7 mm, ovoid-acuminate with patent hairs, 1–2 seeded.

[1] In the scale drawings of the floral parts given in Vicioso (1953, lám. viii and ix) the standard length for *G. triacanthos* is depicted as longer than half the length of the keel, whilst the standard petal for *G. scorpioides* is c. 3/4 the keel. Similarly, the calyx teeth do not accord to the lengths claimed for them.

Type material: "Habit in aridis declivatibus meridionalibus et orientalibus Nebrodum, in locis dictis Chozzo dez Predicatore, Rocca di Mele etc." (Herb. Gussone ?) n.v.

Distribution: Endemic to Sicily.

ITALY: Sicily, Etna, sotto la 'Corsa del Bosco', viii 1903, *Cavara* (FI); Montis Nebrodum, v, *Lojacono Pojero* (LIVU); Castelbuoni, 19 vi 1877, *Lojacono Pojero* (FI); Monte Salvadore, Madonie, 17–24 vii 1906, *Martelli* (FI, G); Madonie, v, *Todaro* (FI, G).

52. G. tridens (Cav.) DC., Prodr. 2: 148 (1825).

Syn.: *Spartium tridens* Cav., Ann. Cien. Nat. 4: 59 (1801).
Genista gibraltarica DC., *loc. cit.*
G. juniperina Spach in Ann. Sci. Nat., sér. 3, 2: 275 (1844).

Low shrub with axillary spines, young branches sparsely pubescent. Leaf pulvinules with two persistant spinose stipules. *Leaves* 2–10 × 0·8–1·2 mm, trifoliolate, or simple, sessile, narrowly oblanceolate, or narrowly elliptical, subglabrous. *Flowers* in terminal racemes. *Bracts* 1–2 mm, simple, slender; *bracteoles* 1–2 mm, subtending the calyx; *pedicel* 1–2 mm. *Calyx* c. 4 mm, glabrous; upper lip as long as the tube, upper teeth as long as the lip, lower lip longer than the upper, lower teeth c. 1/2 the lip. *Standard* c. 6 mm, triangular, glabrous; apex slightly retuse, base truncate. *Keel* longer than the standard, glabrous, *wings* as long as the standard, glabrous. *Legume* c. 6 mm, glabrous, ovoid-acuminate, 1–2 seeded.

Type material: not known.

Distribution: Spain: Cádiz. Morocco.

SPAIN: Cádiz, San Roque, vi 1837, *Boissier* (G); Chiclana, *Laguna* (fide Vicioso); Algeciras, *Laguna* (fide Vicioso); Alcalá de los Gazules, *Bourgeau* (fide Vicioso); Arenales del Pinar de Villanueva, 15 v 1946, *Munoz Medina* (K); Mt. Carbonera, supra San Roque et prope Chiclana, 7–19 v 1895, *Porta & Rigo* 114 (MANCH); Sierra de Palma, prope Algeciras, 25 v–10 vii 1887, *Reverchon* (MANCH).

MOROCCO: Tangiers, 1825, *Saltzmann* (G).

Subgenus III. **Spartocarpus** Spach, Ann. Sci. Nat., sér. 3, 2: 240 (1844) emend. P. Gibbs.

Spiny and non-spiny shrubs, with alternate and opposite, or completely opposite branching. Pulvinules prominent. Leaves simple or trifoliolate, alternate, subopposite or opposite, taking 3 vascular traces. Standard broadly ovate, or angular ovate, usually shorter than the keel. Legume usually ovoid-acuminate, 1–2 seeded (oblong and several seeded in 3 species).

Type species: *G. radiata*.

Distribution: Mainly centred in the Balkan peninsula and the east Mediterranean, but with a secondary centre in North Africa, and other species in southern Spain, Balearics, Sardinia and Sicily.

Section 7. **Spartocarpus.**

Syn.: Sect. *Asterospartum* Spach, *loc. cit.*
Sect. *Ephedrospartum* Spach, *loc. cit.*, p. 243.
Sect. *Retamospartum* Spach apud Cosson, Not. Pl. Crit., 154 (1852).

Non-spiny shrubs, with alternate and opposite, or completely opposite branching; leaves simple, or trifoliolate, alternate or opposite; standard broadly ovate, usually shorter than the keel; flowers in racemes or axillary clusters, alternate or opposite; legume ovoid-acuminate, 1–2 seeded.

Distribution: Balkan peninsula, Turkey, S. Spain, North Africa, Balearics, Sardinia and Sicily.

Spach's subg. *Spartocarpus* was comprised of the sects. *Asterospartum*, *Ephedrospartum*, *Echinospartum*, *Cephalospartum*, *Leptospartum* and *Voglera*.

Of these groupings, the latter two have been united (under *Voglera*) and transferred to subg. *Phyllobotrys*, whilst sect. *Echinospartum* has been recognised as a separate genus. Sect. *Asterospartum* has been selected as the typical section of the subgenus, and its name must therefore become sect. *Spartocarpus*. The species of sect. *Ephedrospartum* form a continuous series with those of sect. *Spartocarpus* and the two sections have been united under the latter name.

G. radiata was the first species listed by Spach under sect. *Asterospartum* (i.e. *Spartocarpus*) and since it is a fairly typical species of the section, and there are no other taxa with competing claims for consideration, *G. radiata* has been selected as the type species of this section, and consequently, of the subgenus.

53. G. radiata (L.) Scop., Fl. Carn., ed. 2, 2: 61 (1772).

Syn.: *Spartium radiatum* L., Sp. Pl. 708 (1753).
Cytisus radiatus Koch, Syn. Fl. Germ., ed. 1, 157 (1835).
Cytisanthus radiatus Lang in Flora 26: 769 (1843).

Erect non-spiny shrub with opposite branching, branches strongly ridged and subtended by swollen pulvinules. *Leaves* 5–20 × 1–4 mm, trifoliolate, subsessile, opposite; leaflets narrowly oblanceolate, lower surface with sericeous hairs, upper subglabrous. *Flowers* subopposite, borne in terminal clusters of 4–12. Only the lowermost flowers of the inflorescence subtended by a simple, sometimes trifid, submembranaceous bract; *bracteoles* 1–3 mm linear; *pedicel* c. 1 mm or lacking. *Calyx* 4–6 mm, with sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 8–14 mm, broadly ovate, glabrous or with sericeous hairs. *Keel* as long as or longer than the standard, with sericeous hairs; *wings* as long as the standard, glabrous. *Legume* 7–12 mm, ovoid-acuminate or somewhat compressed, with dense sericeous hairs, 1–2 seeded. 2n: 48 (Santos, 1945).

Type material: specimen no. 891.14 (Savage Catalogue, 1945) in the Linnaean herbarium (holo. LINN).

Distribution: S. Alps extending to E. Switzerland, C. Italy and W. Jugoslavia, and very locally to S.W. Romania and C. Greece. (Map 4).

Two varieties are recognised:

1. var. **radiata.**

Syn.: *G. radiata* var. *leiopetala* Bucheg. in Oesterr. Bot. Zeitschr. 62: 459 (1912).

Standard glabrous or with a narrow median strand of sericeous hairs; *bracteoles* shorter than the calyx tube.

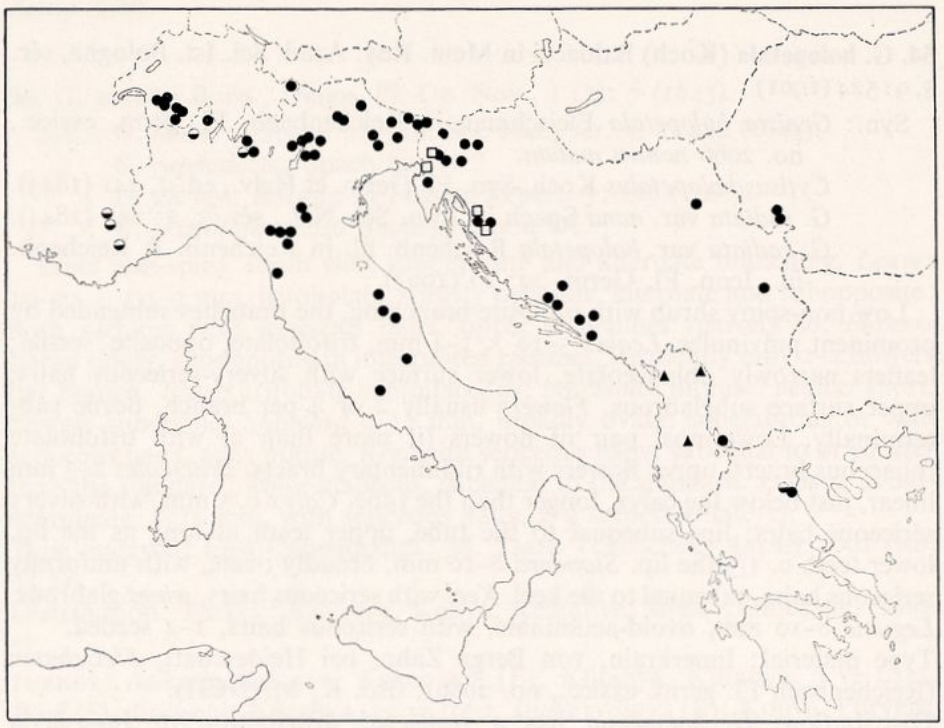
Distribution: Switzerland, Italy, Jugoslavia & Greece.

