TAXONOMY AND DISTRIBUTION OF THE GENUS CALICOTOME

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Although *Calicotome* is a small and distinctive genus the exact number of species which it includes has been a source of some confusion. Two species have been accepted by most authors; *C. spinosa* (L.) Link with solitary flowers and glabrous legumes, and *C. villosa* (Poiret) Link with flowers in fascicles and legumes with an indumentum of dense, patent hairs. *C. spinosa* is centred in the W Mediterranean littoral whilst *C. villosa* is much more widely distributed and occurs throughout most of the Mediterranean coastlands except for the north-west. The taxonomy of the genus is complicated by the occurrence of plants which resemble *C. villosa* in most characters but which can readily be distinguished by possessing legumes with markedly adpressed hairs. Plants with this latter character have been variously accepted as a distinct species under the names *C. infesta* (Presl) Guss., *C. intermedia* Presl and *C. grosii* Pau & Font Quer.

Rothmaler (1949) in a revision of *Calicotome* recognized the genus as comprising five species: *C. spinosa*, *C. villosa*, *C. infesta*, a new species *C. fontanesii* from N Africa and a species recognized under a new combination *C. rigida* (Viv.) Rothm. from N Africa and S Spain. However, as a result of recent studies on a wide range of herbarium material I consider that only the two species *C. spinosa* and *C. villosa* should be recognized, with *C. villosa* as a rather polymorphic species which can be divided into three varieties. A new treatment of the genus is outlined below.

C. SPINOSA AND THE STATUS OF C. FONTANESII

Rothmaler (1949, p. 278 *et seq.* and map 10) considered that *C. spinosa* was confined to the NW Mediterranean littoral of Europe and did not occur in N Africa. *C. fontanesii*, which was based on four specimens from localities in Algeria near Boghar (prov. Alger) and Batna (prov. Constantine), was thought to be closely related to *C. spinosa* (with solitary flowers, glabrous legumes, etc.) but the two taxa were held to differ in the two characters tabulated below.

C. spinosa	*C. fontanesii*
bracteoles 2–3 mm, shorter or subequal to the calyx remnant*	bracteoles 3–5 mm, longer than the calyx remnant
dried specimens black**	dried specimens scarcely black

Rothmaler's omission of *C. spinosa* from N Africa is curious since the species is cited for this area in several Floras, e.g. Battandier & Trabut (1889) and Durand & Barratte (1910). A number of exsiccatae from Algeria have been examined and, with the exception of specimens collected by

* In *Calicotome* species the upper half of the calyx breaks away as the flower expands leaving a cup-like remnant.

** The colour of herbarium specimens of *C. spinosa* is rather variable and seems to depend upon the efficiency of the drying methods employed.

