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THE ANTHYLLIS VULNERARIA COMPLEX: A RÉSUMÉ

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ABSTRACT. A résumé is given of the *Anthyllis vulneraria* L. (Leguminosae) complex which is widely distributed throughout Europe, N Africa and SW Asia. Available taxonomic characters are evaluated and discussed. A total of 35 subspecies is recognised in two informal aggregate groups; stabilised intermediates with distinctive distributions are recognised at varietal rank. Three new subspecies are described (subspp. *stenophylloides* Cullen, *subscaposa* Cullen, *iframensis* Cullen) and three new subspecific combinations made [subspp. *abyssinica* (Sagorski) Cullen, *rifana* (Emb. & Maire) Cullen, *lusitanica* (Cullen & Pinto da Silva) Cullen]. Distribution maps are given for most of the taxa recognised.

Over fifteen years ago I began a biosystematic study of the *Anthyllis vulneraria* complex in Europe; it did not take long for me to become aware that such a project was impossible until such time as a basic taxonomic review of the group was made, to orient the biosystematic work. This basic taxonomic study has continued, with many interruptions, until recently, starting with the European range of the complex, then extending to the African and Asian areas, as material became available. Parts of the revisionary work have already been published, mainly in the form of accounts in Floras (*Flora Generale de Belgique* 4,1:126–134, 1961; *Flora Europaea* 2: 179–181, 1968; Davis, *Flora of Turkey* 3:533–537, 1972), but these have necessarily been brief, containing the basic minimum of explanatory matter only.

I am not now in a position to revert to the biosystematic aspects of the complex; but I hope these will be undertaken by others, as many interesting problems remain to be solved.

The genus *Anthyllis*, in its broadest sense, contains about 20 species, with its centre of distribution in the Mediterranean area (cf *Flora Europaea* 2: 177–182, 1968). Some authors such as Hutchinson (*Genera of Flowering Plants* 1:462–463, 1964) split the genus into four, *Anthyllis* sensu stricto, *Physanthyllis*, *Cornicina* and *Dorycnopsis*, but these are perhaps better treated as subgenera. The *Anthyllis vulneraria* complex remains in *Anthyllis*, however, whether in the strict or the broad sense. The complex consists of a number of intergrading taxa occurring throughout Europe, from the north of Scandinavia to the Mediterranean, and extending into North Africa, Abyssinia and SW Asia (mainly Turkey and the Caucasus area of the USSR). The included taxa have been treated as individual species by some authors, and as infraspecific taxa by others; the latter treatment is adopted here, and

the whole complex, with its intergradation patterns and geographical replacement, shows many similar features to the situation described as a "fossil hybrid complex" in *Galium* by Ehrendorfer (Oest. Bot. Zeitschr. 105:229–279, 1958), except that there is no suspicion of polyploidy in *Anthyllis*, all the taxa of the complex that have been examined being diploid (2n=12).

The revision that follows is based on the examination of some 6000 herbarium specimens, many living plants of various taxa, and populations studied in the field in Britain, Spain, and northern Italy. In order to reduce the length of the revision I have, except where otherwise stated, cited only representative specimens; these have been chosen according to the following criteria: a, to cover the range of the taxon in question; b, to be easily recognisable (i.e., mainly specimens with collectors' numbers); and c, to include some that are widely distributed within herbaria. In a few cases I have cited all the specimens seen; this is noted where relevant. The index to numbered specimens at the end of the paper includes all the numbered specimens I have seen, whether cited under the individual taxa or not. The vast bulk of specimens (mainly from Europe) is, however, unnumbered; most of these should bear "determinavit" labels, though the names on them, particularly those identified in the late 1950s and early 1960s, may be somewhat out of date.

The synonyms cited are those which are taxonomically necessary (e.g. basionyms), or those which occur in the most useful accounts of the group published heretofore, or in important Floras. A quite considerable number of names remain of uncertain application. Many of these are untypifiable (description inadequate, no specimen cited); others are technically typifiable, but the specimens on which they are based have not been traced. The expenditure of effort and money necessary to follow up all these names would be totally incommensurate with the value of the results obtained.

In general, I have cited "type material" rather than type specimens, and I have not consistently designated holotypes, isotypes, etc. Similarly, I have not chosen lectotypes for those taxa whose original authors cited either no specimens or many syntypes. In a group like this, where intermediate types abound (see below), typification is best done from the description (when no specimen was cited) or from the description and as many of the syntypes and/or paratypes as possible.

Because of the frequent occurrence of intermediate types, I must stress that the keys provided should be used with a certain degree of scepticism; they apply only to "typical" members of the various taxa. Intermediates cannot be identified using the keys alone; comparison with a large amount of named material is *absolutely essential*.

Division of the group—species or subspecies?

It is clear, even from the most cursory examination of material from the whole geographical range of the group, that recognisable units occur within it; probably, most taxonomists would agree (more or less) as to what the major units are. Disagreement would probably arise over the rank(s) that should be given to the constituent units within the group.

Before discussing this matter further, I will summarise my own conclusions, so that the following argument has some point of reference. I consider that the group consists of two major units (here called aggregates, for want of a

better name) each divided into a number of subspecies, some of these further divided into varieties. Thus, I recognise one species, divisible into a number of subspecies which can be grouped together into two infra-specific aggregates. There are many possible ways of assigning rank to these units; the main possibilities appear to me to be as follows:

1. To treat the group as one polymorphic, undividable species.
2. To treat the group as consisting of one species divided into a number of subspecies and/or varieties.
3. To recognise two species (the aggregates mentioned above), each divided into a number of subspecies and/or varieties.
4. To recognise many species within the group, these species aggregated into two supraspecific taxa.
5. To provide a special classification of the group considered as a special case.

At first sight, possibility 4, to recognise many species in the group, would be the 'normal' course to adopt. Many workers on the group have, in fact, done this (e.g. Becker, Rothmaler). However, a close examination of the material shows that between almost all the recognisable units there are many specimens which must be identified as intermediate (see p. 34). I am convinced that I have seen sufficient material to say this with confidence, even though Rothmaler (Feddes Rep. 50:181, 1941) states: "Die sogenannten (sic!) Übergänge von einer zur anderen Art habe ich nie beobachten können."

If it is accepted that the occurrence of a large number of intermediates between two taxa precludes their recognition as species (which is the case as far as I am concerned), then possibility 4 is ruled out. As regards the other possibilities, nothing needs to be said about 1; possibility 5 is feasible but unnecessary, though one of the most thorough students of the group, Sagorski, proposed something approaching a special classification with his complex hierarchy of "Rassen" and "Unterrassen". Possibility 3 would be acceptable if intermediates did not occur between taxa from different aggregates; they do, however, though not in so many cases as between taxa from the same aggregate. This leaves possibility 2, the course adopted here. I have recognised the major taxa as subspecies because of their more or less distinct eco-geographic distributions; plants which are morphologically intermediate are usually also geographically intermediate. Similar treatments, for more restricted areas, have been given by Hayek (*Prodromus Florae Balcanicae* 1: 886–890, 1926) and Jalas (see below).

Over the total range of the complex I recognise 35 subspecies. In a few cases, intermediates appear to have become stabilised and to occupy distinct areas as reasonably homogeneous populations; these are recognised as varieties attached to the subspecies they most closely resemble.

The two aggregates into which the subspecies are grouped have no nomenclatural standing: they are convenient and fairly natural groups, but intermediates do occur between them.

History

It does not seem useful to give a detailed review of the taxonomic history of the group. In this section I have listed literature relevant to the whole group and provided some comments about it, in order to place the present account in a historical setting.

Critical taxonomic work on the group began with G. Beck von Managetta's *Flora von Südbosnien und angrenzenden Herzegovina* in 1896. Beck divided the complex into two collective species—"Gesamtarten"—one, *A. dillenii* of red-flowered races, the other, *A. vulneraria* sens. str., of yellow-flowered races. This division of the group was most unfortunate, in that flower colour is a very variable character in the group, not strongly correlated with any other. In spite of this, Beck's work (which, although in a regional Balkan Flora, included a complete revision of "*A. dillenii*") influenced many later workers, notably Sagorski (see below) and Ascherson & Graebner (Synopsis der Mitteleuropäischen Flora 6: 620–640, 1908)

Sagorski [Allg. Bot. Zeit. 14:40–43, 55–58, 89–93, 124–134, 154–157, 172–175, 184–189, 204–205 (1908); 15:7–11, 19–23 (1909)] was the first worker to attempt a revision of the group throughout its geographical range. His work, although very detailed, based on the examination of many specimens and wide field experience in Central Europe, is vitiated by several features of its presentation: a, no key is provided and the descriptions are frequently inadequate; b, he uses an unfamiliar hierarchy of ranks—"Gesamtart," "Rasse," "Unterrasse," etc.; c, he frequently cites localities only, rather than actual specimens (thus rendering typification difficult); d, his work suffers from a false start, returning, in the middle, to some of the taxa already dealt with. As mentioned above, Sagorski accepted Beck's division of the group into red- and yellow-flowered "Gesamtarten".

As a response to the confused accounts dealt with above, Becker [Beih. Bot. Centr. 27, 2:256–287 (1910); 29, 2:16–40 (1912)], provided a treatment of a very different type. Dealing with the group throughout its geographic range, he recognised a number of species, arranged in two series; these series correspond with the aggregates used in the present account. Becker's treatment contrasts with Sagorski's in its convenient layout (though it too lacks a key), adequate descriptions, and citation of specimens.

No further important work on the complex appeared until Rothmaler (Feddes Rep. 50:177–192, 233–245, 1941) produced his account of the west Mediterranean taxa. In this relatively small area (Spain, Portugal, Morocco, Algeria, Tunisia, Libya) he recognised 25 species. Rothmaler denied the existence of intermediates between the taxa (see above); I consider many of his species to be such intermediates.

Rothmaler's account has been severely criticised by Jalas, who has dealt with the Scandinavian and Belgian taxa in three papers [Ann. Bot. Soc. Zool.-Bot. Fenn. 24, 1:1–362, 1950; Arch. Soc. Zool.-Bot. Fenn. 7, 1:49–52, 1952; Bull. Jard. Bot. Brux. 27:405–416, 1957]. Jalas accepted Becker's division of the group into two parts, but considered that the subdivisions of each would be better treated as subspecies, of which he recognised six in Scandinavia and four in Belgium. Most of Jalas' conclusions have been accepted without reservation in the present study.

Taxonomic Characters

STEM. Apart from characters of size and posture, which are of minor importance in the taxonomy of the group, the stem provides one character of major importance—its indumentum. Three types may be distinguished: a,

stems adpressed-sericeous over their whole length; b, stems spreading-hirsute over their whole length; c, stems hirsute below, adpressed sericeous above. The indumentum of the leaf rhachis is usually the same as that in the lower part of the stem, so that the stem indumentum may often be deduced from the leaf indumentum in specimens in which the lower part of the stem is missing.

LEAVES. The leaves provide many useful taxonomic characters. On any complete specimen it is possible to recognise three kinds of leaves, each kind providing its own characters: a, rosette leaves: these are the leaves of the sterile rosettes and the extreme bases of the flowering stems, characterised by their persistence throughout the winter, their imbricated bases, their small number (0–5) of lateral leaflets and a terminal leaflet much larger than any of the lateral leaflets; b, lower stem leaves: these are borne on the flowering stem just above the rosette leaves, and are characterised by their non-imbricated bases, and the possession of more lateral leaflets (5–15) than the rosette leaves; the terminal leaflet may be much larger than any of the lateral leaflets (inequifoliolate) or some or all of the lateral leaflets may equal it in size (equifoliolate); c, upper stem leaves: these are the leaves closest to the inflorescence; they tend to have more leaflets than the lower stem leaves (9–17), and may be equifoliolate or inequifoliolate.