SWITZERLAND: Alps de Lens, 10 vii–20 ix 1878, *Burnat* (GB); Remüs, vii 1922, *Luzzi* (GB); Ardon, Vallais, 6 vi 1908, *Marret* (C); Vallee de Lizerne, 30 vi 1946, *Villarret* (GB).

ITALY: Piemonte, Supra Primosella, ix 1887, *Chrovende* (FI); Novara ad Campello Monti, *Levier* (FI); Lombardia, Lecco, come dol Nibbio, 4 vi

1956, *Chiarugi, Corradi & Bavazzano* (FI); Bondona, 7 vi 1862, *Ball* (E); Cavardina, 13 vii 1860, *Ball* (E); Trentino-Alto-Adige, Riva, v 1902, *Baenitz* (E, MANCH).

JUGOSLAVIA: Slovenija, Cilli, vi 1909, *Hayek* (E, GB); Idria, *Freyer* (E, MANCH); Raibl., vii 1888, *Jabornegg* (E, MANCH, s); Czernaprst, 25 vii 1884, *Pocharsky* (FI); Croatia, M. Pessen, Istria, 30 vii 1871, *Marchesetti*, (FI); M. Ostro Koplje, 29 v 1819, *Sosket* (S); Cattaro, iv 1876, *Studnicka* (GB); Bosnia Hercegovina, Bez Višegrad, Stolac, 25 viii 1897, *Curačic* (FI); Plitvice, 3 vii 1938, *Lenander* (S); Makedonija, Lidtner Caličica, 25 vi 1938, *Lampberg* 663 (E).



Map 4. Distribution of *G. radiata* ● (var. *sericopetala* ◒), *G. holopetala* □ and *G. hassertiana* ▲.

ROMANIA: Timişoara, Băile Herculane, 19 v 1920, *Borza* (GB, E, S); Domugled? 2 vii 1911, *Kottsby* (GB).

GREECE: Thessalia, M. Olympus, 29 vii 1918, *Orphanides* (E, GB, MANCH, S).

2. var. **sericopetala** Bucheg. in Oesterr. Bot. Zeitschr. 62: 458 (1912).

Standard with uniformly sericeous hairs; *bracteoles* longer than the calyx tube.

Type material: France (Hautes Alpes)—Mont Seuse, près Monteger, 29 vi 1865, *Burle* (iso. F).

Distribution: S.W. France, Italy, Greece.

FRANCE: Hautes Alpes, M. Seuse, 12 vii 1863, *Borel* (FI); Près Monteyer, 7 vii 1867, *Borel* (FI); Gap, à Seuse (Ceuse), 13 vii 1871, *Reverchon* (E, MANCH); Basses Alpes, Montagne de Lure, vii 1866, *Le Jolis* (FI); Aurot, Castellane, 2 vii 1874, *Reverchon* (MANCH).

ITALY: Lombardia, Calobzio Bergamo, 5 vii 1907, *Calegari* (FI); Monte Besegone, *Narducci* (FI).
GREECE: Thessalia, Olympus Thessalae, supra Hagos, 17–29 vii 1857, *Orphanides* (F).

In the protologue for *G. radiata* no earlier Linnaean sources are cited, and there is no reason, therefore, why the specimen in the Linnaean herbarium should not be taken as the type for this species. This specimen has a glabrous standard petal, so that var. *leiopetala* should be referred to var. *radiata*.

No material has been seen of var. *bosniaca* Buchegger (based on a single specimen: Troglav—*Neumayer*), so that it has not been possible to confirm the status of this taxon.

54. G. holopetala (Koch) Baldacci in Mem. Roy. Acad. Sci. Ist. Bologna, sér. 5, 9: 524 (1901).

Syn.: *Genista holopetala* Fleischman in Reichenbach, Fl. germ. exsicc., no. 2066 *nomen nudum*.
Cytisus holopetalus Koch, Syn. Fl. Germ. et Helv., ed. 2, 441 (1843).
G. radiata var. *nana* Spach in Ann. Sci. Nat., sér. 3, 2: 241 (1844).
G. radiata var. *holopetala* Reichenb. fil. in Reichenb. & Reichenb. fil., Icon. Fl. Germ. 22: 16 (1903).

Low non-spiny shrub with opposite branching, the branches subtended by prominent pulvinules. *Leaves* 5–10 × 1–4 mm, trifoliolate, opposite, sessile; leaflets narrowly oblanceolate, lower surface with silvery-sericeous hairs, upper surface subglabrous. *Flowers* usually 2 or 4 per branch, borne subterminally. Lowermost pair of flowers (if more than 2) with trifoliolate foliaceous bracts, upper flowers with rudimentary bracts. *Bracteoles* 2–3 mm linear, just below the calyx, longer than the tube. *Calyx* c. 5 mm, with silvery sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 8–10 mm, broadly ovate, with uniformly sericeous hairs, subequal to the keel. *Keel* with sericeous hairs, *wings* glabrous. *Legume* 8–10 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.
Type material: Innerkrain, von Berge Zahn, bei Heideschaft, *Fleischman* (Reichenbach Fl. germ. exsicc., no. 2066); (iso. K, MANCH).
Distribution: *G. holopetala* has a restricted distribution in Jugoslavia (Slovenija, Croatia). (Map 4).
JUGOSLAVIA: Slovenija, Tergestum, Montis Spaccato, vi, *Justin* (MANCH); In agro Tergestino, Montis Spaccato, *Marchesetti* (C, E, FI, GB, MANCH); Primorsko, Čaven, 9 vii 1959, *Mayer* (LIVU); Monte Čaven, vi 1870, *Rastern* (FI); Croatia, Velebit, montis Mickovice, Krug, 26 vi 1908, *Degen* (C, GB); Montes Velebit, montis Krivi Kuk, ad Sugarska Duliba, 18 vi 1913, *Kümmerle* (C, E, FI, GB, S).

55. G. hassertiana (Bald.) Bucheg. in Oesterr. Bot. Zeitschr. 62: 416 (1912).

Syn.: *G. holopetala* var. *hassertiana* Bald. in Mem. Roy. Acad. Ist. Bologna, sér. 5, 9: 524 (1901).

Non-spiny shrub with opposite branching, the branches subtended by prominent pulvinules. *Leaves* 4–10 × 1–1·5 mm, trifoliolate, opposite; leaflets linear or very narrowly oblanceolate, with sericeous hairs, onvolute. *Flowers* opposite in terminal clusters of 2–4, or sometimes lower pair remote. *Bracts* of lowermost flowers foliaceous; *bracteoles* c. 1 mm, simple, linear;

pedicel lacking. *Calyx* 3–3·5 mm, with sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth very short. *Standard* c. 8 mm, broadly ovate, with uniformly sericeous hairs. *Keel* longer than the standard with sericeous hairs. *Wings* as long as the standard, glabrous. *Legume* c. 9 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Albania: infra Scutari et Resica, 2 vi 1897, *Baldacci* (Iter Albanicum Quintum) (iso. BM).

Distribution: Apparently a rare species with isolated localities in Albania. (Map 4).

ALBANIA: Bei Skodra, v–vi 1916, *Janchen* (LIVU, TCD, W); Mali supatit südlich Elbasan, 1 vii 1924, *Markgraf* 873 (GB); Bei Kruma, 28 iii 1918, *Zerny* (GB).

56. G. aucheri Boiss., Diagn. Pl. Or. Nov., 1 (2): 7 (1843).

Syn.: *G. jaubertii* Spach in Ann. Sci. Nat., sér. 3, 2: 242 (1844).
G. cappadocica Spach *loc. cit*?
G. phrygia Bornm. in Feddes Repert. 3: 129 (1906).
G. sessilifolia sensu Buchegger non DC.

Erect non-spiny shrub with subopposite and alternate branching. *Leaves* 10–20 × 1·5–3 mm, trifoliolate, shortly petiolate, alternate and subopposite; both surfaces with sericeous hairs, upper sometimes sparsely so. *Flowers* borne singly, subopposite in interrupted racemes, frequently only 2–4 flowers per branch. *Bracts* trifoliate subfoliaceous; *bracteoles* minute; *pedicel* short, flowers subsessile. *Standard* 9–12 mm, broadly ovate, subglabrous or with sericeous hairs, apex obtuse. *Keel* with sericeous hairs, subequal to or shorter than the standard; *wings* glabrous, subequal to the standard. *Legume* ovoid-acuminate, 7–10 mm, with sericeous hairs, 1–2 seeded. (Plate 1).