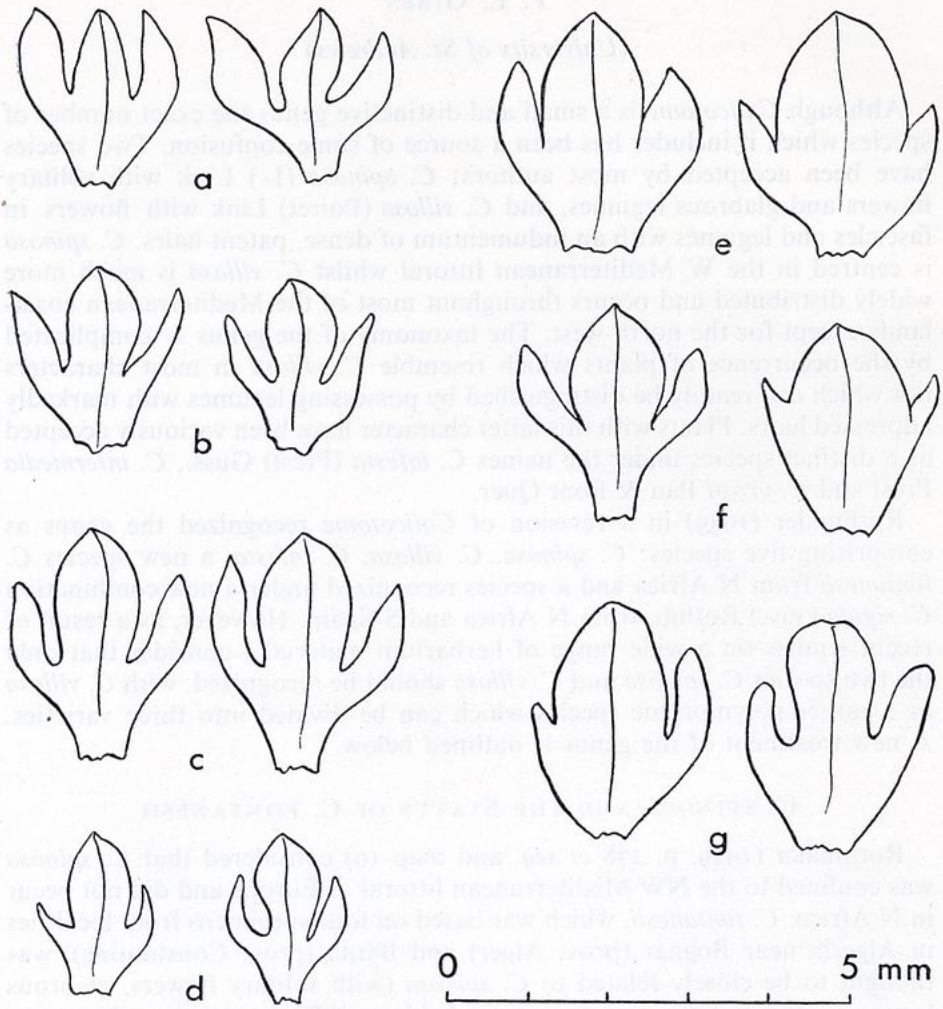

FIG. 1. Variation in bracteole shape in *C. spinosa*.
Source of material: a. Italy, Monterosso al Mare, 8 vi 1926, *Fontana* (BM); b. France, St. Laurent d'Eze, Monte Carlo, 1911, *Lowe* (BM); c. France, Cerbère, vii 1879, *Boutigny* (BM); d. France, Bois de Signan, 17 v 1888, *Magney* (BM); e. France, Giens, Isles d'Hyères, 23 iv 1901, *Lester Garland* (K); f. Sardinia, *Shuttleworth* (BM); g. Algeria, Maison Carrée, v 1849, coll. unknown (BM).

Debeaux at Boghar, all these plants show the normal facies of the species, i.e. with bracteoles of c. 2–3 mm. The Debeaux collections are isotype material of *C. fontanesii* and certainly have bracteoles of c. 3–5 mm, but in all other characters they are comparable with European and N African *C. spinosa*.

No material has been seen of the other three collections cited by Rothmaler for *C. fontanesii* i.e., Montagnes près Batna, *Du Colombier*; Djebel Tuygurt, *Aurès*; Près Batna, *Kuegler* 79. However, a number of exsiccatae which have been studied were collected at the same or neighbouring localities: Djebel Tougour and Lambèse, 25 vi–20 vii 1853, *Balansa*; Djebel Tougour près Batna, 22 v 1853, *Cosson*; Kabylie-Bourgie, iv–vii 1896, *Reverchon*. All these specimens have bracteoles of c. 2–3 mm. Because of this situation, and also the fairly widespread distribution of *C. spinosa* in the coastal and interior ranges of Algeria (cf. Quézel & Santa 1962), I consider that the specimens with extra-long bracteoles cited by Rothmaler for *C. fontanesii* probably represent mere paramorphs of *C. spinosa* and are scarcely worthy of formal taxonomic recognition.

Rothmaler recognized three varieties within *C. spinosa* based upon variation in bracteole morphology; var. *spinosa* with the bracteoles entire or rarely trifid, which occupied most of the distribution of the species; var. *ligustica* Burnat ex Fiori & Paoletti, with a deeply trifid bracteole, restricted to Italy (Liguria); var. *opistholepis* Rothm. with the bracteole sheathing the pedicel just below the calyx. A single specimen from France (Bouzareu) had been seen of the last taxon.

A survey of the bracteole shape throughout the distribution of *C. spinosa* has shown that the degree of bracteole lobing is very variable, even between flowers of the same specimen (fig. 1), and that trifid and partially trifid bracteoles occur in an almost continuous range within the species. Again, therefore, it is considered that formal taxa which are based solely upon bracteole morphology are of dubious significance.

C. villosa and the Status of Plants with Adpressed, Sericeous Legumes

In NW Africa and S Spain typical *C. villosa* (i.e. with densely villous legumes) is distributed sympatrically with plants which have legumes with markedly adpressed, sericeous hairs, whilst in S Italy (Calabria), N Sicily, S Jugoslavia and Libya typical *villosa* is apparently replaced by such sericeous-fruited forms. Taxonomic treatment of this complex has differed from author to author and plants with sericeous legumes have been variously referred to four species names.

Thus *Calicotome* plants with sericeous legumes from southern Europe have been distinguished as *C. infesta* (Presl) Guss. (the basionym *Spartium infestum* Presl was based upon a specimen from Sicily), but *infesta* has been treated as a variety of *C. spinosa* by Arcangeli (1882) and Willkomm (1893) and as a subspecies of *C. spinosa* by Rouy (1897). Plants with sericeous legumes from NW Africa have been recognized as a distinct species *C. intermedia* Presl (based upon specimens collected near Tangier by Salzmann) but Ball (1878) considered *intermedia* to be a variety of *C. villosa*. *C. grosii* Pau & Font Quer is another sericeous-fruited species described from

Morocco, although Maire (1929) has pointed out that this taxon shows an intermediate facies between *C. villosa* and *C. intermedia*. The species *Spartium rigidum* Viv. also consists of *Calicotome* plants with sericeous legumes from Libya, and this epithet was recombined as a variety of *C. villosa* by Béguinot & Vaccari (1912) and subsequently as a distinct species of *Calicotome* by Maire & Weiller (1939), but with the complication that the latter authors considered the species to comprise plants with *glabrous* legumes. This interpretation by Maire & Weiller will be considered subsequently. Rothmaler (1949) in the most recent revision of the genus recognized three species in this complex: *C. infesta* with sericeous legumes and a glabrous upper surface to the leaves from Italy and Jugoslavia; *C. rigida*, which was proposed as a new combination for plants with sericeous legumes and a pubescent upper surface to the leaves distributed in N Africa and S Spain; and *C. villosa* with villous legumes and a glabrous upper surface to the leaves.

On the basis of the herbarium material that has been studied I am unable to accept this view. Thus Rothmaler differentiated between *C. rigida* and *C. infesta* on the one hand and *C. villosa* on the other on the basis of the lobing of the bracteoles and the degree of fasciculation of the flowers. However, the only constant character difference that has been found between these forms is the nature of the indumentum—whether the hairs on the branches, bracteoles, calyx and particularly the legumes are adpressed or patent. For specimens possessing patent, villous legumes and for those with adpressed, sericeous legumes the commonest inflorescence condition consists of umbellate fascicles of 3–5 flowers; occasional specimens have some solitary flowers, and others possess fascicles of up to 12 flowers or short ebracteate racemes. Likewise both forms have trilobed bracteoles although the degree of lobing is rather more variable in typical *villosa*. The indumentum character alone is scarcely sufficient to warrant recognition of distinct species and the sericeous-fruited forms should be considered as conspecific with *C. villosa*.