As well as the type of pinnation, the leaves provide one other important character: they may be concentrated in the lower half of the flowering stem or may be distributed evenly along it. The indumentum and shape of the leaflets are of minor importance.

BRACTS. Each flower-head is subtended by two palmately lobed bracts, of which the inner is small and taxonomically unimportant. The outer bracts provide a number of major characters. The lobes are either more or less parallel-sided and obtuse, or very narrowly triangular and acute. The lobes may extend for less than or more than half of the total bract length and may equal or exceed the corollas. The number of lobes appears to be of no significance.

FLOWERS. Although the basic floral structure is very similar throughout the complex, the flowers provide a large number of characters of taxonomic importance, e.g. the shape, size, colour and indumentum of the calyx, the position of the calyx teeth, and the colour and size of the corolla.

Calyx shape. The calyx is a tubular structure, in which the individual sepals are represented by the 5 unequal teeth. The position of the two lateral teeth provides a character of great importance in the distinction of the two aggregates—the lateral teeth may be narrowly triangular, rather large, and held below the upper teeth, as in the *Alpestris* aggregate, or they may be more or less linear, narrow and adpressed to the upper teeth, as in the *Vulneraria* aggregate. This character is often very difficult to observe in herbarium material, as pressing often alters or obscures the relative positions of the teeth.

The degree of inflation of the calyx at anthesis is also of some importance in distinguishing the aggregates. In the *Alpestris* aggregate the calyx is markedly gibbous, (4.5–)5–7 mm broad at its broadest part; in the *Vulneraria* aggregate the calyx is less markedly gibbous, and is narrower, 2–4(–5) mm

broad. These measurements, which are not closely correlated with calyx length, refer to flowers at anthesis; a considerable amount of swelling takes place after fertilisation.

Calyx indumentum. The hairs on the calyx may be spreading or adpressed; occasionally the calyx is almost glabrous. In 5 subspecies (*weldeniana*, *praepropera*, *maura*, *stenophylloides*, *lusitanica*) the calyx hairs are closely adpressed and very evenly arranged, imparting to the calyx a very characteristic shining appearance, which is difficult to describe, but easy to appreciate, even in herbarium material.

Calyx colour. The calyx is basically white or yellowish, but this coloration may be obscured in various ways. In subsp. *alpestris* the calyx indumentum is usually of a dark grey colour, which completely obscures the ground colour of the calyx itself. In several other races the calyx bears a reddish or purplish blotch at the tip; this character is not strongly correlated with corolla colour.

Calyx length. The range of calyx length found in the complex varies from 3–18 mm; this range breaks up conveniently into four parts; 3–8 mm, 9–11 mm, 12–14 mm, 15–18 mm.

Corolla colour. The corolla may be white, yellow, orange, pink, red or purple; different petals may be of different colours, and the keel may have a tip of different colour from the rest. Flower colour is sometimes useful as an auxiliary diagnostic, but it is not constant enough for use in the way proposed by Beck and Sagorski.

Anthyllis vulneraria L., Sp. Pl. 7019 (1753).

Key to the aggregates

1. Upper cauline leaves equifoliolate; lobes of bracts tapering, acute at apex; lateral calyx teeth obscure, adpressed to the upper . . *Vulneraria* aggregate
+ Upper cauline leaves inequifoliolate; lobes of bracts parallel-sided, obtuse at apex; lateral calyx teeth distinct, not adpressed to the upper . . . . . (p. 26) *Alpestris* aggregate

Vulneraria Aggregate

1. Stem indumentum composed entirely of patent hairs . . 2
+ Stem indumentum, at least in the upper part, composed of adpressed, sericeous hairs 5
2. Calyx 7–10 mm; plant delicate, stems 7–15 cm . . . . 16. subsp. *vulnerarioides*
+ Calyx (10–) 11–15 mm; plant robust, stems 20–100 cm . . 3
3. Stems 80–100 cm, very woody at base; leaves crisply pilose beneath; terminal leaflet of rosette leaves with marked lateral venation . . . . . 27. subsp. *fruticans*
+ Stems 20–60(–80) cm, not or scarcely woody at base; leaves sericeous beneath; terminal leaflet of rosette leaves without obvious lateral veins 4

4. Leaves confined to the lower part of the flowering stem, fleshy, glabrous above . . . . . 26. subsp. *corbierei*
+ Leaves evenly distributed along the flowering stem, not fleshy, sparsely pilose above . . . . . 25. subsp. *hispidissima*
5. Indumentum of calyx evenly adpressed, shining . . . 6
+ Indumentum of calyx subspreading to spreading, not evenly adpressed and shining 12
6. Leaves evenly distributed along the flowering stem; calyx 14–18 mm . . . . . [23. subsp. *maura*] 7
+ Leaves confined to the lower part of the flowering stem; calyx 10–14 mm 9
7. Corolla yellow . . . . 23c. subsp. *maura* var. *ajmasiana*
+ Corolla red to purple 8
8. Plant robust; leaves distributed ± to the top of the flowering stem . . . . . 23a. subsp. *maura* var. *maura*
+ Plant less robust; upper ⅓ of the flowering stem ± leafless . . 23b. subsp. *maura* var. *font-queri*
9. Lower cauline leaves equifoliolate with (5–)7–11 leaflets . . 10
+ Lower cauline leaves inequifoliolate with 1–3(–5) leaflets . . 11
10. Calyx 12.5–13.5(–14) mm; leaflets of lower cauline leaves very narrowly elliptic . . . . . 24. subsp. *stenophylloides*
+ Calyx 10–12 mm; leaflets of lower cauline leaves orbicular to broadly elliptic . . . . . 22. subsp. *weldeniana*
11. Stems, at least below, and the leaf rhachis with long, flexuous hairs as long as stem diameter; bracts exceeding flowers; calyx 11–12 mm . . . . . 21. subsp. *lusitanica*
+ Stems and leaf rhachis with short spreading hairs; bracts shorter than flowers; calyx (11–)12–13.5 mm . . 20. subsp. *praepropera*
12. Bracts divided for more than ½ their length, usually as long as the calyces 13
+ Bracts divided up to ½ their length, usually shorter than the calyces 26
13. Leaves evenly distributed along the flowering stem . . . 14
+ Leaves confined to the lower part of the flowering stem only . 19
14. Corolla purple; leaves equally pilose above and beneath . . 17. subsp. *matris-filiae*
+ Corolla yellow or whitish, rarely pink or red; leaves glabrous above or the indumentum much less dense above than beneath 15
15. Calyx red at apex, weakly spreading pilose; stems thin, not woody at base; lower cauline leaves subequifoliolate . . [1. subsp. *vulneraria*] 16
+ Calyx not red at apex, strongly spreading pilose; stems usually woody at base; lower cauline leaves inequifoliolate . . . 18
16. Corolla pink or red; bract lobes tending to be parallel-sided and obtuse at apex; some cauline leaves tending to be inequifoliolate . 1c. subsp. *vulneraria* var. *coccinea*
+ Corolla yellow; bract lobes clearly tapering and acute; cauline leaves equifoliolate 17

17. Axillary branches many, longer than the leaves which subtend them . . . . . 1b. subsp. *vulneraria* var. *langei*
\+ Axillary branches absent or few, shorter than the leaves which subtend them . . . . 1a. subsp. *vulneraria* var. *vulneraria*

18. Stems ascending to erect, with spreading hairs (rarely glabrescent) in the lower part . . . . 3. subsp. *polyphylla*
\+ Stems prostrate, densely adpressed sericeous in the lower part . 2. subsp. *maritima*

19. Calyx 7–10 mm; plants small, delicate, stems 5–15(–20) cm . 20
\+ Calyx (10.5–)11–17 mm; plants robust, stems 20 cm or more . 22

20. Lower cauline leaves subequifoliolate with 5–11 leaflets . . 16. subsp. *vulnerarioides*
\+ Lower cauline leaves inequifoliolate with 1–5 leaflets . . 21

21. Calyx 7–9 mm; leaves not strongly canescent beneath . . 15. subsp. *pulchella*
\+ Calyx 10 mm; leaves strongly canescent beneath 14. subsp. *fatmae*

22. Calyx 10.5–11 mm; lower cauline leaves inequifoliolate . . 23
\+ Calyx 11–17 mm; lower cauline leaves equifoliolate . . 25

23. Petals all purple; leaves with conspicuously long-ciliate margins 6. subsp. *abyssinica*
\+ At least some of the petals white or yellow; leaves without long-ciliate margins 24

24. Bracts exceeding corollas; calyx usually concolorous . . 4. subsp. *bulgarica*
\+ Bracts shorter than corollas; calyx red-tipped . 5. subsp. *boissieri*

25. Calyx 11–13 mm, red-tipped . . . 18. subsp. *forondae*
\+ Calyx 14–17 mm, concolorous . . . 19. subsp. *pindicola*

26. Calyx 14–16 mm; leaves pilose-lanate on both surfaces; stem 20 cm or more . . . . . 7. subsp. *saharae*
\+ Calyx less than 12 mm; leaves not pilose lanate on both surfaces; stems less than 20 cm 27

27. Leaflets of rosette and lower cauline leaves broadly elliptic to orbicular, very densely silver-sericeous above, the green of the leaf completely obscured . . . 11. subsp. *argyrophylla*
\+ Leaflets of rosette and lower cauline leaves narrower, the indumentum not as above 28

28. Leaves confined to the lower part of the stem only . . 29
\+ Leaves only at the base of the thin, flexuous or arching stems . 30

29. Leaflets of cauline leaves narrowly elliptic . 13. subsp. *reuteri*
\+ Leaflets of cauline leaves markedly oblanceolate 8. subsp. *variegata*

30. Rosette leaves subequifoliolate, with 3–5 leaflets 12. subsp. *atlantis*
\+ Rosette leaves with 1 leaflet (inequifoliolate) 31

31. Calyx 5–8 mm, adpressed sericeous . . 9. subsp. *arundana*
\+ Calyx 10–11 mm, subspreading pilose . . . 10. subsp. *rifana*

1. subsp. **vulneraria**

1a. var. **vulneraria**

Syn.: *A. vulneraria* L., Sp. Pl. 719 (1753) *sensu stricto*; Becker in Beih. Bot. Centralbl. 27, 2:267 (1910) excl. subsp. *maritima*; Rothmaler in Feddes Rep. 50:178 (1941).

A. vulneraria var. *kerneri* Sagorski in Deutsch. Bot. Monatsschr. 8:136 (1890).

A. vulneraria Unterrasse *A. linnaei* Sagorski in Allg. Bot. Zeitschr. 14:152 (1908).

A. linnaei (Sag.) Juzepczuk in Komarov, Fl. URSS 11:265 (1945).

A. vulneraria subsp. *linnaei* (Sag.) Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:29 (1950).

Type material. LINN 897/2 & 3.

NW Europe, from France to Finland (Aland Is) and Latviya; on shallow, calcareous soils and, in the northern part of its range, on sand dunes and sea cliffs. Fig. 1.

FRANCE. Côte du Calvados, *Anon.* (CGE).

BRITAIN. Sussex, between Lewes and Newhaven, 7 vi 1931, *Summerhayes* (K). Derbyshire: Cheedale, 19 vi 1908, *Billups* (CGE); Heights of Abraham, 11 vi 1916, *Wilmott* 676 (BM). Angus, Carnoustie, 14 vi 1924, *Wilmott* 2128 (BM).

IRELAND. Leix, Woodville, 26 vi 1947, *Bor* 31 (K).

HOLLAND. Deventer, vi 1878, *Peteri* (AMD). Zaandvoort, vi 1886, *Smuling* (AMD).

BELGIUM. Blankenberghe, le long du voies du tram, 7 vii 1929, *Lambert* (BR).

GERMANY. Breinig, inter Kornelminster et Stolberg, 21 vi 1951, *Tournay* 95 (BR).

DENMARK. Jylland, Lyngby, vii 1896, *Gelert* (FR, MANCH, P). Bolshavn, v 1958, *Pedersen* (C).