Type material: East Cappadocica: M. Tsara Tchitschek, *Aucher* 1091 (iso. TCD).

Distribution: Turkey: Kütahya, Konya, Kemaliye, Sivas, Gümüşane. (Map 5).

TURKEY: Ankara, Sakarya, *Kuhne* 275 (E); Kütahya, Kütahya, 6 vi 1935, *Wall* (S); Eskişehir-Kütahya, 22 vi 1962, *Dudley* 36072 (E); Konya, Phrygia, supra Akschehr (Akşehir), 10 vi 1899, *Bornmüller* 462 (E); Cihanbeyli, 7 vi 1952, *Davis & Dodds* 18620 (E); Lycoan Taurus, über Korasch, vi 1912, *Siehe* 522 (E, GB); Uber Korasch, *Siehe* 21 (E); Kemaliye, Egin, 20 v 1890, *Sintenis* 2304 (E, GB, FI, MANCH, S); Sivas, Suchehir-Refahiye, 24 vi 1934, *Balls* 1479 (E); Zara-Susehri, 23 vi 1960, *Stainton & Henderson* 5751 (E); Gümüşane, Ad Takya prope Gumusch-Khane, 24 v 1862, *Bourgeau* (C, FI); Ad Euphratem superior, 1834, *Coquebert de Montbret* 2187 (FI, TCD); Sandschak Gumuschkane ad Talaban, 18 vi 1894, *Sintenis* 5880 (E, FI, GB, MANCH, S).

In addition to *G. radiata*, Spach recognised the following three species in sect. *Asterospartum*: *G. aucheri* Boiss., *G. jaubertii* Spach and *G. cappadocica* Spach. Boissier (1872) added *G. sessilifolia* DC. to these.

Examination of a wide range of exsiccatae belonging to this group has shown that only two distinct species can be delimited,[1] and comparison with available type material refers these to *G. aucheri* (isotype material seen)

[1] No material of *G. cappadocica* has been seen.

and *G. sessilifolia* (photograph of the *holotypus* seen). The differential characters of these taxa are tabulated below (see also fig. 6).

	G. aucheri	*G. sessilifolia*
Inflorescence	Interrupted racemes of opposite and subopposite flowers.	Lax racemes of alternate flowers. (Occasional flowers subopposite).
Upper surface of the leaves:	Subglabrous to densely pubescent.	Glabrous.
Length of wing petals:	Subequal to the keel.	Not longer than 2/3 the keel.
Apex of the standard petal:	Obtuse.	Acute.

There are a number of problems associated with this interpretation of *G. aucheri* and *G. sessilifolia*. Buchegger (1919) in his excellent revision of *G. radiata* and allied species briefly reviewed the whole of sects. *Asterospartum* and *Echinospartum*, and he provided a key to all the species of these sections.

In this key, the species *G. aucheri*, *G. jaubertii* and *G. sessilifolia* were recognised. *G. jaubertii* was distinguished from *G. aucheri* and *G. sessilifolia* as follows:

"Flügel halb so lang als das Schiffen, Fahne verne schnabelartig zusammengelegt" (*G. jaubertii*) as opposed to:

"Flügel so lang als das Schiffen, Fahne vorne nicht schnabelartig zusammengelegt" (*G. aucheri* & *G. sessilifolia*). The latter two species were distinguished as follows:

"Blätter beiderseits dicht anliegend behaart, keiliglanzettlich, Teile des Kelchsaumes Kürzer als die Kelchröhre, breit dreieckig, Schiffen mit deutlichemzahn, Flügel spitz" (*G. aucheri*) and:

"Blätter oberseits spärlich behaart oder ganz kahl, lanzettlich, Teile des Kekchsaums so lang als die Röhre, schmal dreieckig, Schiffen vorne abergundet, Flügel ebenfalls abgerunder" (*G. sessilifolia*).

It can be seen, therefore, that Buchegger's view of the group is at variance with the present account not only in the number of species recognised, but also in the characters ascribed to *G. sessilifolia*.

In the original description of *G. jaubertii*, Spach wrote: "Vexillo ovali, retuso, carina obtusa subbreviori, alis paulo longiori" and cited: "In Phrygia, prope Taouchanleu, nec non in Olympo Bithynico legit cl. comes Jaubert!"

It has not been possible to see this type material, but the illustration of *G. jaubertii* in Jaubert & Spach (Ill. Pl. Or. 148, t. 141, 1845) depicts a plant with interrupted racemes of opposite and subopposite flowers, and a wing petal subequal to the keel. These characters refer *G. jaubertii* to *G. aucheri* and it has been reduced to the synonymy of this species in the present revision. The characters ascribed to *G. jaubertii* by Buchegger (see the extract from his key) are those of *G. sessilifolia* (cf. the Table above).

There remains the problem, is there a taxon distinct from *G. aucheri* which is *G. sessilifolia* sensu Buchegger, as delimited in the second part of the key above.

In the exsiccatae that have been examined, the length of the calyx lips relative to the tube was found to vary on some individual specimens within

the limits cited by Buchegger, as long as or shorter than the tube, and consequently this character was of little value. Likewise for many specimens it was difficult to decide whether the apex of the wings should be described as "pointed" or "rounded".

The upper surface of the leaves was found to vary from subglabrous to densely pubescent, and it is of interest to note that there is a tendency for sparse pubescence to be correlated with short standard length (fig. 6). When these specimens were checked for geographical distribution, however, they were found to be distributed at random throughout the geographical range of *G. aucheri*. Consequently, if formal recognition was considered necessary

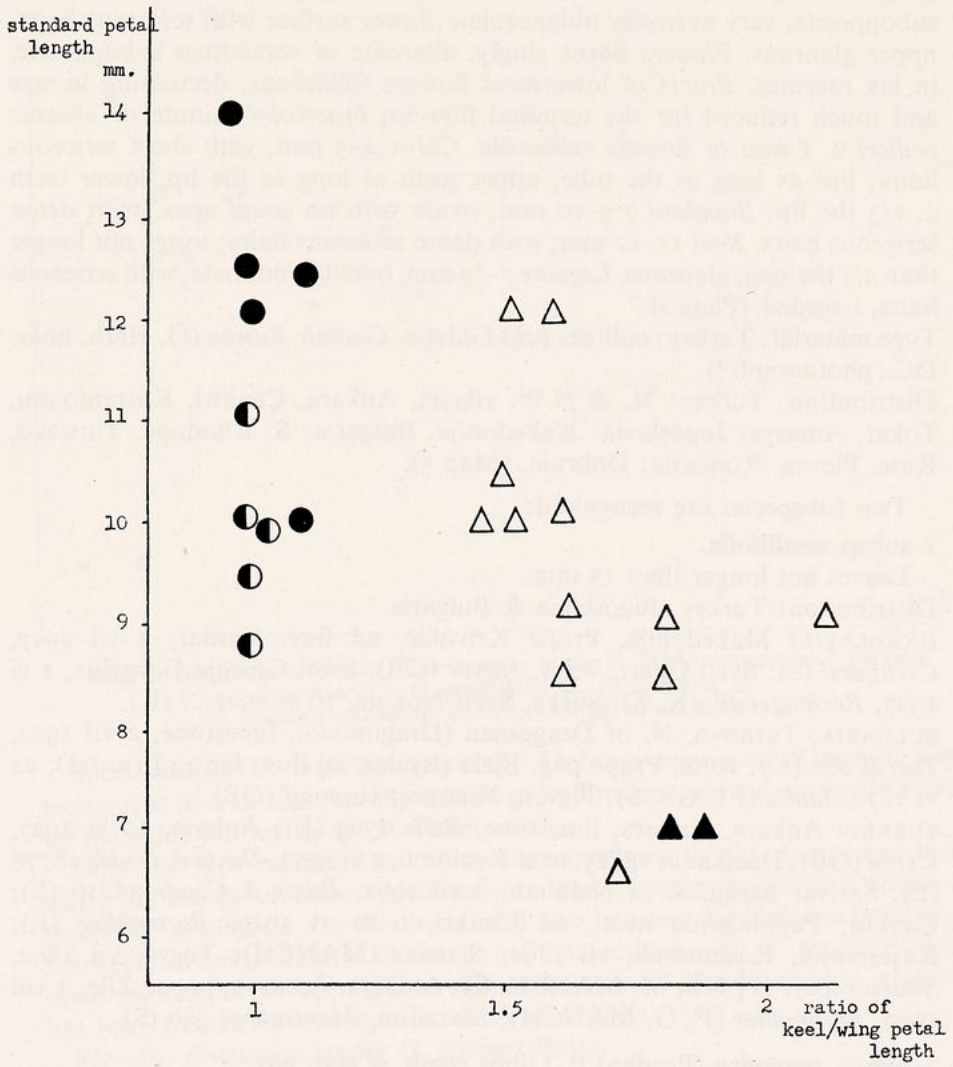


FIG. 6. Correlation of characters in *G. aucheri* and *G. sessilifolia*:

Upper surface of the leaves	*Apex of the standard*	
glabrous	obtuse ○	acute △
sparsely pubescent	obtuse ◐	acute ▲
densely pubescent	obtuse ●	

for these variants, the rank of *varietas* would seem most appropriate. Since, at least from information from herbarium labels, no ecological correlation is indicated, and since there tends to be a more or less continuous gradation in leaf pubescence from subglabrous to densly pubescent ones, no formal recognition has been given in the present account.