As Rothmaler (1949) noted, the plants with sericeous legumes from Italy and Jugoslavia differ from such forms in Morocco, Algeria and S Spain in two characters: the former have a glabrous upper surface to the leaves and have legumes with rather winged sutures, whilst the NW African and Spanish plants tend to have a pubescent upper leaf surface and to lack distinct winging of the legumes. The contrast is not very clear-cut, however, since some of the N African specimens have leaves with the upper surface only sparsely hairy to subglabrous and so are very similar to plants from S Italy and Sicily, and the degree of winging of the legume sutures is also a very variable character. Furthermore, the plants from Libya with sericeous legumes have a glabrous upper surface to the leaves and so are referable to the forms from Italy and Jugoslavia rather than those from NW Africa and S Spain.

It is considered that this variation pattern in indumentum type is best resolved taxonomically by treating *C. villosa* as a rather polymorphic species with three varieties: var. *villosa* for plants with patent, villous legumes distributed throughout most of the Mediterranean except for the North-west; var. *intermedia* (Presl) Ball with sericeous legumes and a pubescent upper surface to the leaves, distributed in NW Africa and S Spain; var. *rigida* which is the earliest name at varietal rank for the plants with sericeous legumes and a glabrous upper surface to the leaves from Italy, Jugoslavia and Libya.

A number of *Calicotome* specimens have been seen which have some flowers solitary and some in fascicles, and with legumes which whilst immature have sparse, whitish hairs, especially on the sutures, but which become glabrous or very sparsely hairy when mature. Such specimens occur in Italy (Liguria), e.g. Monte Nossola, 8 xi 1885, *Groves* (FI); Porto Maurizio, viii 1886, *Mari* (FI); also SE Spain, e.g. Cartagena, Castillo de Galeras, 23 iv 1926, *Ellman & Sandwith* (K); also, Coteaux des environs de Cartagène, 12 v 1886, *De Coincy* (fide Rouy 1890); and Libya, e.g. Gorge above Tolmetha, 14 iv 1939, *Sandwith* 2644 (K); North of Barce, xi 1957, *Park* 82 (K). Plants with this facies from SE Spain have been described as *C. hispanica* by Rouy (1890) whilst specimens from Libya were recognised as *C. rigida* (Viv.) by Maire & Weiller (1939) who considered this species to be distinct from *C. infesta* and *C. intermedia*. Viviani (1824) described *Spartium rigidum* from Magna Syrtis (the Gulf of Sidra) and according to Durand & Barratte (1910) the type specimen was collected by Della Cella (litoral de la Grande Syrte, près Melfa) in 1817. Viviani's description and illustration (Viviani 1824, t. 17, f. 1) depict a specimen with flowers in fascicles of 2–5 and an adpressed, sericeous calyx. No mature legumes had been seen but Viviani noted: "Germen lineare, margine hirsuto".

If a number of specimens from Libya are compared they show a range of variation in legume pubescence from densely sericeous to glabrous, and both solitary and fascicled flowers; e.g. the sheet Cyrenaica, Barce, 20 iv 1938, *Maire & Weiller* (FI) has a specimen with mature, solitary, glabrous legumes, but also fragments which have fascicled flowers and immature, sparsely sericeous legumes. It would seem, therefore, that *C. rigida* sensu Maire & Weiller simply represents rather extreme variants of *C. villosa* var. *rigida*. The specimens from Italy-Liguria also have a glabrous upper surface to the leaves and rather thickened legume sutures and so are perhaps referable to var. *rigida* but the specimens from SE Spain (i.e. *C. hispanica* Rouy) have a sericeous upper surface to the leaves and scarcely thickened sutures to the legumes and so may be considered as extreme variants of var. *intermedia*.

Interpreted in this way, var. *rigida* has a rather discontinuous distribution in the central Mediterranean, and the situation is further complicated by the fact that whilst var. *intermedia* is distributed sympatrically with typical *villosa*, the two varieties *villosa* and *rigida* are allopatric virtually throughout the range of the latter taxon. It should be emphasised that plants of *C. villosa* var. *villosa* can only be readily distinguished from var. *rigida* in fruiting specimens, and that with flowering and particularly sterile material the two may be difficult to identify with certainty. The pubescence of the upper surface of the leaves provides an additional character to distinguish specimens of var. *intermedia* from var. *villosa*. In addition, the occurrence of specimens with some solitary flowers and finally glabrous legumes makes confusion possible between *C. spinosa* and *C. villosa* var. *rigida*, and a further problem is that two specimens of *C. spinosa* have been seen which have legumes with sparse, adpressed hairs (France. Pyrénées Orientales: Cerbère, vii 1879, *Boutigny*, BM; Mallorca, Puerto Soller, 31 v 1954, *J. F. M. & M. J. Cannon* 2556, BM). Because of this situation, and also the fact that *C. spinosa* is largely allopatric with *C. villosa*, there are some grounds for treating *Calicotome* as a single circum-Mediterranean species.

Taken all together these aspects suggest a complex pattern of relationships

with possibly some form of hybridisation as a contributory factor. In this connection it is perhaps significant that two of the areas where specimens with some solitary flowers and finally glabrous or subglabrous legumes occur are regions where *C. villosa* s.s. and *C. spinosa* are almost sympatric, i.e. SE Spain and Italy-Liguria. Clearly, this is a situation where decisive information can only be obtained by detailed field studies in the areas where several of the variants outlined above are distributed. The present classification, with the recognition of two species *C. spinosa* and *C. villosa*, the latter with three taxa of varietal rank, necessarily represents something of a taxonomic compromise.