SWEDEN. Uppsala, Estuna, Vämblinge, 1 vii 1952, *Smith* (BM)

FINLAND. Ahvenanmaa (Aland Is), par Jomala, 4 vii 1908, *Florström*, Pl. Finl. Exsicc. 756 (C, K, W).

1b. subsp. **vulneraria** var. **langei** Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:31 (1950).

Syn.: *A. vulneraria* var. *stenophylla* Lange, Haandbok i den Danske Flora, ed. 4, 825 (1886–88) non Boiss., Fl. Or. 2:168 (1872).

A. maritima auctt. mult. non Schweigger ex Hagen.

Type. Denmark (Sjaelland), Esbjerg, *Lange* (holo. C, iso. E).

NW Europe, from Ireland to Denmark; on sand dunes and sea cliffs.

IRELAND. Antrim, between Ballycastle and Fanhead, 23 vi 1930, *Whiting* 122 (K). Kerry, Derrynane, *Muirhead* 145/52 (E).

BRITAIN. Channel Is., Jersey, Le Quennevais, 20 vi 1928, *Arsène* (CGE, E, MANCH). Somerset, Burnham, 8 vi 1916, *Marshall* 4353 (CGE, E). Northumberland, Bamburgh, 4 vi 1956, *Exell* 1697 (BM).

BELGIUM. Wenduyne, 1867, *Crepin*, Hb. Pl. Belg. 267 (BR, CGE, K, MANCH). Zeebrugge, 3 ix 1923, *Lebrun* (BR).

HOLLAND. S'Gravenhage, 30 vi 1947, *van Soest* (K).

GERMANY. Schleswig-Holstein, Oester Oversee, 23 vi 1952, *Christiansen* (KIEL).

Intermediate between var. *vulneraria* and subsp. *iberica* (no. 33), but forming stabilised and homogeneous populations.

1c. subsp. **vulneraria** var. **coccinea** L., Fl. Suec., ed. 2, 249 (1755).

Type citation. In Oelandia 54.71, prope tumulum lapillosum Borckholmensen

[No specimen seen.]

Sweden (Gottland and Oeland) and scattered locations in Denmark and the British Isles.

BRITAIN. Cornwall, Whitesand Bay, 9 vii 1866, *Bailey* (BR, CGE, LIVU, MANCH). Pembrokeshire cf. T. A. W. Davis in Proc. B.S.B.I. 6: 123 (1965).
DENMARK. Fyn, Odense, 7 vi 1893, *Svendsen* (BR).
SWEDEN. Oeland, Kastlösa, Lunda, 11 vii 1927, *Sterner* Pl. Suec. Exsicc. 1070 (BM, C, K, W). Gottland, Bro Aby, 18 vi 1928, *Fries*, Pl. Suec. Exsicc. 1071 (BM, C, K, W).

Jalas (op. cit.) has suggested that this race represents the result of introgression between subsp. *vulneraria* and a now more or less extinct subspecies of the *Alpestris* aggregate.

2. subsp. **maritima** (Schweigger ex Hagen) Corb., Nouv. Fl. Norm. 148 (1894).

Syn.: *A. maritima* Schweigger ex Hagen, Chlor. Boruss. 265 (1819); Rothmaler in Feddes Rep. 50:178 (1941); Juzepczuk in Komarov, Fl. URSS 11:268 (1945); non auctt. mult. gall., scand. et brit.
A. vulneraria var. *maritima* (Schweigger ex Hagen) W. Koch, Syn., ed. 1, 175 (1837); Gams in Hegi, Ill. Fl. von Mitteleur. 4, 3:1360 (1927).
A. vulneraria Unterrasse *A. maritima* (Schweigger ex Hagen) Sagorski in Allg. Bot. Zeitschr. 14:42 (1908).

Type unknown

Southern coasts of the Baltic Sea (Denmark, Germany, Poland, Lithuania, Latviya); on sand dunes and sandy flats. Fig. 1.

DENMARK. Sjaelland, Skamlebak, 10 vii 1958, *Wiinstedt* (C).
GERMANY. Ins. Usedom, *Gierth* (W). Rügen, bei Sellin, vii 1860, *Arndt* (W).
POLAND. Kahlberg, 1 viii 1894, *Gross* (W). Danzig, Westerplatte, 7 vii 1874, *Baenitz* Hb. Eur. 6 (HAL, K, MANCH). Vistulamünde, *Beck* (HAL, K, LIVU, MANCH, W).
USSR. Lithuania, Konigsberg, *Gerecke*, Fl. Germ. Exsicc. 272 (BM, BR, CGE, HAL, K. MANCH, P, W). Latvia, Bulli, Paa Klittern, 26 vii 1928, *Grøntved* (C).

I have been unable to trace a copy of Hagen's *Chloris Borussicae*, so nothing is known of the type of this race; there seems little doubt, however, that the name refers to the very characteristic southern Baltic coast plant. Records of '*maritima*' from west of Denmark should be referred to subsp. *vulneraria* var. *langei*.

3. subsp. **polyphylla** (DC.) Nyman, Consp. 164 (1878); Hayek, Prodr. Fl. Balc. 1:886 (1926); Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:32 (1950).

Syn.: *A. vulneraria* var. *polyphylla* DC., Prodr. 2:170 (1825); Gams in Hegi, Ill. Fl. von Mitteleur. 4, 3:1359 (1927).
A. polyphylla (DC.) Kit. ex G. Don fil., Gen. Syst. (1832); Sagorski in Allg. Bot. Zeitschr. 14: 125 (1908); Becker in Beih. Bot. Centr. 27, 2:261 (1910); Juzepczuk in Komarov, Fl. URSS 11:275 (1945).
A. vulneraria var. *schiwereckii* DC., Prodr. 2:170 (1825).
A. polyphylla var. *schiwereckii* (DC.) Sagorski in Allg. Bot. Zeitschr. 14: 126 (1908).
A. schiwereckii (DC.) Błocki in Oest. Bot. Zeitschr. 62:397 (1912); Juzepczuk in Komarov, Fl. URSS 11:277 (1945).
A. macrocephala Wenderoth, Ind. Sem. Hort. Marb. (1829).

Type. None cited.

C and E Europe, Turkey, Caucasus; in dry valleys and on steppe; introduced via cultivation in a few other areas. Fig. 1.

ITALY. Auf dem Mendel bei Bozen (Bolzano), 1020 m, *Petz* (W).

JUGOSLAVIA. Belgrade, iv 1888, *Bornmüller* (W). Mt Trebevic, 750 m, 25 vi 1905, *Maly* (W).

AUSTRIA. Niederösterreich, Sebenstein, 3 vii 1932, *Korb* (W). Zaisa-Harwegg, kultiviert, 29 vi 1913, *Ronniger* (W). Oberösterreich, Salzburg, bei Itzling v. Bergheim, *Eysen* (M). Steiermark, bei Tautendorf, v 1904, *Sabransky* (W). Burgenland, Zitsmannsdorfer, Wiesen bei Neusiedl, 20 v 1956, *Gutermann* (M).

HUNGARY. Pest, 100 m, *Staub*, Fl. Exsicc. Austr.-Hung. 431 (C, E, HAL, K, M, MANCH, P, RECH). Mt Kis Szenashegy, Pilissentivan, 300 m, 31 v 1913, *Filarszky & Javorka*, Fl. Hung. Exsicc. 685, II (M, RECH, W). Rakospalata pr. Budapest, 21 v 1916, *Koszilkov*, Fl. Hung. Exsicc. 685, I (BM, M, RECH, W). Mt Blocksberg prope Buda, 10 vi 1879, *Steinitz* in Schultz, Hb. Norm. 463 (FR, M, MANCH, P, RECH, W).

ROMANIA. Kapellenberg bei Kronstadt, 8 vii 1918, *Vetter* (W).

CZECHOSLOVAKIA. Nove Mesto, 590 m, 25 vi 1953, *Filipi*, Fl. Exs. Rp. Boh. Slov. 815, II (BR, C, K). Sudeti Montes, prope Beroun, 570 m, 21 vi 1933, *Otruba*, Fl. Exs. Rp. Boh. Slov. 815, I (BR, C, K). Becura, Przano Wsetin, 18 vi 1910, *Machacek* Fl. Boh. Mor. Exsicc. 471 (BM, E). Uhersky Ostroh, prope Hlik, 360 m, 8 vi 1915, *Podpěra & Filipi* Fl. Exsicc. Rp. Boh. Slov. 814, I (BR, C, W).

POLAND. Swieta Gora prope Zloczowem, *Raciborski* Ros. Pol. 196 (W). Olsztyn, lac Wigry-Jezioro, 19 vi 1939, *Wisnewski* 3221 (K).

USSR. Leningrad, distri. Luga, prope Krupeli, 27 vi 1898, *Masarakij & Baranow* Hb. Fl. Ross. 208 (C, K, W). Lithuania, Tilsit, 2 vi 1911, *Frieburg* (M). Latvia, Riga, 27 vi 1929, *Grøntved* (C). Ukraine, Campulung, Livedi, 1 viii 1903, *Wolosczak* (W). Adzharia, *Gubbis* (LE). Armenia, 1700 m, 17 vii 1952, *Vasiliev & Vasilieva* (LE). Terskaya Obl., . . . , 1720 m, 1 vii 1913, *Busch* (LE). In montosis Imeretiae, *Szovits* 31 (LE). Krasnodar, Kuban, 28 v 1907, *Busch* (LE). Tserkessk A.O., 13 vi 1939, *Schiffers* (LE). Stavropol, in campis prope Stavropol, 6 vi 1862, *Owerin* (LE). Bassein i Uruma, 27 vii 1945, *Schiffers* (LE). Severo-Zapadnii Kavkaz, Vodorazdel r.r. Belaya Lada, 26 vi 1930, *Leskov* (LE). Prope pagum Chanaclaer, distr. Airim, 7 vi 1844, *Kolenati* (LE).

TURKEY. Erzurum to Ispir, 1800 m, *Alpay* (ISTF). Aci Su to Sarikamiş, 22 vii 1947, *Heilbronn* (ISTF).

Subsp. *polyphylla* forms series of intermediates with three other races: those between subsp. *polyphylla* and *carpatica* and subsp. *polyphylla* and *weldeniana* are discussed under those subspecies. The third series is between subsp. *polyphylla* and subsp. *bulgarica*, which replaces subsp. *polyphylla* in the Balkans. These intermediates occur over a wide area, and differ from subsp. *polyphylla* in being less robust and having the leaves inserted in the lower part of the stem only. The following specimens may be cited:

Jugoslavia. Slovenija, Postojna, 7 vi 1958, *Gutermann* (M); Hercegovina, am Draguljac bei Sarajevo, *Maly* (W). Bulgaria. Bei Loutscha, 1895, *Urumoff* 101 (HAL).

The name '*schiwereckii*' has been applied to variants of subsp. *polyphylla* in which the lower part of the stem is almost glabrous; these are of sporadic occurrence within the area of the subspecies and are not worth recognition.

Subsp. *polyphylla* was once cultivated as a forage plant and this perhaps explains its local occurrences in Belgium (cf. Jalas in Bull. Jard. Bot. Brux. 27:405–416, 1957) and Scotland (Moray, road verge near Randolph's Leap, 3 vii 1961, *Webster* 5965 (CGE)).

4. subsp. **bulgarica** (Sagorski) Cullen in Watsonia 6:389 (1968).

Syn.: *A. dillenii* Unterrasse *A. spruneri* var. *bulgarica* Sagorski in Allg. Bot. Zeitschr. 14:173 (1908)

A. serpentinicola Rech. f. & Goulimy in Anz. Math.-Nat. Kl. Oest. Akad. Wiss. Wien 94:21 (1957).

Type material. Bulgaria, in collibus ad Tekir, *Stríbrný* (MANCH, P).