It would seem, therefore, that no taxon equivalent to *G. sessilifolia* sensu Buchegger can be recognised.

57. G. sessilifolia DC. Mem. Legum. 6: 208 (1825).

Syn.: *G. trifoliata* Janka, Oesterr. Bot. Zeitschr. 23: 243 (1873).
G. jaubertii sensu Buchegger non Spach.

Erect non-spiny shrub with opposite and subopposite branching. *Leaves* 5–25 × 1–2·5 mm, trifoliolate, sessile or shortly petiolate, alternate and subopposite, very narrowly oblanceolate; lower surface with sericeous hairs, upper glabrous. *Flowers* borne singly, alternate or sometimes subopposite, in lax racemes. *Bracts* of lowermost flowers foliaceous, decreasing in size and much reduced for the terminal flowers; *bracteoles* minute or absent; *pedicel* c. 1 mm or flowers subsessile. *Calyx* 4–5 mm, with short sericeous hairs; lips as long as the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* 7·5–10 mm, ovate with an acute apex, with dense sericeous hairs. *Keel* 11–12 mm, with dense sericeous hairs; *wings* not longer than 2/3 the keel, glabrous. *Legume* 7–10 mm, ovoid-acuminate, with sericeous hairs, 1-seeded. (Plate 2).

Type material: Turkey: collines près Galatie, *Casimir Rostan* (G, Herb. holo. DC., photograph !)

Distribution: Turkey: N. & N.W. vilayet, Ankara, Çankiri, Kastamonou, Tokat, Amasya. Jugoslavia: Kakedonija. Bulgaria: S. Rhodope, Turnovo, Ruse, Pleven. Romania: Dobruja. (Map 5).

Two subspecies are recognised:

1. subsp. **sessilifolia.**

Leaves not longer than 15 mm.

Distribution: Turkey, Jugoslavia & Bulgaria.

JUGOSLAVIA: Makedonija, Prope Krivolac, ad fluv. Vardar, 2 vii 1927, *Černijarsi* (S); Sveti Ojieri, Veles, *Hayer* (GB); Sveti Gjorgje Gevgelija, 1 vi 1927, *Rechinger fil.* (K, S); Soška, Sveti Nokola, 10 vi 1922, ? (K).

BULGARIA: Turnovo, N. of Dragoman (Dragonovo), limestone, 2 vii 1922, *Turrill* 682 (K); Ruse, Prope pag. Bjela (Byala), ad fluv. Jantra (Yantra), 22 vi 1872, *Janka* (FI, GB, S); Pleven, Nikopol, *Urumoff* (GB).

TURKEY: Ankara, Ankara, limestone, *Balls* 2364 (E); Ankara, 12 vi 1927, *Cyrén* (GB); Hacikadin valley, near Keciören, 2 vi 1952, *Davis & Dodds* 18778 (E); Sarivar baraji, S. of Nallihan, 8 vii 1962, *Davis & Coode* 37216 (E); Çankiri, Paphlagonia aust., ad Cankri, 6–16 vi 1929, *Bornmüller* (E); Kastamonu, Kastambuli, vii 1892, *Sintenis* (MANCH); Tosya, vii 1892, *Sintenis* 4192 (F, GB, M, MANCH, S); Amasya, Amasya, prope Zîle, 4 viii 1889, *Bornmüller* (F, G, MANCH); Merzifon, *Manisadjan* 886 (S).

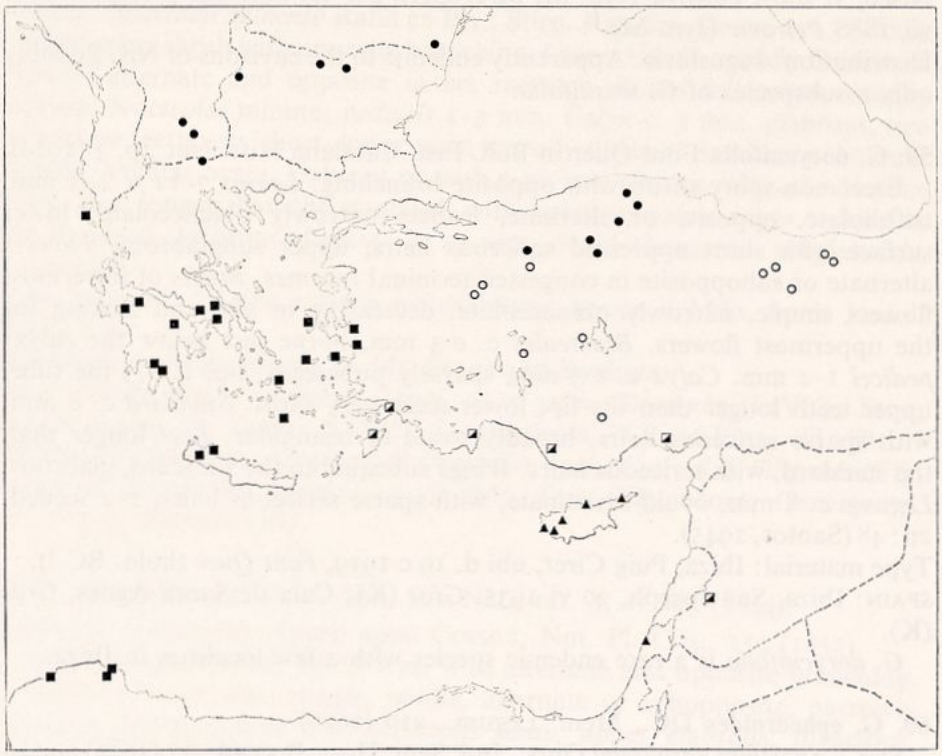
2. subsp. **romanica** (Prodan) P. Gibbs **comb. et stat. nov.**

Syn.: *G. trifoliata* var. *romanica* Prodan in Bul. Grăd. Bot. Cluj 5: 39 (1925).
G. romanica Prodan Fl. Det. Descr. România, ed. 2, 506 (1939).

Leaves 12–25 mm.

Type material: Romania, Caliacra: prope Simionava, *Prodan* (Fl. Rum. Exsic. no. 573) (iso. C, K, S).
Distribution: Dobruja region of Romania.
ROMANIA: Caliacra, Cavaina, 13 vii 1931, *Skotsky* (GB).

Material from Jugoslavia, Bulgaria and Romania has been described as a distinct species *G. trifoliata* by Janka. Specimens from these areas, however, are not distinguishable from those of *G. sessilifolia* from Turkey, and *G. trifoliata* must be regarded as conspecific with this species, even though *G. sessilifolia* in this sense has a rather disjunct distribution.



Map 5. Distribution of subg. *Spartocarpus* in the E. Mediterranean and Turkey. *G. aucheri* ○, *G. sessilifolia* ●, *G. fasselata* ▲, *G. acanthoclada* subsp. *acanthoclada* ■, subsp. *echinus* ◪.

Specimens of *G. trifoliata* from the Dobruja region of Romania were recognised as a distinct variety *romanica* by Prodan, and subsequently raised by the same author to specific level.

Only the type material and one other specimen of this taxon has been seen; the leaves of these specimens are considerably larger than those of typical *G. sessilifolia*. On this basis, and also because the Dobruja presents a markedly different habitat to that usually associated with *G. sessilifolia* (flat open marshland as opposed to mountain terrain) the Romanian material has been treated as a subspecies of *G. sessilifolia*.

See also discussion under *G. aucheri* Boiss.

58. G. nissana Petrovic, Add. Fl. Ag. Nyss., 51 (1885).

Erect densely pubescent shrub with alternate and subopposite branching. *Leaves* 5–15 × 1–4 mm, trifoliolate, sessile, subopposite and alternate;

leaflets narrowly oblanceolate with dense sericeous to patent hairs on both surfaces. *Flowers* borne in lax racemes. *Bracts* at least of the lowermost flowers foliaceous; *bracteoles* linear; *pedicels* 1–2 mm. *Calyx* c. 5 mm, with dense sericeous to patent hairs; lips shorter than the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* c. 7–10 mm, triangular, with dense sericeous hairs, much shorter than the keel. *Keel* with dense sericeous hairs, *wings* glabrous. *Legume* c. 7 mm, ovoid-acuminate, with dense sericeous hairs, 1–2 seeded.

Type material: Jugoslavia (Makedonija): Ad Gorica, non procul ad oppido Nisch, vi 1887, *Petrovic* (syn. M, MANCH). Servie: buissons près de Nisch, vii 1888 *Petrovic* (syn. M).