Key to the Four Taxa Recognised within Calicotome

1. Flowers mostly solitary; legumes glabrous . . . 1. *C. spinosa*
+ Flowers mostly in fascicles; legumes villous or sericeous, sometimes sparsely so . . . . . 2. (*C. villosa*)
2. Calyx, bracteole and particularly the legume with dense, patent villous hairs . . . . . 2a. *C. villosa* var. *villosa*
+ Calyx, bracteole and particularly the legume with adpressed, sericeous hairs, sometimes subglabrous 3
3. Upper leaf surface glabrous; upper suture of legume somewhat winged . . . . . 2b. *C. villosa* var. *rigida*
+ Upper leaf surface sericeous sometimes sparsely so; upper suture of legume not or only slightly winged 2c. *C. villosa* var. *intermedia*

All species occur in evergreen scrub (maquis) of the Mediterranean littoral and inland mountain areas. *C. villosa* also occurs in inland areas in S Portugal.

Taxonomy

1. C. spinosa (L.) Link, Enum. Hort. Berol. Alt. 2: 225 (1822).

Syn.: *Spartium spinosum* L., Sp. Pl. 709 (1753).
Cytisus spinosus (L.) Lam., Fl. Fr. 2: 625 (1778).
Genista spinosa (L.) Poll., Fl. Veron. 2: 462 (1822).
Calicotome spinosa subsp. *ligustica* Burnat, Fl. Alp. Marit. 2: 57 (1896).
C. ligustica (Burnat) Fiori, Béguinot & Pamp., Fl. Ital. exsicc. no. 583 (1907) *in scheda* (fide Rothmaler 1949).
C. spinosa var. *opistholepis* Rothm. in Bot. Jahrb. 74: 280 (1949).
C. fontanesii Rothm. *loc. cit.*, p. 280.

Erect shrub up to 3 m, with stout axillary spines, young twigs with sericeous hairs, becoming glabrous. Leaves trifoliolate, petiole 3–12 mm; leaflets 5–15 × 3–5 mm, obovate, with adpressed hairs beneath, glabrous above. Flowers borne singly in the axils of fascicled bracts, occasionally some in fascicles. Pedicels 4–8 mm; bracteoles obovate, usually somewhat trifid and sometimes markedly so, sparsely hairy, borne just below the calyx; calyx remnant with sparse, adpressed hairs. Standard 12–18 mm, broadly ovate, glabrous; wings and keel as long as the standard, glabrous. Legume c. 30 mm, narrowly oblong, glabrous (very rarely with sparse hairs), sutures usually slightly thickened. Seeds 3–8, estrophiolate. 2n: 48 (Gilot 1965).

SPAIN. Barcelona: Barcelona, faubourg de Gracia, iv 1847, *Bourgeau* 321 (BM, K); Barcelona, massif de Tibidabo, 9 viii 1929, *Sennen* (BM); Castellón: Sierra de Castellón, 25 vi 1852, *Bourgeau* 54 (E, K); Alicante: Denia, 12 v 1928, *Ellman & Sandwith* 1136 (K); Mallorca: Soller, 1 iv 1910, *Bianor* 45 (E); Palma, 11 iii 1921, *Brown* (K); Puerto Soller, 31 v 1954, *J. F. M. & M. J. Cannon* 2556 (BM); Potanza, 3 iv 1929, *Edmonds* 192 (K).
FRANCE. Alpes Maritimes: St. Laurent d'Eze, Monte Carlo, 1911, *Lowe* (BM); Menton, iv 1910, *Pryce Jones* (K); Cap d'Antibes, iii 1875, *Rogers* (K); Gard: Bois de Signan, 17 v 1888, *Magney* (BM); Var: Mont Coumontz, près de Toulon, 8 v-7 vii 1861, *Huet, Dreuille & Jacquin* (K); Toulon, bords des routes à la Seyne, 30 iv 1848, *Bourgeau* 99 (BM); Giens, Isles d'Hyéres, 23

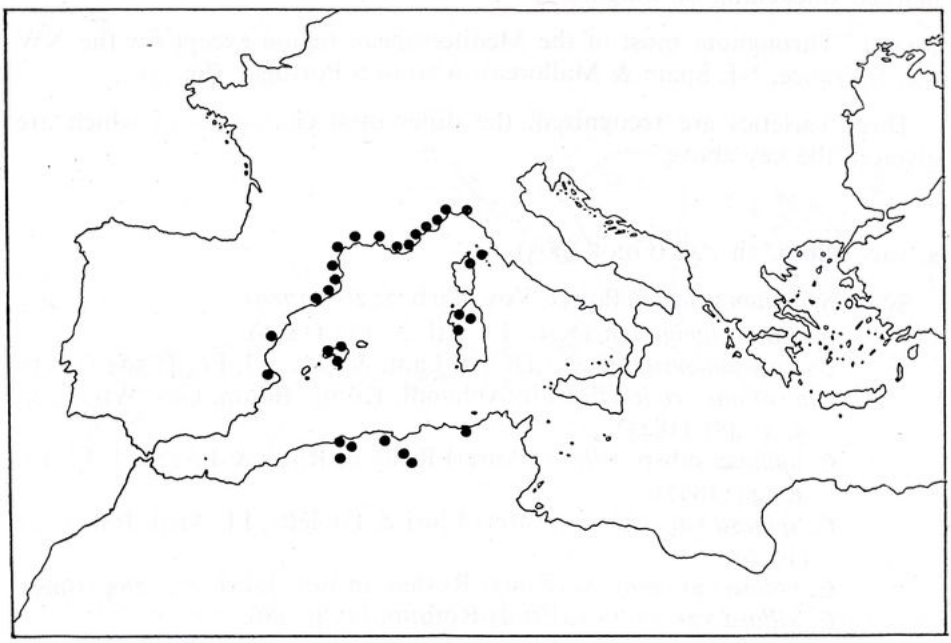

FIG. 2. Distribution of *Calicotome spinosa*.