SE Europe (Jugoslavia, Albania, Bulgaria, Greece); on hillsides and rocky slopes. Fig. 2.

GREECE. Makedhonia, Zoodochos Pigi pass between Veroia and Kozani, 1000–1400 m, 25 v 1961, *Ball & Wagstaffe* 694 (LIVU). Mt Vermion prope Naussa, 500 m, 30 v 1936, *Rechinger* 8919 (W). Thraki, prope Toxotai, 60–100 m, 12 vi 1936, *Rechinger* 9390 (RECH).

ALBANIA. Distr. Scutari, Mt Maramaj supra Vorfay, 20 vi 1897, *Baldacci* 268 (BM, BR, E, W).

JUGOSLAVIA. Bukovia prope Cetinje, 1200 m, vi 1931, *Pejovic* (BR). Bertiscus, Cakor prope Plav, 1300 m, 14 vii 1933, *Rechinger & Scheffer* 845 (RECH).

BULGARIA. ad Tatar Pazardzhik, vii 1910, *Stríbrný* (FR, W). Dep. Dragoman, Mt Golem Cepan, 31 vii 1930, *Rechinger* 1795 (RECH).

Subsp. *bulgarica* is morphologically similar to subsp. *polyphylla*, which it replaces in the southern Balkans; intermediates between the two races are mentioned under subsp. *polyphylla*. Some specimens from Greek Macedonia are rather less robust than those from the rest of the range, and sometimes have an obscurely developed red tip to the calyx. In these characters the plants approach subsp. *pulchella* (q.v.) which grows in the same area but generally at higher altitudes.

5. subsp. **boissieri** (Sagorski) Bornmüller in Feddes Rep. 50:135 (1941).

Syn.: *A. boissieri* Sagorski in Allg. Bot. Zeitschr. 14: 155 (1908).
A. taurica Juzepczuk in Komarov, Fl. URSS. 11:392 (1945).
A. lachnophora Juzepczuk, *l.c.* 393.
A. variegata sensu auctt. mult. russ., pro parte non *A. vulneraria* var. *variegata* Boiss.

Type material. Numerous syntypes from Turkey.

Turkey, USSR (Crimea, Caucasus); on slopes and banks and in pasture. Fig. 2.

TURKEY. Bolu: Nallihan to Mudurnu, 1200 m, *Davis* 37061 (E). Gümüşane, Argyridagh, *Sintenis* 1894:5968 (E). Trabzon, Haldizan Da., 3100 m, *Balls* 1530b (E). Erzincan, Sipikor Da., *Sintenis* 1889:2654 (E). Içel, Pursuk to Bulghar Maaden, *Siehe* 1912:572 (E).

USSR. Abkhazya, distr. Gudauty, in monte Napra, 2000–2600 m, 20 vii 1935, *Kolakovsky* (LE). In jugum Bzybicum, in pascuis alpinis Tagidshi-Itara, 1900 m, 4 viii 1935, *Kolakovsky* Herb. Fl. SSSR 3216 (LE). Armenia, distr. Nor-Bajazet, in monte Inak-dagh, 28 viii 1928, *Zedelmeier & Gejdemann* (LE). Azerbaydzhan, distr. Kubh, 20 vii 1930, *Sachokia* (LE). Terek, distr. Chassaw-Jurt, in declivitate jugi boreali Sala-Tau supra pag. Czirkei, 1800 m, *Alexeenko* (LE). Daghestania borealis, 21 vi 1861, *Ruprecht* (LE). In monte Basardjusi prope Kurusch et in Megri dagh, 1874, *Becker* 109 (LE). In monte Schelbus-dagh Daghestaniae, 1880, *Becker* 169, 213 (LE). Tiflis, 1843, *Wittman* 145 (LE). Prov. Krasnodar, Circassia, 5 ix 1927, *Woronow & Steup* (LE). Prov. Stavropol, prope Stavropol et Pjatigosrk, 1838, *Hoeffi* (LE). Ossetia, distr. Alagir, v 1861, *Ruprecht* (LE).

Subsp. *boissieri* is the commonest race of the complex in Turkey and the Caucasus. In a few places it forms intermediates with subsp. *pulchella*; these are small plants like subsp. *pulchella* but with larger flowers. Some western Turkish specimens approach subsp. *bulgarica*, and indeed, subsp. *boissieri* may perhaps occur itself in Bulgaria; some unlocalised specimens kindly sent to me by Dr B. Kuzmanov approach it very closely.

6. subsp. **abyssinica** (Sagorski) Cullen, **stat. nov.**
Syn.: *A. dillenii* Unterrasse *A. abyssinica* Sagorski in Allg. Bot. Zeitschr. 14:174 (1908).
A. abyssinica (Sagorski) Becker in Beih. Bot. Centr. 27, 2:273 (1910).
Type. Abyssinia, 1862, *Schimper* (WU fide Sagorski—not seen).
Ethiopia; on rocks.
ETHIOPIA. Tigré v. Begemder, 1863–8, *Schimper* 616 (K). Amba Alagi, 210 km N of Dessie, flowers red purple, roadside rocks, 21 i 1963, *Hagos* 178 (K). [All the specimens seen.]

The most southerly of the races of the complex, related to both subsp. *polyphylla* and subsp. *saharae*.

7. subsp. **saharae** (Sagorski) Maire in Bull. Soc. Hist. Nat. Afr. Nord. 30:339 (1939).
Syn.: *A. saharae* Sagorski in Allg. Bot. Zeitschr. 14:174 (1908). Becker in Beih. Bot. Centr. 27, 2:272 (1910).
Type. Morocco, Sahara, Ain Sefra, in pascuis m. Djebel Mekter, *Chevalier* (iso. BR).
Morocco, Algeria, rocks in desert.
ALGERIA. Djebel Bou Naclen, 3000 m, viii 1954, *Univ. d'Alger* (RAB). Djebel Lalla Aziza, 1883, *Ibrahim* (P).
MOROCCO. Zaine, env. de Tifourheline, 25 v 1950, *Sauvage* (RAB). Debdou, 1500 m, 16 v 1927, *Emberger* (RAB). Chaouen, in rupestribus calcareis monte Magou, 1600 m, 14 vi 1928, *Emberger* (RAB). SW Maroc, Ida Oubahil, 1875, *Mardochee* (P). SE of Maroc, nr. Keira, v 1867, *Balansa* (P). [All the specimens seen.]

A well-marked desert race, characterised by its densely lanate leaves. Maire (*op. cit.*) recognises several varieties of this subspecies.

8. subsp. **variegata** (Boiss.) Cullen in Davis, Flora of Turkey 3:536 (1970).
Syn.: *A. vulneraria* var. *variegata* Boiss., Fl. Or. 2:158 (1872).
Type. S Turkey, Bulghar Da., Kysil Depe, *Kotschy* 4, 220a (iso. W).
S Turkey (Taurus and Anti-Taurus mountains); rocky slopes and scree. Fig. 4.
TURKEY. Kayseri, Bakir Da. above Kisge, 1900 m, *Davis* 19378 (E). Adana, distr. Saimbeyli, Bozoğlan Da., 1900–2000 m, *Davis* 19779 (E). Adana, Bürüçek, Aşir Gediği, 1500 m, *Balls* 1296. Niğde, Bulghar Maaden, vii 1855, *Balansa* (E).

9. subsp. **arundana** (Boiss. & Reut.) Vasc. in Anais Inst. Vinho Porto 1:73 (1941).
Syn.: *A. arundana* Boiss. & Reut., Pug. Pl. Nov. 35 (1852); Willk. & Lange, Prodr. Fl. Hisp. 3:333 (1877); Beck in Ann. Nat. Hofm. Wien 11: 67 (1896); Sagorski in Allg. Bot. Zeitschr. 15:20 (1909); Becker in Beih. Bot. Centr. 27, 2:279 (1910); Lindberg in Act. Soc. Sci. Fenn. 1, 2:25 (1932); Rothmaler in Feddes Rep. 50: 244 (1941) *pro parte*.
Type. Spain, prov. Cadiz, Cerro san Cristoval, et montium circa Grazalema, tractus Serrania de Ronda, iv 1849, *Boissier & Reuter* (iso K).
S Spain; on alpine rocks. Fig. 1.
SPAIN. Cadiz, Grazalema, Sierra de Pinar, 1400 m, 12 vii 1925, *Font-Quer* Fl. Ib. Sel. 35 (K). Jaen, Sierra Grimona, 1800 m, vi 1901, *Reverchon* 1184 (MANCH). Sierra Cabrilla, Las Empanadas, 2100 m, 28 vi 1948, *Heywood & Davis* 296 (BM). Granada, Sierra Sagra, vii 1890, *Porta & Rigo* 437 (BM, BR, K, LIVU, MANCH, W).

Subsp. *arundana* is notable in having the smallest flowers in the complex. This feature possibly helps to isolate it from the other subspecies in the southern Spanish mountains, which all have larger flowers. Occasional intermediates to subsp. *argyrophylla* do, however, occur, recognisable by their larger flowers and suborbicular, very hairy terminal leaflets.

Rothmaler (1941) adopted a slightly different circumscription of this taxon as compared with other authors, including in it specimens referred to subsp. *reuteri* (formerly *A. hispida*) by Sagorski, Becker and myself.

10. subsp. **rifana** (Emb. & Maire) Cullen, **stat. nov.**

Syn.: *A. vulneraria* subsp. *gandogeri* (Sagorski) Becker var. *rifana* Emb. & Maire in Mém. Soc. Sci. Nat. Maroc 17:32 (1927).

Type. Morocco. Souk-et-Tnin, in monte Timouzai supra Targuist, 1400–1500 m, 1926, *Emberger & Maire* (RAB).

Morocco; rocks in *Quercus ilex* scrub.

MOROCCO. In Atlante Rifano, in rupestribus arenaceis quercetorum ilicis infra Imassinen, 1500 m, 13 vi 1929, *Emberger* (RAB). Middle Atlas, Ain Tahla, 17 vi 1951, *Herb R. Negre* (RAB). In Atlante Rifano prope Suik el Tisin, 1500 m, 20 vi 1926, *Emberger* (RAB). Mt Tidiguin, 2300 m, 21 vi 1933, *Sennen & Mauricio* 8764 (RAB). [All the specimens seen.]

A race restricted to the Rif area of Morocco, with a distinct facies; most specimens have no cauline leaves, though occasional robust shoots have one or two.

11. subsp. **argyrophylla** (Rothm.) Cullen in Watsonia 6:389 (1968).

Syn.: *A. argyrophylla* Rothmaler in Feddes Rep. 50: 190 (1941).
A. webbiana auct. mult. non Hooker, Bot. Mag. t. 3284 (1833) nec Boiss., Fl. Or. 2: 158 (1872).

Type. Spain, prov. Almeria, Sierra de los Filabres, prope Vacares, 14 vi 1929, *Gros* (holo. ROTH).

S Spain; on alpine and subalpine slopes. Fig. 3.

SPAIN. Malaga, Lomillas de Aceituna, Los Hornajos y puerto de la Orga, 8 vi 1919, *Gros* (ROTH). Granada, Sierra Tejeda, 1300–2000 m, 25 vi 1879, *Huter, Porta & Rigo* 68 (BM, FR, M, MANCH, W). Cerro Trevenque, 21 vii 1876, *Winkler* (C, HAL). Minas de Beiras, 23–27 vi 1926, *Wilmott & Lofthouse* (BM).

In 1833, as t. 3284 of the *Botanical Magazine*, Hooker described and figured a plant which, according to the notes with the description, he received from Mr P. B. Webb in Teneriffe, via the Botanic Garden in Birmingham. The name he gave it, *A. webbiana*, was taken up by later authors (cited above) and applied to this very characteristic race endemic to the southern Spanish mountains. None of the authors in question gives any reason for his choice of this name, though Beck states that Hooker was mistaken in thinking that the plant came from Teneriffe (without quoting any source for this information). The situation is further complicated by the fact that in 1872 Boissier took up the name and applied it (at varietal level) to specimens considered by most authors to belong to subsp. *pulchella*, again without giving any reason for his choice of the name.