Distribution: Jugoslavia. Apparently endemic to the environs of Niš. Possibly only a subspecies of *G. sessilifolia*.

59. G. dorycnifolia Font Quer in Bull. Inst. Catalana Hist. Nat., p. 3 (1920).

Erect non-spiny shrub with opposite branching. *Leaves* 7–12 × 1–3 mm, trifoliolate, opposite or alternate, leaflets narrowly oblanceolate; lower surface with short appressed sericeous hairs, upper subglabrous. *Flowers* alternate or subopposite in congested terminal racemes. *Bracts* of lowermost flowers simple, narrowly oblanceolate, decreasing in size and lacking for the uppermost flowers. *Bracteoles* c. 0·5 mm, borne just below the calyx; *pedicel* 1–2 mm. *Calyx* c. 2·5 mm, sparsely pubescent; lips c. 1/3 the tube, upper teeth longer than the lip, lower teeth very short. *Standard* c. 8 mm, with sparse sericeous hairs, broadly ovate to triangular. *Keel* longer than the standard, with sericeous hairs. *Wings* subequal to the standard, glabrous. *Legume* c. 8 mm, ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded. 2n: 48 (Santos, 1945).

Type material: Ibiza, Puig Cirer, ubi d. 19 c 1919, *Font Quer* (holo. BC !).

SPAIN: Ibiza, San Joseph, 20 vi 1935, *Gros* (K); Cala de Santa Agnes, *Gros* (K).

G. dorycnifolia is a rare endemic species with a few localities in Ibiza.

60. G. ephedroides DC., Mem. Legum., 210 (1826).

Syn.: *Spartium gasparrini* Guss., Ind. Sem. Hort. Boccad., 11 (1825) *nomen nudum*.

Genista numidica Spach in Ann. Sci. Nat., sér. 3, 2: 244 (1844).

Non-spiny shrub with opposite and subopposite branching. *Leaves* 4–15 × 1–2 mm, trifoliolate, alternate or subopposite, fugaceous; leaflets oblanceolate, both surfaces with sparse sericeous hairs. *Flowers* alternate or subopposite in lax racemes. *Bracts* foliaceous, lowermost trifoliolate, uppermost simple; *bracteoles* up to 1 mm, borne just below the calyx; *pedicel* 1–2 mm. *Calyx* 3–6 mm, with sericeous hairs; lips less than the tube, upper teeth subequal to the lip, lower teeth c. 1/3 the lip. *Standard* 7–10 mm, broadly to angular ovate with sparse sericeous hairs. *Keel* longer than the standard, with sericeous hairs, *wings* as long as the standard, glabrous. *Legume* c. 10 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Sardinia—Sarda, *Soleirol* (herb. DC., G, ?) n.v.

Distribution: Sardinia, Sicily and associated islands, Algeria.

ITALY: Campania, Ponza-Lemafozo, 27 iv 1900, *Beguinot* (FI); Sicily, Insula Lipari, 29 v 1933, *Bornmüller* 511 (S); Insula Vulcano, vi 1801, *Borzi* (FI, MANCH); Monte Gallo, prope Panorum, 10 vii 1840, *Heldreich* (FI, S);

Sferracavallo, E. of Palermo, v, *Lojacono Pojero* (MANCH); Isnello, apricis Nebrodum, 19 vi 1855, *Pavillon* (FI); Sardinia, Tachti di Portoesme, 8 iv 1896, *Martelli* (F); Isola di Antioco, 26 iv 1893, *Martelli* (FI); Cagliari, 14 iv 1894, ? (FI, MANCH); Tempio, 5 v–26 vi 1881, *Reverchon* (MANCH).
ALGERIA: Près de la Colette, 26 v 1904, *Albert* (MANCH); Philippeville, 1853, *Balansa* 1919 (S); Bougie, 19 iv 1925, *Hauptman* (S); Aux Caroubiers, à Bône, 22 iv 1866, *Tribout* (MANCH).

61. G. aetnensis (Rafin. ex Biv.) DC., Prodr. 2: 150 (1825).

Syn.: *Spartium aetnense* Rafin ex Biv., Stirp. Rar. Sic. Descr. 2: 13 (1814).

Non-spiny shrub with opposite branching. *Leaves* simple, rapidly fugacious. *Flowers* alternate and opposite in lax racemes. *Bracts* foliaceous, usually lacking; *bracteoles* minute; *pedicels* 1–3 mm. *Calyx* c. 3 mm, glabrous, lips and upper teeth very short, lower teeth scarcely distinct. *Standard* c. 10 mm, broadly angular ovate, glabrous or with a narrow median ridge of sericeous hairs. *Keel* longer than the standard, with sericeous hairs; *wings* as long as the standard, glabrous. *Legume* c. 10 mm, ovoid-acuminate, subglabrous, 1–2 seeded.
Type material: "Aetne regione pedemontana, prope il Milo, floret Junio" Herb. ? n.v.
Distribution: Sicily (slopes of Mt. Etna) and Sardinia.
ITALY: Sicily, Etna, southern slopes, 15 v 1960, *Brummitt* (LIVU); Etna, eastern slopes, vii, *Todaro* (LIVU); Linguaglossa, N.E. of Etna, viii 1881, ? (MANCH); Sardinia, Altipiano di Orgosolo, 1956, *Corradi & Filigeddu* (FI); Lougo di Giume des Osiniri, 15 vii 1887, *Fiori* (FI); Monte Genergenta, 30 vi 1894, *Martelli* (FI).

62. G. spartioides Spach in Ann. Sci. Nat., sér. 3, 2: 243 (1844).

Syn.: *G. retamoides* Spach apud Cosson, Not. Pl. Crit., 153 (1852).

Erect non-spiny shrub up to 1 m, with alternate and opposite branching. *Leaves* 3–7 × 2–3 mm, simple, sessile, alternate or subopposite, narrowly elliptical; lower surface with sericeous hairs, upper glabrous, fugacious. *Flowers* borne singly or in clusters in racemes. *Bracts* linear; *bracteoles* lacking; *pedicel* c. 1 mm. *Calyx* 2·5–4 mm, with short sericeous hairs; lips shorter than the tube, upper teeth as long as the lip, lower teeth very short. *Standard* c. 8 mm, broadly angular ovate, glabrous or with a narrow ridge of sericeous hairs. *Keel* longer than the standard, with sericeous hairs; *wings* as long as the standard, glabrous. *Legume* c 8 mm, ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded.
Type material: Algeria (Oran): "prope Oran, *Durieu*" (Herb ?) n.v.
Habitat: Arid hillsides and lower mountain slopes.
Distribution: Spain, S. & S.E. provinces: Algeria, Morocco.
SPAIN: Granada, Albuñol, 21 iv 1929, *Gros* (MA); Lanjarón, 16 vi 1926, *Sandwith & Ellman* 684 (MA); Almería, Sierra de Alhamilla and Sierra de Cabo de Gata, v 1890, *Porta & Rigo* (LIVU, MA, MANCH); Velez Rubio, v 1899, *Reverchon* (MANCH); Málaga, Completa, 2 vi 1931, *Ceballos* (MA); Frigiliana, vii 1911, *Gros* (MA); Sierra Almijara, 10 iv 1936, *Laza* (MA).
MOROCCO: Melilla, Barco de Hidum, 27 ii 1933, *Mauricio* (Sennen 8746) (MA); Massifs de Kebdana, 12 vi 1934, *Sennen & Mauricio* 9315 (MA); Muley-Rashid, 6 v 1934, *Sennen & Mauricio* 9316 (MA).

ALGERIA: Falaises à l'est de la batterie espagnole, 20 i–9 v 1852, *Balansa* (MA); Les Andalouses, près Oran, 23 iv 1911, *Faure* (MA, S).

There has been some confusion over the grouping of *G. spartioides* and allied species. Spach included the following species in sect. *Ephedroides*: *G. spartioides*, *G. ephedroides*, *G. numdica* and *G. gasparrini*.

Cosson (1852), based on notes by Spach, described sect. *Retamospartum* with the diagnosis: "Caractérisée par les fleurs fasciculées en petites grappes laterales, aphylles assez denses, sessiles ou subsessiles." In this section he placed a new species, *G. retamoides*. together with *G. spartioides*, *G. ephedroides*, etc.

G. retamoides was distinguished from *G. spartioides* by two characters, namely, branches subterete, not evidently angled, and legume sparsely pubescent. These characters are in fact shared by specimens of *G. spartioides*, and no differential characters have been discerned between material of this species and specimens which have been determined as *G. retamoides* by different collectors.

Consequently, as noted by Vicioso (1953) sect. *Retamospartum* is superfluous and *G. retamoides* must be regarded as a synonym of *G. spartioides*. Vicioso followed Pau in recognising *retamoides* as a variety of *G. spartioides* but no differential characters were given and this taxon has not been accepted in the present revision.