iv 1901, *Lester Garland* (K); Pyrénées Orientales: Cerbère, vii 1879, *Boutigny* (BM); Perpignan, 18 vi 1807, *De Candolle* (K); Port Vendres, 17 iv 1952, *Eastern* 34 (K); Corsica: Calvi, *Soleirol* 1369 (BM); Le Pigno, au-dessus de Cardo, près Bastia, 7 vi–10 vii 1866, *Mabille* (BM, K).
ITALY. Liguria: Bordighera, 13 iv 1897, *Bricknell* (E); Monterosso al Mare (Spezia), 8 vi 1926, *Fontana* (BM); Ospedelletti, iv 1935, *Metcalfe* (K); Toscana: Marciana, 2 v 1936, *Pichi-Sermolli* 2688 (FI); Sardegna: without precise locality, 1874, *Moris* (BM, K).
ALGERIA. Alger: Environs d'Alger, iv 1879, *Allard* (FI); Alger, v 1837, *Bové* (K); Boghar, 1858, *Debeaux* (FI); Kabylie-Bourgie, iv–vii 1896, *Reverchon* (E); Maison Carrée, vi 1849, coll. unknown (BM); Constantine: Djebel Tougour & Lambèse, 25 vi–20 vii 1853, *Balansa* (E, FI, K); Djebel Tougour, près Batna, 22 v 1853, *Cosson* (FI); La Calle, 28 iv '30, coll. unknown (BM)

mixed sheet. Without precise locality: Kouba, ii 1879, *Gandoger* (BM, FI); Bou-Taleb et des Madids, iii 1873, *Oliver & Reboud* (FI).

RANGE: W Mediterranean, NE Spain, France, Italy (Liguria and Archipelago Toscano), Corsica, Sardinia, Algeria (fig. 2).

2. C. villosa (Poiret) Link in Schrader Neues Jour. Bot. 2(2): 51 (1808).

Like *C. spinosa* but with young twigs, lower surface of the leaves (and sometimes the upper), bracteoles and calyx densely sericeous or villous; flowers mostly in umbellate fascicles of 2–15, or short ebracteate racemes; legume usually densely sericeous or villous, the sutures with or without marked thickening or winging.

RANGE: Throughout most of the Mediterranean region except for the NW (i.e. S France, NE Spain & Mallorca). Also in S Portugal. (fig. 3).

Three varieties are recognized, the differential characters of which are given in the key above.

a. var. **villosa.** 2n=48 (Gilot 1965).

Syn.: *Spartium villosum* Poiret, Voy. Barb. 2: 207 (1789).
Spartium lanigerum Desf., Fl. Atl. 2: 135 (1800).
Cytisus lanigerus (Desf.) DC. in Lam. & DC., Fl. Fr. 4: 504 (1805).
Calicotome cretica Presl in Abhandl. König. Böhm. Ges. Wiss., ser. 5, 3: 481 (1845).
C. spinosa subsp. *villosa* (Poiret) Rouy in Rouy & Foucaud, Fl. Fr. 4: 249 (1897).
C. spinosa var. *villosa* (Poiret) Fiori & Paoletti, Fl. Anal. Ital. 2: 23 (1900).
C. villosa var. *genuina* (Rouy) Rothm. in Bot. Jahrb. 72: 284 (1949).
C. villosa var. *cretica* (Presl) Rothm., l.c. p. 286.

SPAIN: Almería: Almería, 14 iv 1876, *Winkler* (K); Málaga: Ronda, near Cortes de la Frontera station, 9 v 1924, *Ellman & Hubbard* 331 (K); Cerro S. Anton, 29 iii–9 v 1879, *Huter, Porta & Rigo* (E, K); Cádiz: 28 km SE of Alcata, 20 iv 1951, *Alston* 10463 (BM); San Roque, iv 1845, *Willkomm* (BM); Algeciras, 15 iv 1876, *Winkler* (K); Huelva: entre Valverde et Beas, *Gros* (fide Vicioso 1955); Valverde del Camino, *Martin Bolanos* (fide Vicioso 1955).
GIBRALTAR. Gibraltar, 24 iii 1845, *Willkomm* 544 (K).
FRANCE. Corsica: Bastia, 2 v–20 vi 1866, *Mabille* (BM, E, K); Ajaccio, 26 iii 1848, *Bourgeau* 97 (BM); Bonifacio, 7 v–10 viii 1880, *Reverchon* (E).
ITALY. Toscana: Porto Ferrajo, 14 iv 1862, *Ball* (E); Follonica, coll. unknown (FI); Lazio: Terracina, coll. unknown (FI); Puglia: Gargano, 19 iv 1875, *Porta & Rigo* 109 (K); Mt. Gargano, inter Carpinet et Tschietella, 14 vi 1874, *Porta & Rigo* (K); Monte Argentario, x 1871, *Duthie* (BM); Campania: Naples, Lago di Agnamo, 19 iii 1872, *Joad* (K); Sicilia: Licata, *Citarda* 816 (BM, K); Sardegna: Tempio, iv 1901, *Gamble* 28279 (K); Cagliari, v, *Müller* (E); Tempio, 9 iv–7 vii 1882, *Reverchon* (E, K).