I have not been able to trace the specimen which Hooker described, and the description itself is vague and leaves out many important characters. An

examination of the figure, however, shows that the plant is neither subsp. *argyrophylla* nor subsp. *pulchella*. In general facies the plant most resembles *A. lehmanniana* Lowe, from Madeira, but because of the incompleteness of the description and the poor quality of the illustration, it is not possible to be sure. I therefore propose to reject the name *A. webbiana* Hooker as a *nomen confusum*.

Apart from the intermediates to subsp. *arundana*, mentioned above, subsp. *argyrophylla* is a very homogeneous taxon. Rothmaler attempted to distinguish "*A. webbiana*" from *A. argyrophylla* on the basis of stem indumentum, but the examination of a large number of specimens shows this to be untenable.

12. subsp. **atlantis** Emb. & Maire in Bull. Soc. Hist. Nat. Afr. Nord. 24: 209 (1933); Bull. Soc. Sci. Nat. Maroc. 13:282 (1933).

Syn.: *A. webbiana* var. *nivalis* Willk., Ill. Fl. Hisp. 2:151, t. clxxxi, f. 2 (1892); Sagorski in Allg. Bot. Zeitschr. 15:19 (1909); Becker in Beih. Bot. Centr. 27, 2:279 (1910).

A. nivalis (Willk.) Beck in Ann. Nat. Hofmus. Wien 11:67 (1896); Rothmaler in Feddes Rep. 50:242 (1941).

Type. Morocco, Grand Atlas, Mont Ghat au Tizi-n-Ait-ou-Mellal, 2900 m, 29 vi 1931, *Emberger* (holo MPU).

S and E Spain, Morocco; on alpine slopes. Fig. 2.

SPAIN. Granada, Sierra Nevada, 3000–3300 m, viii 1848, *Funk* (W). Picacho de Veleta, 8 vii 1851, *Bourgeau* 1114 (K, P). Peñas Negras, 24 vi 1926, *Lofthouse* (BM). Jaen, Sierra de Castril, 1800 m, vi 1903, *Reverchon* 1291 (P). [A representative selection.]

MOROCCO. Grand Atlas de Demnat, rochers calc. du Tizi-n-Ait-Ouirah (Dj. Ghat), 2900 m, 29 vi 1931, *Emberger* (RAB). Grand Atlas du Demnat, eboules calc., Dj. Ghat, 3300 m, 30 vi 1931, *Emberger* (RAB). Dj. Ghat, Tizi Tifsit, 3700 m, 12 viii 1936, *Balls* (RAB). Moyen Atlas, Ain Kahla, 1850 m, 16 v 1927, *Jahandiez* (RAB). [All the specimens seen.]

These Spanish and Moroccan plants form a very homogeneous taxon, rather similar in general appearance to subsp. *vulnerarioides* (q.v.); The only dubious specimen seen is one that is disjunct from the rest of the range of subsp. *atlantis* [Spain, prov. Teruel, Sierra de Valacloche, 1600 m, vi 1893, *Reverchon* 863 (K, MANCH, HAL, P, W)]; this is somewhat larger in all its parts, and probably represents an intermediate to subsp. *reuteri*.

13. subsp. **reuteri** Cullen in Watsonia 6:389 (1968).

Syn.: *A. hispida* Boiss. & Reut., Pug. Pl. Nov. 36 (1852); Beck in Ann. Nat. Hofmus. Wien 11:67 (1896); Sagorski in Allg. Bot. Zeitschr. 15:10 (1909); Becker in Beih. Bot. Centr. 27, 2:278 (1910); Rothmaler in Feddes Rep. 50:243 (1941).

A. vulneraria var. *hispida* (Boiss. & Reut.) Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3:333 (1877) non Boiss., Fl. Or. 2:158 (1872).

A. dillenii subsp. *hispida* (Boiss. & Reut.) Asch. & Graebn., Syn. 6(2): 636 (1908).

Type. Spain, prov. Granada, Sierra Tejeda, 1837, *Boissier* (iso. E).

S and E Spain; slopes, hillsides, forest margins. Fig. 4.

SPAIN. Cuenca, 15 km from Canete on road to Cuenca, 7 vi 1962, *Brummitt, Gibbs & Ratter* 392 (E, LIVU). Albacete, Mt Mugron prope Almansa, 1000–1400 m, vi 1890, *Porta & Rigo* 469 (HAL, MANCH, W). Granada, Sierra de Mijas et Almeria, iv 1879, *Huter, Porta & Rigo* 67 (BR, CGE, E, MANCH, W). Almeria, Sierra de Maria, 1150 m, *Jeronimo* Pl. d'Esp. 7325 (RECH, W). Jaen, Sierra de Cazorla, Cabezo del Tejo, 1500 m, 25 vi 1948, *Heywood & Davis* 152 (BM). Murcia, Pena Rubia, 2 v 1925, *Jeronimo* Pl. d'Esp. 5644 (BM, W). Valencia, Villena, nr. Alicante, 7 v 1942, *Küpper* (M). Teruel, Sierra Alta between Bronchiales & Neguera, 1700 m, *Brummitt, Gibbs & Ratter* 872 (E, LIVU).

14. subsp. **fatmae** Font-Quer in Mem. Acad. Cienc. Barcelona 18:17 (1931). Type. Morocco, Mt. Kraa, 1930, *Font-Quer* (n.v.).
Morocco; apparently very rare.
MOROCCO. Djebel Lechaas, dolini, 7 vii 1961, 1950 m, *Sauvages* 16836 (RAB). [Only specimen seen.]

I have been unable to find the type of this subspecies, but there is no doubt from the description that the above-cited specimen belongs here.

15. subsp. **pulchella** (Vis.) Bornm. in Bot. Jahrb. 59:483 (1925); Hayek, Prodr. Fl. Balc. 1:888 (1926).
Syn.: *A. pulchella* Visiani, Fl. Dalm. Suppl. 1:141 (1872); Beck in Ann. Nat. Hofmus. Wien 11:66 (1896); Sagorski in Allg. Bot. Zeitschr. 14:187 (1908); Becker in Beih. Bot. Centr. 27, 2:274 (1910).
A. vulneraria var. *webbiana* sensu Boiss., Fl. Or. 2:158 (1872) non Hooker nec auct.
A. scardica Wettst. in Bibl. Bot. 26: 37 (1892).
A. albana Wettst., l.c.
A. biebersteiniana (Taliev) Popl. ex Juzepczuk in Komarov, Fl. URSS 11:267 (1945).
A. dillenii subsp. *pulchella* (Vis.) Asch. & Graebn., Syn. 6, 2:638 (1908).
Type material. Jugoslavia, Mt Lovcen, *Huter* (BM, BR, CGE, HAL, K, MANCH, P, W).
Balkan Peninsula, Turkey, USSR (Crimea, Caucasus); on mountain slopes. Fig. 4.
GREECE. Thessalia, Mt Olympus, 2150–2850 m, 15 vii 1927, *Handel-Mazzetti* (K, W). Epiros, Mt Smolika, 2200–2700 m, 9 vii 1958, *Rechinger* 20999 (W).
ALBANIA. Gjalica Ljumes, 2000–2200 m, 18 vi 1918, *Zerny* (W). Peani, Cafa Stogut, 1940 m, 2 vii 1916, *Dörfler* 204 (K, W). Nemercka mountains above Biorishde, 24 vi 1933, *Alston & Sandwith* 1844 (BM, K).
JUGOSLAVIA. Scardus (Sar Planina), Mt Ljubitrn, 3050 m, 15 vii 1890, *Dörfler* (HAL). Kuci, Hum Orahovsky, 6 vii 1898, *Baldacci* 114 (BM, K, W). Mt Vila bei Rikavac, 1800 m, *Dörfler* 324 (K, M, W). Biokowo supra Macarsca, 2500–3000 m, vi 1872, *Pichler* (FR, HAL, K, W).
BULGARIA. Mt Rhodope, Bela Erkva, 1600 m, vii 1900, *Podpéra* (M).
TURKEY. Göl Da., *Bornmüller* 1893:3371 (E). Isparta, Dedegol Da., 2000 m, *Davis* 15956 (E). Niğde, Demirkazik nr. Farasch, 3200 m, *Siehe* 1911:167 (E).
USSR. Crimea, Ai Petri, 19 vi 1904, *Wanow & Zyrina* (K). Adzharo- Imeretinskii chvebet', 13 vii 1914, *Kikodse* (LE). Armenia, distr. Nor-Bajazet, in monte Aghdagh minor, 2 viii 1929, *Zedelmeier & Gejdeman* (LE). Mont. Aghdagh minor, 3600 m, 17 viii 1926, *Schelkovnikov* (LE). In jugo Schachdagh, 25 vii 1928, *Zedelmeier & Gejdeman* (LE). Daghestan, distr. Dargi, pr. Lewaschi, in declivitate NE jugo Urbo-Karak in pascuis calcareis, 1500 m, *Alexeenko* (LE).

Subsp. *pulchella* forms a series of intermediates with subsp. *bulgarica* (see no. 4), and another with subsp. *alpestris* (see no. 29).

16. subsp. **vulnerarioides** (All.) Arc., Comp. Fl. It. ed. 2, 502 (1925).

Syn.: *Astragalus vulnerarioides* Allioni, Fl. Pedem. 1:343 (1785).
Anthyllis vulnerarioides (All.) Bonjean ex Reichb., Fl. Germ. Exc. 515 (1832); Beck in Ann. Nat. Hofmus. Wien 11:65 (1896); Sagorski in Allg. Bot. Zeitschr. 15:8 (1909); Becker in Beih. Bot. Centr. 27, 2: 277 (1910); Rothmaler in Feddes Rep. 50:241 (1941).
A. dillenii subsp. *vulnerarioides* (All). Asch & Graebn., Syn. 6, 2:635 (1908).
A. bonjeani Beck in Ann. Nat. Hofmus. Wien 11:65 (1896).

Type. see below.

Pyrenees, SW Alps, Apennines; mountain slopes. Fig. 2.

SPAIN. Lerida, Cerdana, Cambredase, 2000–2400 m, vii 1915, *Sennen*, Pl. d'Esp. 2589 (M, W). Huesca, Biebre, *del Campo* (M).
ANDORRA. Mt Maja et Pic Octalfa, 2700 m, 22 viii 1892, *Guilhot* (W).
FRANCE. Hautes Pyrenees, Crete du Brada & Gedre, 2560 m, viii 1875, *Bordère* (FR, HAL, K, MANCH, W). Pyrenees Orientales, Canigou, Pic Barbet, 2400 m, 3 viii 1928, *Rechinger* 226 (RECH). Vaucluse, Halden des Mont Ventoux, 1200–1900 m, 6 viii 1955, *Merxmüller & Wiedemann* 1077 (M). Var, La Sante Baume, 29 v 1958, *Lawalree* 9427 (BR). Hautes Alpes, Monetier-les-Bains, a puy Chevalier, 2200 m, 14 viii 1903, *Faure* (MANCH, W). Savoie, Mt Cenis, *Thomas* (MANCH, W).
ITALY. Piemonte, Enraque, Gessotale, 28 vi 1927, *Ronniger* (W). Abruzzi, Majella, 2400–2795 m, 25–26 vii 1924, *Handel-Mazzetti* (W).

I have not traced a type for the name *vulnerarioides*, and Allioni's figure and description are somewhat obscure; however, there is no doubt that the name has been used for this taxon by all subsequent authors. Subsp. *vulnerarioides* replaces subsp. *forondae* at higher altitudes in the same general area, and within it there are two variants—one in which the whole flowering stem is covered with patent hairs, the other in which patent hairs are restricted to the lower half of the stem. The second variant has been named *A. bonjeani*, but the two occur together over the whole distribution area, and are not worth discrimination. *A. vulnerarioides* subsp. *multifolia* Becker (Beih. Bot. Centr. 27, 2:278, 1910) is the name applied to occasional intermediates between subsp. *vulnerarioides* and subsp. *forondae*.