63. G. haenseleri Boiss., Elenchus, 31 (1838).

Erect non-spiny shrub with alternate and opposite branching. *Leaves* c. 6 × 3 mm, alternate, shortly petiolate, elliptical or narrowly oblanceolate, with sericeous hairs on both surfaces. *Flowers* in clusters of 2–5 on short lateral branches. *Bracts* foliaceous, fugaceous; *bracteoles* lacking; *pedicel* 2–3 mm. *Calyx* c. 6 mm, subinflated, with short sericeous hairs; lips as long as or longer than the tube, upper teeth as long as the lip, lower teeth c. 1/3 the lip. *Standard* c. 11 mm, angular ovate, with a median strand of sericeous hairs. *Keel* longer than the standard, with sericeous hairs; *wings* as long as the standard, glabrous. *Legume* c. 8 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Spain (Málaga): "in montibus calidis inter Monda et Ojen et prope Estepona" *Boissier* (iso. K).

Habitat: arid hillsides.

Distribution: Spain prov. Málaga. Endemic to the Sierra de Estepona and neighbouring sierras.

SPAIN: Málaga, Sierra de Marbella, 16 v 1919, *Gros* (MA); In collibus inter Monda et Ojen, 13 v 1926, *Gros* (K, MA, S); Sierra Blanca, Ojéis, 5 vi 1952, *C. Vicioso* (MA); Cádiz, San Roque y Gibraltar (fide Vicioso); Granada, Lanjarón, *Laguna* (fide Vicioso).

Although not a spiny species, *G. haenseleri* was included in sect. *Erinacoides* (subg. *Genista*) by Willkomm (1877). Pellegrin (1908) noted that *G. haenseleri* differed anatomically from the other species of this section, and Vicioso (1953) placed this species in a new section *Cytisospartium* together with *G. tejedensis*.

Sect. *Cytisospartium* must be rejected, however: as noted under *G. lobelii*, *G. tejedensis* comprised the Spanish populations of this former species, whilst the nature of the floral parts (*of.* fig. 4.2), the ovoid-acuminate 1 seeded

legume and partly opposite branching refer *G. haenseleri* to subg. *Spartocarpus*.

Section 8. **Acanthospartum** Spach in Ann. Sci. Nat., sér. 3, 2: 247 (1844).

Spiny shrubs with opposite branching. Leaves trifoliolate, opposite or alternate. Standard broadly angular ovate, shorter or longer than the keel. Flowers borne singly, alternate or opposite. Legume ovoid-acuminate, 1–2 seeded.

One species, *G. acanthoclada*, is included in sect. *Acanthospartum*. *G. fasselata* was also placed in this section by Spach, but this taxon has been located in a distinct section in the present revision. (See discussion under sect. *Fasselospartum*).

64. G. acanthoclada DC., Mem. Legum. 6: 208 (1825).

Syn.: *Spartium horridum* Sibth. & Smith, Fl. Graec. Suppl. 2: 54 (1812) *non* Vahl.
Genista alpini Spach in Ann. Sci. Nat., sér. 3, 2: 247 (1844).
G. bruguieri Spach *loc. cit.* p. 248.
G. peloponesiaca Spach *loc. cit.* p. 249.

Shrub with opposite branching, the branches terminated by a small cartilaginous spine. *Leaves* 5–10 × 1–3 mm, subsessile, trifoliolate, alternate or opposite; leaflets narrowly oblanceolate with short sericeous hairs on both surfaces. *Flowers* borne singly, alternate or opposite towards the ends of new branches. *Bracts* foliaceous, lowermost trifoliolate, uppermost simple. *Bracteoles* c. 1 mm or less; *pedicel* 0–3 mm. *Calyx* 2·5–5 mm, subglabrous or with sparse sericeous hairs; lips subequal to the tube, upper teeth as long as the lip, lower teeth very short. *Standard* 7–14 mm, broadly or angular ovate, with sericeous hairs. *Keel* longer than or shorter than the standard, with sericeous hairs *Wings* ass long as the standard, glabrous. *Legume* c. 9 mm ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Turkey/Greece: "Tschesme"—*Olivier & Brugière* (G ?) n.v.

Distribution: East Mediterranean. Greece (Ionian Isles, Peloponese, Attica, Aegean Isles, Dodecanese), Turkey, Syria and Libya.

Two subspecies are recognised:

1. subsp. **acanthoclada.**

Standard 6–10 mm, shorter than the keel, claw 1–2 mm wide. *Pedicel* 0–2 mm.

Distribution: Greece and the Aegean region, W. Turkey and Libya.

GREECE: Attica, Dhekelia, 1888, *Halácsy* (E); Attiki, vi 1848, *Heldreich* (E); Prope Thoriko, 10 v 1885, *Heldreich* (E); Prope Athenai, 22 v 1850, *Orphanides* (E, MANCH); Evvoia, Kandhilou Oros, above Prokopion, 20 vi 1956, *Rechinger fil.* 18192 (LIVU); Peloponese, Morea, prope Xerocampas, vi 1876, *Pichler* (MANCH); Lakonia Krokeai, 7 vi 1958, *Rechinger fil.* 19993, (E); Karinthos, Argos, 6 vi 1958, *Rechinger fil.* (LIVU); Ionian Isles, Corfu, Spagus, 7 vi 1891, *Bicknell* (LIVU); Aegean Isles, Khíos, 29 vi 1939, *Platt* 305 (K); Sporadhes, Ikaría, 24 vii 1887, *Forsyth* (E); Samos, prope Tigani, 2 iv 1934, *Rechinger fil.* 3629 (K); Kikladhes, Anafi, *Gill* (LIVU); Naxos, 1843–44, *Heldreich* (E); Crete, Akrotiri, 2 vi 1883, *Reverchon* (E, MANCH); Kissamos, 5 vi, 1884, *Reverchon* (E, MANCH).

LIBYA: Cirenaica, 2 ml S.W. of Derna, 22 vii 1951, *Gimingham* (K); Tolmehta,

Sidi Dachil, 23 iv 1933, *Pampanini* (K); Merzott, 21 v 1958, *Park* 545 (K); Wadi Derna, 8 iv 1939, *Sandwith* 2471 (K).

TURKEY: Izmir, Sedikoi, S. of Smyrne, 13 vii 1854, *Balansa* (K); Smyrna, *Whittall* (E); Muğla, Matas to Bodrum, 26 v 1962, *Dudley* 35002 (E).

2. subsp. **echinus** (Spach) Vierhapper in Ver. Zool.-Bot. Ges. Wien 69: 162 (1919).

Syn.: *G. echinus* Spach in Ann. Sci. Nat., sér. 3, 2: 249 (1844).

Standard 9–12 mm, as long as or longer than the keel; width of the claw not more than 1 mm. *Pedicel* 0·5–4 mm.

Type material: "Ad Cariae (vil. Muğla) littora, prope Megri, *Clarke* (Herb. cl. Webb)." (FI ?) n.v.

Distribution: S.W. & S. Turkey; Rhodes; Syria.

GREECE: Rhodes, Vallée de Bastia, 17 v 1870, *Bourgeau* (E, W); Embana, 15 v 1935, *Rechinger fil.* 7272 (K).

TURKEY: Muğla, Marmaris to Emecik, 25 iii 1956, *Davis & Polunin* 25,341 (E); Antalya, Atbükü, Antalya-Finike, 7 v 1936, *Tengwall* 534 (K); Merşin, Boulouki, N. of Merşin, 3 v 1855, *Balansa* (E, K); Anamur-Gilindre, 14 iv 1956, *Davis & Polunin* 25,972 (E).

SYRIA: Wadi Karudil, 8 vi 1938, *Dinsmore* (K).

Spach recognised a number of species in sect. *Acanthospartum* which the author has followed Vierhapper in reducing to the synonymy of *G. acanthoclada*.

Vierhapper recognised two subspecies of *G. acanthoclada*, subsp. *echinus* with two *formae—tenuior* and *rhodica*, and subsp. *graeca* with three *formae—bruguieri*, *alpini* and *micropetala*. In the exsiccatae of this group that have been examined only the characters of the two subspecies are correlated with any constancy, and the *formae* have been rejected.

One of Vierhapper's subspecies must be referred to the typical element of the species: it has not been possible to examine the type specimen of *G. acanthoclada*, but De Candolle cited two specimens, one from "Tchesme" (locality not traced—Greece or N.W. Turkey ?) and another simply labelled "Greece". De Candolle also refers to another specimen from Greece collected by D'Urville.

It would seem, therefore, that when he delimited *G. acanthoclada* De Candolle had not seen any material from southern Turkey, and it is proposed to refer Vierhapper's subsp. *graeca* to the typical element. The correct epithet for the long flowered form from S. Turkey is then subsp. *echinus*.

Section 9. **Fasselospartum** P. Gibbs, **sect. nov.**

Frutices ramosissimi, ramis et ramulis alternis vel oppositis, rigidis, spinis axillaribus. Folia simplicia vel trifoliolata. Flores solitarii vel fasciculati in ramulis novellis et spinis lateralibus. Vexillum angulare ovatum, carina brevius. Legumen ovato-acuminatum, 1-vel 2-spermum.