ALBANIA. South of Sarandë, 1 vi 1933, *Alston & Turner* 1293 (BM, K).
GREECE. Ionioi Nisoi: Kerkira (Corfu), 6 iv–28 v 1896, *Baenitz* (E); Sterea Ellas: Attica, ii 1930, *Atchley* (K); Mt. Parnes, 17–27 iv 1930, *Guiol* 1120 (BM); Evvoia: Mtns. of Euboea, v 1862, *Mill* (K); Thessalia: Volos, Agria, 29 iv 1896, *Sintenis* 114 (E, K); Makedhonia: Athos peninsula, Simopetra, 13 iv 1934, *Hill, Sandwith & Turrill* 2285 (K); Kapujilar, 3 m SE of Salonica, 24 iv 1918, *Ramsbottom* (BM); Kavalla, 4 vii 1933, *Tedd* (K); Thasos: Limenasia, 6 vi 1891, *Sintenis & Bornmüller* 649 (BM, K); Samothraki: Samothraki, 18–20 vi 1936, *Rechinger, K. H. & F.* 9939 (BM); Lesvos: Mitilini, 20 v 1927, *K. H. Rechinger* 1240 (BM); Samos: Malagari, pr. Vathi, 29 iii 1934, *K. H. & F. Rechinger* 3374 (BM); Rodhos: Miramare

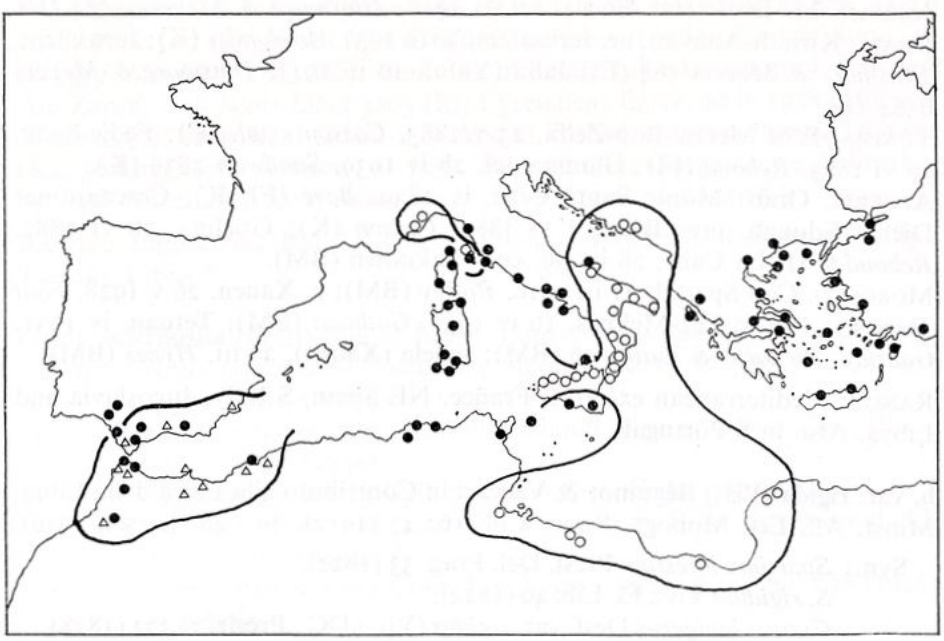

FIG. 3. Distribution of the three varieties of *Calicotome villosa* in the Mediterranean area. ● var. *villosa;* △ var. *intermedia;* ○ var. *rigida.*

beach near Rodhos, 21 iii 1965, *Davis* 40273 (E); Sporadhes: Skyros, 29 iv–6 v 1927, *K. H. Rechinger* 782 (BM); Kikladhes: Milos, 1917, *Ogilvie* (BM); Mikonos, 12 iv 1927, *K. H. Rechinger* 378 (BM); Astipalaia, 26 v 1935, *K. H. & F. Rechinger* 7562 (BM); Kriti: Skylons, 28 vi 1899, *Baldacci* 165 (BM); Mirabello, Ay. Nikolaos, 23 v 1914, *Gandoger* 1275 (K); Zyros-Achladi, 9 v 1942, *K. H. Rechinger* 12790 (K); Montes Aphendi Kavusi, 20 v 1942, *K. H. Rechinger* 13153 (BM); Rhers Akrotiri, 7 v 1883, *Reverchon* (E, K).
CYPRUS: Stavros, Paphos Forest, 21 iv 1933, *Foggie* 186 (E); Platres, 9 xii 1936, *Kennedy* 546 (K); Kyrenia Pass, iii 1902, *Lascelles* (K); Peristerges, near Kilamenos, 3 iv 1962, *Meikle* 2428 (K).
TURKEY. Istanbul: Princes Isle (Adalar), 17 vii 1925, *Gilliat-Smith* 1271 (K); Aydos Dagli, 9 vi 1965, *Yaltirik* 3327 (E); Bursa: Mudanya, 2 iv 1934, *Balls & Gourlay* 615 (K); Çanakkale: Gelibolu, *Ingoldby* (K); Renkoi-Scala, 21 iv 1883, *Sintenis* 271 (BM, E, K); Izmir: Torbali-Ephesus, 22 iii 1956, *Davis & Polunin* 25165 (K); Muğla: Cumali-Reşadiye, 17 iv 1965, *Davis* 41258 (E);