17. subsp. **matris-filiae** Emb. & Maire in Mém. Soc. Sci Nat. Maroc 22:30 (1929).

Type. Morocco, in montium Tichchoukt cacumine Lalla-oum-el-Bent, ad alt. 2600–2850 m, ubi junio et julio floret, 1927, *Emberger & Maire* (n.v.).

Morocco; calcareous rocks.

MOROCCO. In Atlant. med. or. in rupibus calcareis montis Tichchoukt (Lalla-oum-el-Bent), 2700 m, 2 vii 1927, *Emberger* (RAB). Tashdirt, rock crevices, 3300 m, 1 vii 1936, *Balls* (RAB).

I have not seen the type of this subspecies, but the specimen from the *locus classicus* cited above, determined by Emberger, leaves no doubt as to the application of the name. The race is very distinct among the north African taxa in its evenly distributed stem leaves which are equally densely hairy on both surfaces.

18. subsp. **forondae** (Sennen) Cullen in Watsonia 6:389 (1968).
Syn.: *A. forondae* Sennen in Sched. ad Pl. d'Esp. 5695 (1926); Rothmaler in Feddes Rep. 50:240 (1941).
A. sampaiana Rothm., *l.c.* 239.
Type material. Spain, Lerida, Cerdana, Sarege, 1300 m, 19 vi 1926, *Sennen* Pl. d'Esp. 5695 (BM, RECH, W).
NE Spain, Pyrenees, W Alps; slopes and pastures. Fig. 4.
SPAIN. Lerida, Llivia, gorges, 17 vi 1926, *Sennen* (BM). Catalonia, Ripoll et Gombreny, 700–1400 m, vii 1914, *Sennen* 1942 (W). Cuenca, Canete on road to Cuenca, 4 vi 1962, *Brummitt, Gibbs & Ratter* 490 (E, LIVU). Teruel, roadside near Terriente, 5 vi 1962, *Brummitt, Gibbs & Ratter* 890 (E, LIVU).
FRANCE. Hautes Pyrenees, Lourdes, M. du Calvaire, 18 vi 1925, *Ronniger* (W). Vaucluse Hassan, 12 vi 1876, *Reverchon* (MANCH). Drome, Crest, vi 1874, *Hervier* (BR, HAL, MANCH, W). Alpes Maritimes zwischen Tenda und Vievola, 17 vi 1927, *Ronniger* (LIVU, W). Basses Alpes, Annot, 26 v 1874, *Reverchon* (BR, K).
ITALY. Piemonte, Portofino, v 1961, *Heywood* (LIVU). Finalborgo, Capo di Caprazoppa, 5 v 1907, *Ronniger* (W).

19. subsp. **pindicola** Cullen in Watsonia 6:389 (1968).
Type. Greece, Epirus, inter Vriskos et Joanina, 8 viii 1958, *Rechinger* 20721 (holo. RECH).
Greece, Jugoslavia; dry stony slopes. Fig. 2.
GREECE. M. Korax prope Musinitza, 20 v 1899, *Leonis* 323 (HAL). Mt Peristeri prope Kalarrytae, 800 m, 12 vii 1893, *Halacsy* (HAL). Mt Mitsikeli prope Joanina, 600–700 m, 11 v 1961, *Rechinger* 23231 (RECH).
JUGOSLAVIA. Metchija, Prizren, 29 v 1958, *Rechinger* 19650 (RECH). Inter Struga et Debar, 12 vi 1955, *Rechinger* 15990 (RECH).

This race is easily distinguished by the following combination of characters: long, concolorous calyces, lower stem leaves equifoliolate with numerous elliptic to orbicular leaflets. The records from Jugoslavia were unfortunately omitted in *Flora Europaea* 2:181 (1972).

20. subsp. **praepropera** (Kerner) Bornmüller in Bot. Jahrb. 59: 483 (1925).
Syn.: *A. dillenii* var. *praepropera* Kerner, Sched. ad Fl. Exsicc. Austr.-Hung. 433 (1882).
A. praepropera (Kerner) Beck in Ann. Nat. Hofmus. Wien 11:62 (1896).
A. dillenii subsp. *praepropera* (Kerner) Asch. & Graebn., Syn. 6, 2:630 (1908).
A. vulneraria var. *spruneri* Boiss., Fl. Or. 2:158 (1872); Gams in Hegi, Ill. Fl. von Mitteleur. 4, 3: 1362 (1927).
A. spruneri (Boiss.) Beck in Ann. Nat. Hofmus. Wien 11:62 (1896).
A. vulneraria subsp. *spruneri* (Boiss.) Bornm. in Bot. Jahrb. 59: 483 (1925); Hayek, Prodr. Fl. Balc. 1:888 (1926).
A. rosea Willk. in Willk. & Lange in Prodr. Fl. Hisp. 3:332 (1877).
A. illyrica Beck in Ann. Nat. Hofmus. Wien 11:62 (1896).
A. insularum Rothmaler in Feddes Rep. 50:239 (1941).
A. dillenii auctt. mult., *pro parte*.

Type material. Jugoslavia (Hrvatska), Clissa (Klis), *Pichler* Fl. Exsicc. Austr.-Hung. 433 (C, HAL, K, M, RECH, W).

Mediterranean area. Spain (Balearic Is only), France, Corsica, Sardinia, N Italy, Jugoslavia, Albania, Greece, Crete, Turkey, Lebanon, Syria, Israel; stony hills, usually at low altitudes. Fig. 3.

BALEARIC IS. Menorca, a Porto Cristo, 10 vi 1933, *Sennen* 8618 (W).

FRANCE. Var, Le Luc, *Hanry* in Schultz, Herb. Norm. 454 (BM, BR, C, CGE, K, LIVU, MANCH, W). Aude, Narbonne, La Clappe, 25 v 1885, *Pons* Fl. Sel. Exsicc. 1123 (HAL, W). Gard, Vigan, 18 v 1864, *Tuezkiewicz* Fl. Gall.-Germ. 3560 bis (CGE, LIVU, MANCH). Vaucluse, Fontaine du Grosseau, 8 vi 1876, *Delacour* (K).

CORSICA. Bastia, 23 v 1868, *Debeaux* (BR, P, W). Bonifacio, 26 iv 1849, *Kralik* 534 (W).

SARDINIA. St. Teresa Gallena pr. Tempio, 6 v 1881, *Reverchon* (MANCH).

ITALY. Padua, Eugenaei, *Grabmayr* (CGE, W). Ascoli Piceno, Fermo, 8 vi 1872, *Lochenies* (BR).

JUGOSLAVIA. Ins. Veglia (Krk), *Noe* Fl. Germ. Exsicc. 346 (BM, W). Split, M. Marjan *Petter* Fl. Dalm. Exsicc. 33 (W). Ragusa (Dubrovnik), Omblathal, 5 vi 1868, *Pichler* (BR, HAL, W). Mostar, Humberg, 2 vi 1911, *Schneider* (W).

ALBANIA. Borsh, by road to Valona, 4 vi 1933, *Alston & Sandwith* 1436 (BM).

GREECE. Corcyra, auf dem Pass Ponteleimon, 317 m, 10 v 1896, *Baenitz* (E, FR, HAL, P, W). Cephalonia, in montis "Rudi", 1000–1500 m, 17 v 1926, *Bornmüller* 485 (W). M. Parnethis (Parnes), reg. media, 25 v 1895, *Heldreich* 1224b (BM, HAL, K, MANCH, P). Hymettus (Imitos), 5 v 1895, *Heldreich* 407 (HAL, K, P, W). Arcadia, 6 km a Vitina, 14 vi 1958, *Rechinger* 20426 (W). Paros, prope Parikia, 4 v 1898, *Leonis* 77 (HAL, P, W). Ikaria, Hag. Kyrikos, 24 iv 1934, *Rechinger* 4385 (RECH). Skyros, 6 v 1927, *Rechinger* 721 (RECH). Evvoia, prope Hagois, 550 m, 27 v 1955, *Rechinger* 16424 (K, LIVU, W). Chios, Amadhes, Pytios, 5 vi 1939, *Platt* (K). Athos, 23 vi 1891, *Sintenis & Bornmüller* (HAL). Crete: Viano, Christos, 15 iv 1900, *Leonis* (HAL). Knossos, 8 iv 1954, *Merxmüller & Wiedemann* 70 (M).

TURKEY. Istanbul, 1828, *Greville* (K). Çanakkale, Erenköy, *Sintenis* 1883:160, 160b (E). Aydin, Samsun Da., 40 km from Davutlar, 420 m, *Dudley, Davis* 34955 (E). Muğla, 1946, *Heilbronn* (ISTF).

Subsp. *praepropera* is replaced in Spain, Malta, most of Italy and N Africa by varieties of subsp. *maura* (q.v.), and is the only race of the complex that is frequently annual.

21. subsp. **lusitanica** (Cullen & Pinto da Silva) Cullen, **comb. et stat nov.**

Syn.: *A. lusitanica* Cullen & Pinto da Silva in Agron. Lusit. 30, 3–4:206–208 (1970).

A. arundana sensu auct. lusit., non Boiss. & Reut.

Type. Portugal: Bragança, Monte de Sao Bartolomeo, in pascuis dumetorum solo argillaceo amphibolitico, 820 m, *Pinto da Silva, Rainha & Martins* 7605 (holo LISE; iso. LIVU).

N Portugal. Fig. 3.

PORTUGAL. Bragança, Monte de Sao Bartolomeo: 800 m, *Pinto da Silva & Rainha* 7508 (LISE, LIVU); *ibid.*, 810 m, *Pinto da Silva & Rainha* 7060 (LISE, LIVU). Penacal, 700 m, *Teles & Rainha* 816 (LISE).

A somewhat obscure race, related to subsp. *praepropera*, but restricted to an area of serpentine in northern Portugal. Pinto da Silva cites a few more specimens and gives much ecological information with the original description.

22. subsp. **weldeniana** (Reichb.) Cullen in Watsonia 6:389 (1968).

Syn.: *A. weldeniana* Reichb., Fl. Germ. Exc. 515 (1832).

A. spruneri var. *weldeniana* (Reichb.) Becker in Beih. Bot. Centr. 27, 2:270 (1910).

A. vulneraria subsp. *spruneri* var. *weldeniana* (Reichb.) Hayek in Prodr. Fl. Balc. 1:887 (1926).

A. adriatica Beck in Ann. Nat. Hofmus. Wien 11:62 (1896).

Type material. Jugoslavia, Dalmatia, Biokowo, *Welden* (W).

Coasts of the Adriatic; on stony slopes and hillsides. Fig. 5.

ITALY. Termi, Alte Valle Tiberina, Regnosi di Alliarno, 22 v 1935, *Pichi-Sermolli* (W). Abruzzi, Sulmona bei Pettorana, 700 m, 8 vi 1907, *Mayer* (M). Venezia, Opcina, *Marchesetti* Fl. Exsicc. Austr.-Hung. 432 II (HAL, W). Trieste, bei Spaccato, vi 1866, *Pichler* (K). JUGOSLAVIA. Isola pr. Capodistria (Kopor), 18 v 1879, *Marchesetti* (W). Hrvatska, San Marco, Porto Re (Kraljevica), *Pichler* Fl. Exsicc. Austr.-Hung. 432 I (BM, C, K, HAL, M, MANCH, RECH, W). Peljesac (Sabioncello), Orebic, 14 iv 1930, *Rechinger* 218 (RECH); Lussin, Ciagale, 7 vi 1913, *Ronniger* (W). Pola, Kaiservalder, v 1881, *Pichler* (K, MANCH). Mostar, 28 v 1910, *Sagorski* (FR, W). Cattaro, vi 1907, *Sagorski* (MANCH, W).