Stout much branched shrubs with recurved axillary spines. Leaves simple or trifoliolate. Flowers borne singly or in clusters on new branches and spines. Standard broadly angular ovate, shorter than the keel. Legume ovoid-acuminate, 1–2 seeded.

One species: G. fasselata Decne.

G. fasselata was included in sect. *Acanthospartum* by Spach who also made the unwarranted name change to *G. sphacelata*. There are a number of character differences between *G. fasselata* and *G. acanthoclada* which are

tabulated below, and on the basis of these it is considered preferable to include *G. fasselata* in a distinct section.

G. acanthoclada	*G. fasselata*
Branching opposite, branches terminated by a small spine.	Branching alternate, with axillary spines.
Pulvinules swollen and prominent.	Pulvinules black and scale-like.
Standard with sericeous hairs.	Standard glabrous.

65. G. fasselata Decne. in Ann. Sci. Nat., sér. 2, 4: 360 (1835).

Syn.: *G. sphacelata* Spach in Ann. Sci. Nat., sér. 3, 2: 250 (1844).

Erect stoutly spined shrub up to 3 m, but usually less than 1 m, spines recurved and axillary. *Leaves* 3–15 × 1–3 mm, simple or trifoliolate, alternate, fugaceous, narrowly oblanceolate, with appressed sericeous hairs on both surfaces. *Flowers* borne singly or in clusters on the spines and branches. *Bracts* foliaceous; *bracteoles* minute; *pedicels* 2–3 mm. *Calyx* 4–5 mm, glabrous; lips less than the tube, upper teeth longer than the lip, lower teeth c. 1/3 the lip. *Standard* 6–7 mm, broadly angular ovate, glabrous. *Keel* longer than the standard with sparse sericeous hairs. *Wings* as long as the standard, glabrous. *Legume* ovoid-acuminate, with sparse sericeous hairs, 1–2 seeded.

Type material: Israel: Mount Carmel, Haifa, 1832, *Bové* (iso. K).

Distribution: Cyprus, and apparently the isolated locality in Israel, Mount Carmel. Also Greece: Karpathos, Kasos.

GREECE: Chio (Chios ?) sub. *G. scorpius*, *Aucher Eloy* 1087 (K).

CYPRUS: Kyrenia, 5 vii 1955, *Atherton* (K); Paphos-Kitinia, 15 viii 1933, Foggie (E); Troodos, 21 vi 1939, *Linberg* (K); Montibus inter Pentedactylos et Epietos, 26 v 1880, *Sintenis & Rigo* (K, MANCH).

ISRAEL: Mount Carmel, 9 v 1913, *Dinsmore & Meyers* 913 (E); Mount Carmel, 12 x 1951, *Zohary & Amdursky* (E, K).

Section 10. **Cephalospartum** Spach in Ann. Sci. Nat., sér. 3, 2: 254 (1844) emend. P. Gibbs.

Syn.: Sect. *Lasiospartum* Spach *loc. cit.*, p. 141 (1845).

Non-spiny shrubs with alternate or opposite branching. Leaves simple or trifoliolate. Inflorescence capitate. Standard broadly ovate, or triangular, or ovate with an acute apex, as long as or less than the keel. Legume ovoid-acuminate, 1–2 seeded, or narrowly oblong, several seeded.

Type species: *G. cephalantha*.

Distribution: Predominantly North Africa, from Morocco to Libya, but with one species distributed in S. Spain.

A perplexing and possibly heterogenous grouping; the species of sect. *Cephalospartum* are united principally by the characters of capitate inflorescence and partly opposite branching. Several species, however, exhibit a mixture of the characters which serve to distinguish the other sections and subgenera of *Genista*. For example, *G. clavata* and *G. umbellata* have the standard petal as long as the keel and a narrowly oblong legume as in subg. *Genista*. *G. clavata* has trifoliolate leaves, however, whilst *G. umbellata* is unifoliolate. *G. quadriflora* likewise has the narrowly oblong several seeded legume of subg. *Genista*, but in this species the standard petal is broadly angular ovate and shorter than the keel as in subg. *Spartocarpus*.

G. capitellata with its triangular standard petal, and particularly *G. cephalantha* which has an ovate standard petal with an acute apex, resemble species of sect. *Voglera*, but these two species, like the remainder of sect. *Cephalospartum*, have leaves taking three vascular traces instead of one trace as in sect. *Voglera* (cf. Pellegrin, 1908).

It is not possible to more than speculate on the relationships of the species of sect. *Cephalospartum*. Possibly they are ancient taxa retaining the characters which later became distinctively correlated in the sections of the three subgenera. Or possibly they are derived from several sections of the genus which have developed parallel facies due to adaptation to markedly xerophytic conditions. Certainly, the section as comprised in the present revision cuts across the sectional characters found elsewhere in the genus, and this grouping of North African species would probably repay further detailed study.

66. G. cephalantha Spach in Ann. Sci. Nat., sér. 3, 2: 254 (1844).

Erect non-spiny shrub with alternate or subopposite branching, the branches deeply ridged and quadrangular. Leaf pulvinules persisting and bearing two spinose stipules. *Leaves* 10–15 × 3–4 mm, simple, sessile, oblanceolate, both surfaces with sericeous hairs, upper sparsely so. *Inflorescence* capitate with 5–10 flowers. *Bracts* subfoliaceous, lanceolate; *bracteoles* linear; *Calyx* c. 7 mm with sericeous hairs, especially on the teeth; lips as long as the tube, upper teeth and lower teeth as long as the lip. *Standard* 10–11 mm, ovate with an acute apex, subglabrous. *Keel* as long as the standard, with sericeous hairs along the ventral suture. *Wings* as long as the standard, glabrous. *Legume* ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Algeria, Oran, *Bové* (syn. K).

Distribution: Morocco and Algeria. Coastal ranges.

MOROCCO: Melilla a Hidum, 7 iv 1932, *Mauricio* (G).

ALGERIA: Oran, Santa Cruz, 24 iv 1913, *Alleizette* (CLF); Oran, Djebel Santo, iv 1921, *Alleizette* (LD, M); Oran, 20 ii–12 vi 1852, *Balansa* (K); Santa Cruz, 1839, *Bové* (K).

67. G. demnatensis Cosson ex Murb. in Lunds Univ. Årsskr. NF., Bd. 18 3: 55 (1922).

Erect non-spiny shrub with opposite and alternate recurved branching, young branches terete and lightly ridged. Leaf pulvinules persistant and bearing two spinose stipules. *Leaves* c. 7 × 2 mm, simple, sessile, narrowly oblanceolate, with dense sericeous hairs on both surfaces. *Inflorescence* capitate with 8–10 flowers. *Bracts* linear with dense patent pubescence; *bracteoles* lacking. *Calyx* c. 6 mm, with dense patent pubescence; lips as long as the tube, upper and lower teeth as long as the lips. *Standard* c. 10 mm, broadly ovate, subglabrous, apex retuse. *Keel and wings* as long as the standard, keel with sparse hairs, wings glabrous. *Legume* ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: Morocco (Prov. Demnat): Djebel Tahallate, 18 vi 1882, *Ibrahim* (holo. LD, iso. K).

Distribution: Morocco, Haut Atlas (Demnat). S. Spain?

MOROCCO: Idemez-Demnate, Ait Touthin, 9 vii 1936, *Balls* (K); Demnate-Imi N'Ifri, 22 v 1921, *Murbeck* (LD); High Atlas, near Demnate, 20 iii 1958, *Whiting & Richmond* 89 (K).

One specimen of this species has been seen from Spain: Málaga-Sierra de Tolox, vi 1920, Herb. *Alleizette* (CLF). It has not been possible to trace any other reference to the occurrence of *G. demnatensis* in Spain so that this record requires confirmation.

68. G. microcephala Cosson in Bull. Soc. Bot. Fr. 3: 738 (1856).

Syn.: *G. tripolitana* Bornm. in Magyar Bot. Lapok. 33: 83 (1934).

Erect non-spiny shrub with opposite and alternate branching, branches terete, lightly ridged. *Leaves* 7–10 × 1·5–3 mm, simple, alternate or opposite with appressed hairs on both surfaces. Leaves fugacious, but stipules sometimes spinescent and persisting. *Inflorescence* capitate, with 4–8 flowers. *Bracts* and *bracteoles* linear-lanceolate, densely pubescent. *Calyx* c. 7 mm, with dense, patent, silky hairs; lips longer than the tube, upper teeth as long as the lip, lower teeth c. 2/3 the lip. *Standard* c. 12 mm, broadly ovate, with a sparse median ridge of hairs. *Keel and wings* subequal to the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 7 mm, ovoid-acuminate, with sericeous hairs, 1–2 seeded.

Type material: *Balansa*, Pl. Alg. Exsiccata no. 1018 (Herb. ?) n.v.

Distribution: Algeria and Libya. Coastal ranges.