d. Marmaris, Ordugah, 10 vii 1960, *Khan et al.* 8 (E); Antalya: Bahçeil Evler, 7 iv 1959, *Nijhoff* (K); E. of Antalya, 15 iii 1936, *Tengwall* 112 (K); c. 10 ml. NE of Kalkan, 13 v 1964, *Jackson* 5066 (E); Içel: Cilicien, Gyse Dere, iii 1895, *Siehe* (E); Cilicien, 1895, *Siehe* 25 (K); Seyhan: d. Bahçe, Haruniye-Fevzipaşa, 18 iv 1957, *Davis & Hedge* D. 26768 (E); Karataş, 1 v 1965, *Coode & Jones* 265 (E); Adana-Ceyhan, 3 v 1965, *Coode & Jones* 356 (E); Hatay: 5 mls. towards Belen from Antakya, 6 v 1965, *Coode & Jones* 529 (E); Alexandrette (Iskenderun), 15–20 iii 1910, *Haradjian* 3983 (E, K).
LEBANON. Broumana, 4 vi 1952, *Mooney* 4475 (K); Ajaltun, 1 iv 1956, *Philby* (BM); Araya, nr. Beyrouth (Beirut), 4 iv 1959, *Polunin* 5201 (E, K); Bechmezzine, 1 iii 1945, *Trench* (BM).
JORDAN. M. Ebal (Har Eival), 22 xii 1910, *Dinsmore & Meyers* 4584 (E).
ISRAEL. Kiriath-Anavim, nr. Jerusalem, 30 iii 1931, *Amdursky* (K); Jerusalem, *Dinsmore & Meyers* 584 (E); Jaffa (Yafo), 10 iii 1911, *Dinsmore & Meyers* 6584 (E).
TUNISIA. E of Merzel-Bou-Zelfa, 23 v 1883, *Cosson et al.* (K); Fedje-Saha, 30 vi 1883, *Reboud* (FI); Hammamet, 28 iv 1939, *Sandwith* 2838 (K).
ALGERIA. Oran: Monte Santa Cruz, iv 1839, *Bové* (FI, K); Constantine: Djebel Edough, près Bône, 1 vi 1880, *Cosson* (K); Guelma, 28 vi 1882, *Reboud* (FI); La Calle, 28 iv '30, coll. unknown (BM).
MOROCCO. Cap Spartel, 31 iii 1916, *Roffey* (BM); c. Xauen, 26 v 1928, *Font Quer* 171 (BM); Fez-Meknès, 10 iv 1931, *Godman* (BM); Tetuan, iv 1931, *Gourlay, Richards & Tutin* 246 (BM); Jebela (Xauen), 27 iii, *Hynes* (BM).

RANGE: Mediterranean except S France, NE Spain, S Italy, Jugoslavia and Libya. Also in S Portugal.

b. var. **rigida** (Viv.) Béguinot & Vaccari in Contributo alla Flora della Libia, Minst. Aff. Est. Monogr. Rapp. Col. 16: 47 (1912). 2n=48 (Larsen 1956).

Syn.: *Spartium infestum* Presl, Del. Prag. 33 (1822).
S. rigidum Viv., Fl. Lib. 40 (1824).
Cytisus lanigerus Desf. var. *rigidus* (Viv.) DC., Prodr. 2: 372 (1828).
Calicotome infesta (Presl) Guss., Fl. Sic. Syn. 2(1): 247 (1844).
C. spinosa var. *infesta* (Presl) Arcangeli, Fl. Ital. 148 (1882).
C. spinosa subsp. *infesta* (Presl) Rouy in Rouy & Foucaud, Fl. Fr. 4: 248 (1897).
C. rigida (Viv.) Maire & Weiller in Bull. Soc. Hist. Nat. Afr. Nord 30: 271 (1939).

JUGOSLAVIA. Croatia: Dalmatia, Malfi, 24 v 1897, *Baenitz* (E); Island of Lacroma, Ragusa, 20 v 1905, *Crawford* (E); Rijeka of Dubrovnik, 28 vi 1953, *Denis* (K); Ragusa, vi 1882, *Marchesetti* (FI); Dalmatia, Gravosa, v 1899, *Rudolph* (BM, E).
ITALY. Liguria: Diano Marino a Monte Torre, 31 vii 1888, *Ferrari* (FI); Monte Nossola, 8 xi 1886, *Groves* (FI); Porto Maurizio, viii 1886, *Mari* (FI); Toscana: Elba, 7 vii 1891, *Martelli* (FI); Puglia: Al lago degli Alimini verso Frassanili, Otranto, v 1883, *Groves* (FI); Otranto, 10 v 1875, *Porta & Rigo* 535 (FI); Monopoli, 3 v 1945, *Manfini* (FI); Gargano, Mont San Angelo, iv 1875, *Porta & Rigo* (K); Manduria, iv 1876, *Profita* (FI); Basilicata: Metaponta, 10 vi 1930, *Gavioli* (FI); Calabria: Santa Cristina, 22 v 1877, *Arcangeli* (FI); Pizzo, 5 v 1877, *Arcangeli* (FI); S. Eufemia d'Aspromonte, 22 v 1877