Subsp. *weldeniana* more or less replaces subsp. *praepropera* at the northern end of the Adriatic; there is, however, some overlap, and intermediates do occur. Inland from the coast, in northern and central Jugoslavia, subsp. *weldeniana* forms a series of intermediates with subsp. *polyphylla*. These plants show a mixture of characteristics of the two races, having the floral characters of subsp. *weldeniana* and the vegetative of subsp. *polyphylla*. Such plants have been named as *A. tricolor* Vukotinović (Rad. Jugosl. Akad. Znan. 34:5, 1876); the following may be cited as representative:

JUGOSLAVIA. Croatia littoralis, vii 1881, *Vukotinović* in Schultz, Hb. Norm. 1339 (HAL, MANCH, W—perhaps type material). In agro Fluminense (Rijeka), *Pichler* Fl. Exsicc. Austr.-Hung. 430 (C, E, HAL, MANCH, RECH, W). Buccari (Bakar), 18 v 1883, *Hirc* (W).

Subsp. *weldeniana* also forms intermediates to subsp. *carpatica*; these are discussed under the latter race (no. 28).

23. subsp. **maura** (Beck) Lindb. in Act. Soc. Sci. Fenn. ser. B, 1, 2:77 (1932).

23a. var **maura**

Syn.: *A. maura* Beck in Ann. Nat. Hofmus. Wien 11:64 (1896); Sagorski in Allg. Bot. Zeitschr. 14:184 (1908); Becker in Beih. Bot. Centr. 27, 2:270 (1910); Rothmaler in Feddes Rep. 50:234 (1941).

A. vulneraria var. *vulgaris* sensu Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3:333 (1877) pro parte, non Koch.

A. occidentalis Rothm. in Feddes Rep. 50:236 (1941).

Type material. Algeria, Constantine, *Choulette*, Frag. Fl. Alg. 325 (W).

S Spain and Portugal, S Italy, Sicily, Malta, Morocco, Algeria, Tunisia, Libya; hillsides and slopes. Fig. 5.

PORTUGAL. Algarve, Monchique, Barranco des Pisoes, 500 m, 24 v 1939, *Rothmaler* 15122 (ROTH). Lisboa, Perna de Pau, iv 1877, *Daveau* (CGE).

SPAIN. Cadiz, San Roque, *Wilkomm* 632 (K). Malaga, NE of Periana, 1000–1300 m, 19 v 1927, *Ellman & Nelmes* 238 (K).

ITALY. Puglia, Peschichi, 5 vi 1960, *Brummitt* 60E:978 (LIVU). Napoli, Capri, 1926, *Ronniger* (W).

SICILY. Busumbra, iv 1880, *Lojacono* 376 (HAL, P, W); Ragusa, 21 v 1960, *Brummitt* 60E:719 (LIVU). Mt Erice, *Todaro* (BM, HAL, K, P, W); Messina, 7 v 1927, *Ronniger* (W).

MALTA. Marfa Ridge, Mellieha, 31 iii 1958, *Sell* (CGE). Valetta, 1831, *Anon.* (W).

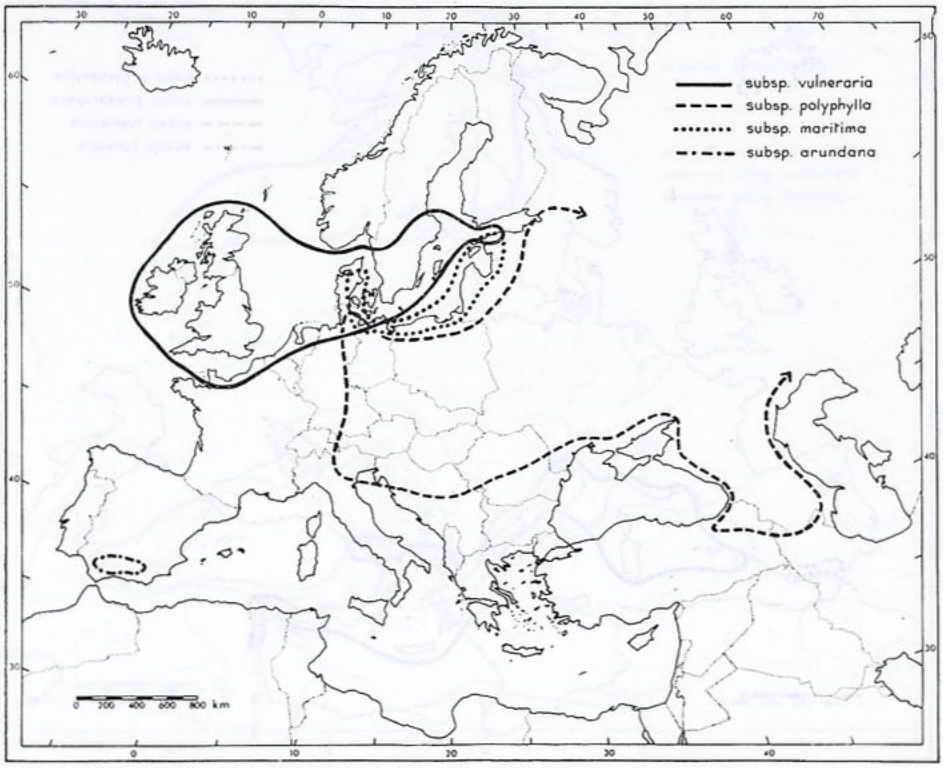

FIG. 1. Distribution of subspecies of *Anthyllis vulneraria*.

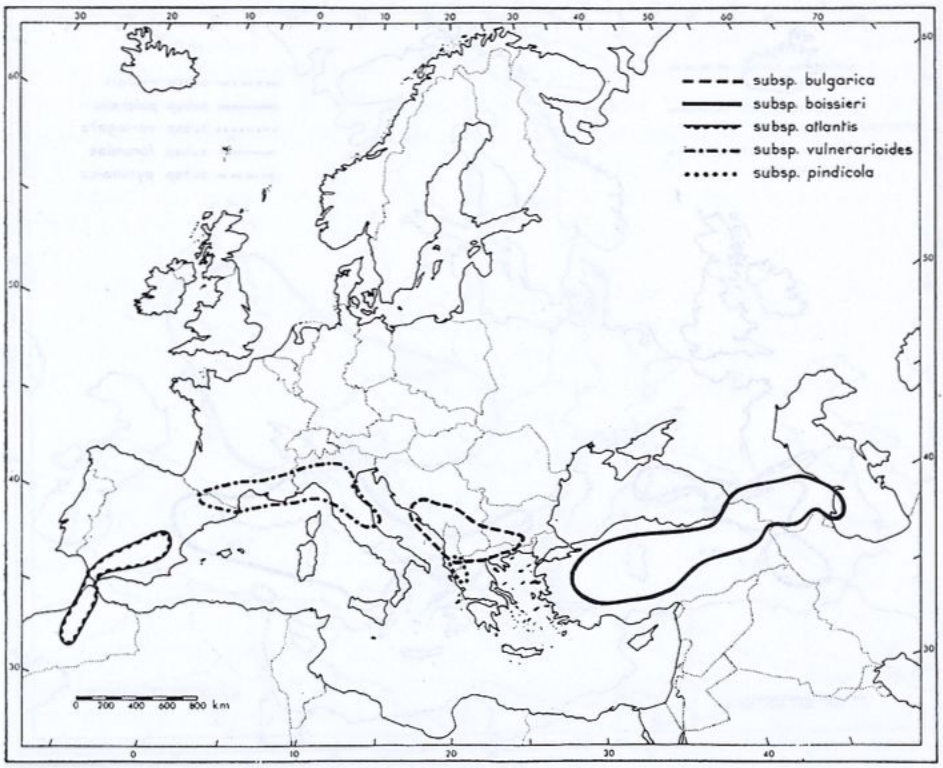

FIG. 2. Distribution of subspecies of *Anthyllis vulneraria*.

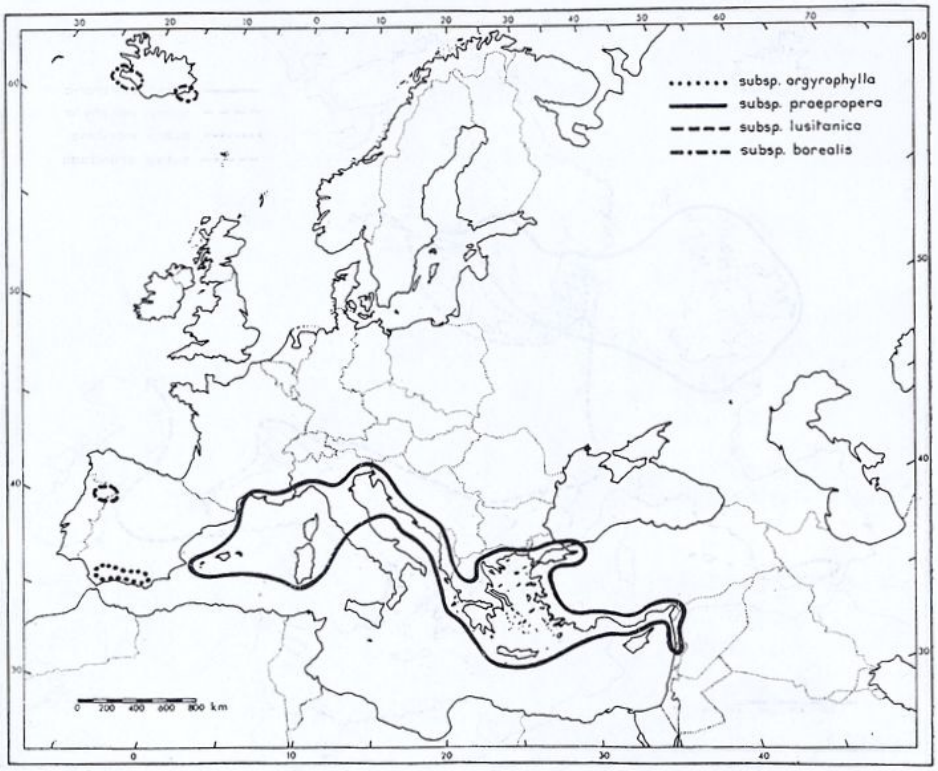

FIG. 3. Distribution of subspecies of *Anthyllis vulneraria*.

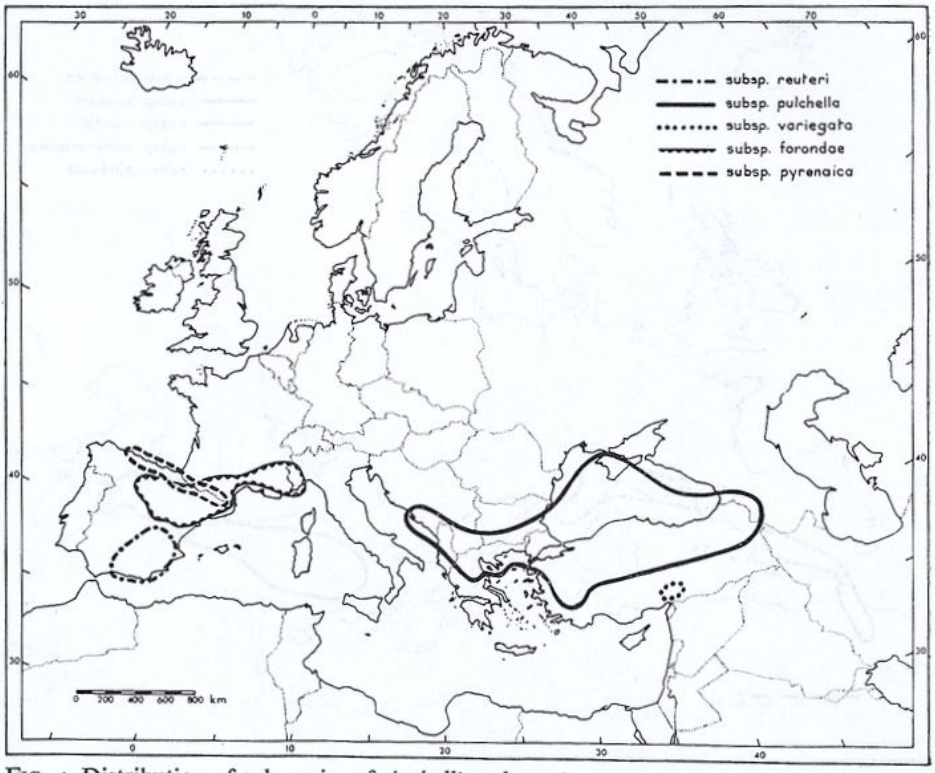

FIG. 4. Distribution of subspecies of *Anthyllis vulneraria*.