ALGERIA: El Kantara, 19 iv 1937, *Alston & Scorpin* 37,322 (K); Près Biskra, 18 v 1853, *Balansa* (K); Ain-Ajagout (Constantine), 18 v 1853, *Cosson* (K); Djebel-Djellas, Djelfa, v 1857, *Reboud* (K).

LIBYA: Ghargan, Tripolitania, 13–20 iv 1933, *Bornmüller* 703 (K, LD); Ghargan, Jallilia, *Keith* 607 (K); Tarhuna, Jebel el Msid, 23 iv 1939, *Sandwith* 2750 (K); West of Homs, 27 iii 1939, *Sandwith* 2047 (K); Ghargan, Rumia, 25 iv 1939, *Sandwith* 2778 (K).

69. G. capitellata Cosson in Bull. Soc. Bot. Fr. 3: 672 (1856).

Non-spiny shrub with opposite and subopposite branching. *Leaves* c. 5 × 1·5 mm, simple, sessile, alternate or subopposite, narrowly oblanceolate with sericeous hairs on both surfaces. *Inflorescence* capitate with 2–4 flowers. *Bracts* foliaceous; *bracteoles* absent. *Calyx* c. 6 mm, with sericeous hairs; lips longer than the tube, upper and lower teeth subequal to the lips. *Standard* c. 7 mm, triangular, glabrous or with a narrow median ridge of sericeous hairs. *Keel* longer than the standard, with sericeous hairs, *wings* as long as the standard glabrous. *Legume* c. 7 mm, ovoid-acuminate with sparse sericeous hairs, 1–2 seeded.

Type material: Algeria (Oran): Guelta abdessan, entre Khadra et Ain Madhy, 7 vi 1856, *Bourgeau* Pl. Alg. Exsicc. no. 223 (iso. K).

Distribution: Algeria and Tunisia.

ALGERIA: Djebel Djella, près Djelfa, *Reboud* (LIVU, MANCH).

TUNISIA: Khanyuld Drenara (Oulad Selamafin), 9 v 1889, *Letourney* (K); Djebel Mequila, 16 v 1889, *Letourney* (K).

70. G. quadriflora Munby in Bull. Soc. Bot. Fr. 2: 283 (1855).

Erect shrub with prominently opposite branching, each branch subtended by a swollen pulvinule. *Leaves* fugacious, n.v. *Inflorescence* capitate with 2 or 4 flowers. *Bracts* c. 2 mm, lanceolate; *bracteoles* c. 1·5 mm, linear. *Calyx* c. 4 mm, with short sericeous hairs; lips subequal to the lip, upper teeth as long as the lip, lower teeth c. 1/2 the lip. *Standard* 8–9 mm, broadly to angular ovate, with sericeous hairs, apex retuse. *Keel* longer than the standard, with

sericeous hairs; *wings* as long as the standard, glabrous. *Legume* 10–13 mm, narrowly oblong, with dense sericeous hairs, 2–5 seeded.
Type material: Algeria (Oran): Tenira, près Sidi-bel-Abbes, v–vi 1855, *Munby* (syn. K). Dhaya, vi 1853, *Munby* (syn. K).
Distribution: Morocco (Moyen Atlas); Algeria (Coastal ranges).
MOROCCO: Moyen Atlas, Azrou, 25 vi 1926, *Linberg* 4027 (K).
ALGERIA: Cap Falcon, prope Oran, *Bourgeau* 123 (K); Oran, *Faure* (K); Sidi-bel-Abbes, 6 v 1858, *Munby* (K); Sidi-bel-Abbes, 21 b 1874, *Warion* (K).

71. G. umbellata (Desf.) Poiret, Encycl. Méth. Bot. Suppl. 2: 715 (1812).
Syn.: *Spartium umbellatum* Desf., Fl. Atl. 2: 132 (1798).
Genista equisetiformis Spach in Ann. Sci. Nat., sér. 3, 3: 143 (1845).
Erect non-spiny shrub with alternate and opposite branching. *Leaves* 5–15 × 1–3 mm, simple, sessile, alternate or subopposite, very narrowly elliptical with long appressed sericeous hairs on both surfaces. *Inflorescence* capitate with 4–16 flowers. *Bracts* elliptical to oblanceolate with dense patent pubescence; *bracteoles* linear. *Calyx* c. 5 mm, with dense patent hairs; lips longer than the tube, upper teeth subequal to the lip, lower teeth c. 1/3 the lip. *Standard* 8–12 mm, broadly ovate to subrotund, with dense sericeous hairs. *Keel and wings* as long as the standard, keel with sericeous hairs, wings glabrous. *Legume* c. 15 mm, narrowly oblong with dense patent hairs, 2–5 seeded.
Type material: Algeria: "in collibus aridis prope Arzeau ad maris littora" (herb. Desfontaines, P ?) n.v.
Distribution: S. & S.E. Spain; Morocco; Algeria.
SPAIN: Albacete, Sierra de las Cabras, 26 v 1850, *Bourgeau* (G); Murcia, Sierra de Espuña, 17 v–24 vi 1927, *Jerónimo* (G); Prope Cartagena, 18 v 1891, *Porta & Rigo* 43 (LIVU, MANCH, S); Almería, Cerro Almirez, Sierra Nevada, 27 v 1902, *Gandoger* (MANCH); Barranco de Caballar, prope Almería, 22 iv 1879, *Huter, Porta & Rigo* (G, M); Cabo de Gata, v 1890, *Porta & Rigo* (M, MANCH); Granada, Trevélez, vii 1853, *Alioth* (G); Finaux, Sierra Nevada, 17 v 1902, *Gandoger* (MANCH); Granada-Guadix, 21 vii 1896, *Gautier* (G); Cerro Colorado, Lanjarón, 25 v 1944, *Munos Medona* (S); Motril-Granada, 23 vii 1951, *Rank* (M); Málaga, Puerto de Viento, Sierra de Ronda, 29 vi 1849, *Bourgeau* (G); Sierra Tejeda, v–vi 1913, *Brandt* (S); Yunquera, 10 iii 1895, *Porta & Rigo* 115 (MANCH); Sierra Cartama, 15 vi 1888, *Reverchon* (G, LIVU, MANCH, S); Sierra de Tolox, 1 v 1952, *Roivainen* (S); Cádiz, Grazalema, 24 v 1890, *Reverchon* (MANCH).
MOROCCO: Mostagenem, ? 4 vi 1851, *Balansa* (G); Kedbana, à Ulad el Hach, 25 vi 1932, *Sennen & Mauricio* (G).
ALGERIA: Oran, batterie espagnole, *Bourgeau* (K); Oran, iv 1839, *Bové* (MANCH); Oran, 7 vi 1906, *Faure* (K, MANCH).

72. G. clavata Poiret, Encycl. Méth. Bot. Suppl., 2: 717 (1812).
Erect non-spiny shrub with opposite branching. *Leaves* 5–15 × 1·5–4 mm, sessile, trifoliolate, narrowly oblanceolate, both surfaces with dense sericeous hairs. *Inflorescence* capitate with 4–16 flowers. *Bracts* and *bracteoles* linear-lanceolate, densely pubescent. *Calyx* 5–7 mm, with dense sericeous to patent hairs; lips twice as long as the tube, upper teeth as long as the lip, lower teeth less than 1/4 the lip. *Standard* 12–18 mm, broadly ovate, glabrous or with a narrow median ridge of hairs. *Keel* subequal to the standard, with

dense sericeous hairs, wings as long as the standard, glabrous. *Legume* 15–20 mm, oblong, with dense patent hairs, c. 4 seeded.
Type material: Morocco—Mogador, *Broussonet* (iso. K).
Distribution: Endemic to Morocco. Coastal ranges.
MOROCCO: Tetuan—Larache, Rharb, 25 iv 1953, *Jovet, Sauvage & Vindt* (CLF); Los Olvidados, pr. Tangiers, 1926, *Linberg* 4 (K); Ain Haurica, 18 iv 1913, *Pitard* (K); Tangier, 1831, *Saltzman* (LD, M); Tangiers, iii 1837, *Trewethy* (K).

SPECIES OF UNCERTAIN STATUS

Genista spinulosa Pomel, Mat. Fl. Atl., 174 (1860). Also: Batt. & Trab., Fl. Alger., 197 (1889); Batt. & Trab., Atlas Fl. d'Alger., 2: 26 et tab. xviii (1895).

No specimens have been seen of this taxon, which was placed in a new section, *Fagonium* of subg. *Spartocarpus* by Pomel.

The diagnostic characters of this species are apparently quite distinctive viz. persistent spinescent stipules and spinescent calyx teeth. Other characters cited—subtriangular standard petal shorter than the keel, ovoid-acuminate, 1-seeded legume and sessile, trifoliolate leaves—certainly exclude this species from subg. *Genista*, but whether it should be referred to subg. *Phyllobotrys* or subg. *Spartocarpus*, as these are constituted in the present revision, can only be determined by study of actual specimens.

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