Biondi (FI); S. Giovanni, 26 viii 1883, *Caruel* (FI); Fiumarella di Catanero 23 iv 1883, *Fiori* (FI); Reggio-Gerace, 21 iv/2 vi 1877, *Huter, Porta & Rigo* 95 (FI, K); La Sila, Vecchiarello, 20 vi 1950, *Sarfatti & Corradi* (FI); prope Sila, 25 vi–20 viii 1906, *Silipranti* (E, FI, K); Sicilia: Taormina, 16 v 1933, *Bornmüller* 357 (K); Messina, ii 1882, *Borzi* (FI); Mazzara, 30 iv 1855, *Pavillon* (K); Solunto, 1886, *Marchesetti* (FI); Mistretta, 11–15 vii 1906, *Martelli* (FI); Novara, *Manaza*? (FI); c. Palermo, v–vii 1902, *Ross* 325 (E, FI); Aetnensis, prope Catanam ad Mare, 17 iii–vi 1874, *Stroby* (K); Castelbuono, 8 iv 1874, *Stroby* (FI); ad Palermo, v *Todaro* 1316 (K).
TUNISIA. Gabès, El Hama (Beni Zid), 29 iii 1938, *Simpson* 38050 (BM).
LIBYA. Tripolitania: Bugheilan, 14 ii 1958, *Guichard* TR858 (BM); Hescian, W of Tripoli, 6 ii 1963, *Kijlstra* 1166 (K); Garbulli Livestock Ranch, 11 xii 1957, *Park* 107 (K); Wadi Mol Ghildel, in desert, 122 km East of Syrte, 19 iv 1939, *Sandwith* 2684 (K); Summits of sandy hillocks amongst marshes, Ain Zarah, 10 i, *Scott-Elliot* 3205 (E); Cyrenaica: Barce, 20 iv 1938, *Maire & Weiller* (FI); Gasr Beni Gdani-Sidi Abd el Wahed, iv 1933, *Pampanini* 3452 (K); 30 km North of Barce, xi 1957, *Park* 82 (K); Gorge above Tolmetha, by road descending from Barce, 14 iv 1939, *Sandwith* 2644 (K).

RANGE: Jugoslavia, Italy (Liguria, Puglia, Basilscata, Calabria, Sicily), Tunisia, Libya.*

c. var. **intermedia** (Presl) Ball in Journ. Linn. Soc. (London) 16: 398 (1878).
Syn.: *Cytisus intermedius* Salzm. ex Steudel, Nomencl. Bot., ed. 2, 477 (1841) *nomen nudum.*
Calicotome intermedia Presl in Abhandl. König. Böhm. Ges. Wiss., ser. 5, 3: 481 (1845).
C. hispanica Rouy in Bull. Soc. Bot. France 37: 162 (1890).
C. spinosa subsp. *hispanica* (Rouy) Rouy in Rouy & Foucaud, Fl. Fr. 4: 248 (1897).
C. grosii Pau & Font Quer, Iter Maroc. 1927, exsic. no. 278 (1928) *in scheda.*

MOROCCO. Yebel Malmusi, c. Tiganimin, 19 v 1927, *Font Quer* 278 (BM); Djebel Hammam, 1 iii 1929, *Font Quer* 237 (BM); Tangier and Tetuan, iv 1871, *Hooker* (K); Zerhoun, route de Moulay Idriss, 10 v 1929, *Jahandiez* 184 (BM); Beni Sicar, Farkana, 8 iii 1934, *Mauricio* 9646 (BM); Melilla, Hidum et Kabila de los Santos, ii–iii 1933, *Mauricio* 8754 (BM); in collibus sterilibus c. Tingidum, iv (1825?), *Salzmann* (K); Tanger, 28 iv 1839, *Salzmann* (FI, K); Cabo Tres Forcas, 17 vi 1930, *Sennen & Mauricio* 7548 (BM, FI); Beni Bu-Yahi, Aguada de Afso, 7 v 1933, *Sennen & Mauricio* 8752 (BM);

* Rothmaler (1949) included Menorca and also SE Turkey and the Lebanon in his distribution for this taxon (as *C. infesta*), and Hayek (1926) also claimed that *C. infesta* was distributed in the E Mediterranean. None of the three specimens cited by Rothmaler from Menorca has been seen, but because of the occurrence of an anomalous specimen of *C. spinosa* with sparsely hairy legumes (as noted above) from Mallorca, it is considered that the occurrence of *C. villosa* var. *rigida* in Menorca requires confirmation.

Duplicate material for one of the two specimens cited by Rothmaler from the Levantine area has been seen (Cilicien, Gyse Dere, *Siehe* 25): these specimens lack legumes but certainly the indumentum of the leaves and bracteoles etc. is not villous. However, because of the existence of numerous collections of typical *villosa* from neighbouring localities it is again considered that the occurrence of var. *rigida* in the East Mediterranean requires confirmation.

Melilla, Gurugu, Sidi-Had el Hach, 11 v 1933, *Sennen & Mauricio* 8753 (BM); Tanger, Cap Spartel, 28 ii 1960, *Whiting & Richmond* (K); Beni Snassene, vallée de l'Oued Zegrel, 18 iv 1928, *Wilczek et al.* (K); without precise locality: 'S Morocco' 1907, *Bainbridge* (BM).

ALGERIA. Oran: Mostaganem, 20 iii 1851, *Balansa* (FI, K); Grand Ravin d'Oran, 25 i–17 vi 1852, *Balansa* (E, FI); Oran, 1849, *Boissier & Reuter* (E, K); Djebel Santo à Oran, 22 iv 1856, *Bourgeau* (FI, K); Santa Cruz, 6 iii–15 v 1910, and 14 iii–10 iv 1928, *Faure* (BM, E, K).

SPAIN. Murcia: Cartagena, Castillo de Galeras, 23 iv 1926, *Ellman & Sandwith* 295 (K); Carthagène, collado de los pinos, iv 1908, *Jimenez & Ibanez* (E); Málaga: Torrox, *Gros* (fide Vicioso 1955); Cádiz: Algeciras, *Chodat* (fide Vicioso 1955).

RANGE: Morocco, Algeria, S and SE Spain.

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