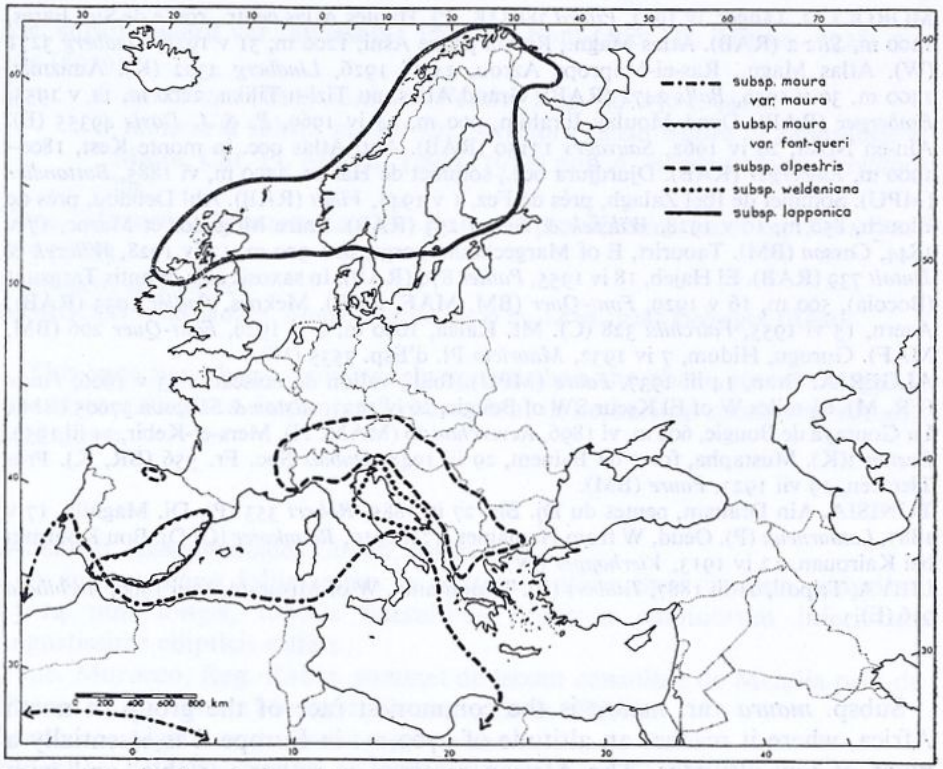

FIG. 5. Distribution of subspecies of *Anthyllis vulneraria*.

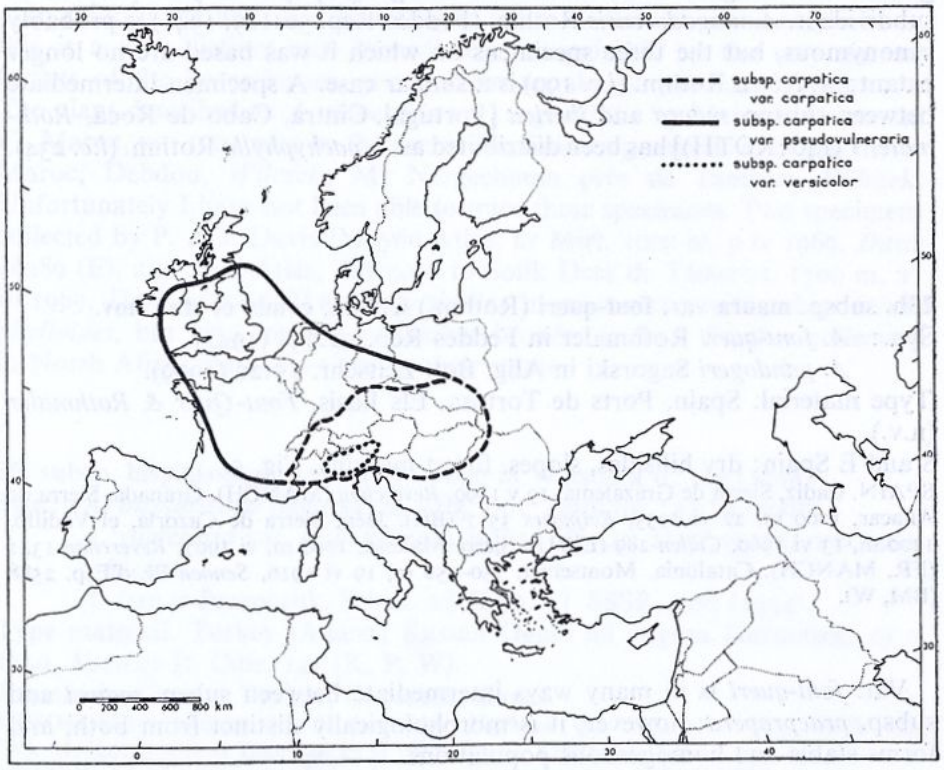

FIG. 6. Distribution of subspecies of *Anthyllis vulneraria*.

MOROCCO. Tanger, iv 1913, *Pitard* 3888 (K, P). Hautes Atlas centr., route de Sidi Fares, 1200 m, *Sitz* 2 (RAB). Atlas Magn., Reraia prope Asni, 1200 m, 31 v 1926, *Lindberg* 3271 (W). Atlas Magn., Ras-el-Maprope Azrou, 24 vi 1926, *Lindberg* 4302 (K). Amizmiz, 1400 m, 30 v 1936, *Balls* 2472 (RAB). Grand Atlas, au Tizi-n-Tilika, 2200 m, 11 v 1955, *Emberger* (RAB). Oued Moulay Ibrahim, 900 m, 14 iv 1969, *P. & J. Davis* 49355 (E). Ain-en Noka, 20 iv 1962, *Sauvages* 17150 (RAB). Anti-Atlas occ. in monte Kest, 1800–1900 m, *Emberger* (RAB). Djurdjura occ., sommet de Haizer, 2700 m, vi 1885, *Battandier* (MPU). Sommet de Ibel Zalagh, prés de Fez, 1 v 1948, *Vindt* (RAB). Ahl Debdou, près de Flouch, 850 m, 10 v 1928, *Wilczek & Dutoit* 253 (RAB). Entre Mogador et Maroc, 17 v 1844, *Cosson* (BM). Taourirt, E of Margechoum gorge, 600–900 m, 13 iv 1928, *Wilczek & Dutoit* 739 (RAB). El Hajeb, 18 iv 1955, *Pailler* 870 (RAB). In saxosis calc. montis Targsunt (Bocoia), 500 m, 16 v 1929, *Font-Quer* (BM, MAF, RAB). Meknes, *Pailler* 1033 (RAB); Azern, 15 vi 1955, *Fairchild* 328 (C). Mt. Kalaa, 1000 m, 4 vi 1929, *Font-Quer* 206 (BM, MAF). Gurugu, Hidum, 7 iv 1932, *Mauricio* Pl. d'Esp. 7535 (W).

ALGERIA. Oran, 14 iii 1937, *Faure* (MPU). Ibid., vallon de noiseaux, 13 v 1906, *Faure* (FR, M). 6½ miles W of El Kseur SW of Bougie, 26 iv 1937, *Alston & Simpson* 37605 (BM). La Gouraya de Bougie, 600 m, vi 1896, *Reverchon* 26 (MANCH). Mers-el-Kebir, 31 iii 1952, *Easton* 3(K). Mustapha, foret de Bainem, 29 iii 1948, *Dubuis* Soc. Fr. 556 (BR, K). Prés Tlemcen, 19 vii 1923, *Faure* (BM).

TUNISIA. Ain Draham, pentes du Dj. Bir, 27 ix 1885, *Robert* 353 (P). Dj. Maghila, 17 v 1887, *Letourneux* (P). Oeud, W from Hamamet, 27 ii 1910, *Raunkaier* (C) Dj. Bou Kourmin bei Kairouan, 12 iv 1913, *Vierhapper* (W).

LIBYA. Tripoli, 21 iii 1887, *Taubert* (P). Tripolitania, W of Misurata, 19 ii 1966, *Archibald* 916 (E).

Subsp. *maura* var. *maura* is the commonest race of the group in north Africa, where it reaches an altitude of 2700 m; in Europe it is essentially a plant of low altitudes. The African material is rather variable, and with greater knowledge of local conditions and geography it may be possible to subdivide it. *A. mogadorensis* Rothm. (Feddes Rep. 50:189, 1941) is probably synonymous, but the three specimens on which it was based are no longer extant; *A. lybica* Rothm. (*l.c.* 190) is a similar case. A specimen intermediate between subspp. *maura* and *iberica* [Portugal, Cintra, Cabo de Roca, *Rothmaler* 13140 (ROTH)] has been distributed as *A. pachyphylla* Rothm. (*l.c.* 234).

23b. subsp. **maura** var. **font-queri** (Rothm.) Cullen, **comb. et stat. nov.**

Syn.: *A. font-queri* Rothmaler in Feddes Rep. 50:238 (1941).
A. gandogeri Sagorski in Allg. Bot. Zeitschr. 15:20 (1909).

Type material. Spain, Ports de Tortosa, Els Basis, *Font-Quer & Rothmaler* (n.v.).

S and E Spain; dry hillsides, slopes, forest margins. Fig. 5.

SPAIN. Cadiz, Sierra de Grazalema, 19 v 1890, *Reverchon* (MANCH). Granada, Sierra de Alfacar, 1200 m, 22 vi 1955, *Reijnders* 3517 (BR). Jaén, Sierra de Cazorla, el Vadillo, 1200 m, 13 vi 1960, *Cullen* 289 (LIVU). Sierra Malessa, 1700 m, vi 1907, *Reverchon* 1341 (FR, MANCH). Catalonia, Montserrat, 750–950 m, 19 vi 1916, *Sennen* Pl. d'Esp. 2588 (BM, W).

Var. *font-queri* is in many ways intermediate between subsp. *maura* and subsp. *praepropera*; however, it is morphologically distinct from both, and forms stable and homogeneous populations.

23c. subsp. **maura** var. **ajmasiana** Pau ap. Font-Quer, It. Maroc. 1928, no. 205 (1929).

Syn.: *A. ajmasiana* (Pau) Roth. in Feddes Rep. 50:236 (1941).
A. vulneraria subsp. *maura* var. *flaviflora* sensu Maire in Jahandiez & Maire, Cat. Pl. Maroc. 3:893 (1934) non *A. vulneraria* var. *flaviflora* DC.

Type. Morocco, Mauretania, Mt Kalaa supra Xauen, 1000 m, *Font-Quer* 205 (BM).

Morocco; dry slopes.

MOROCCO. Chechaouen, Monte Magou, 1500 m, 14 vi 1928, *Emberger* (RAB).

This race is perhaps more widely spread than the above records suggest; it is often difficult to determine flower colour in herbarium specimens without field notes.

24. subsp. **stenophylloides** Cullen, **subsp. nov.**

A subsp. *maura* foliis solum in partibus inferioribus caulium, calycibus 13–14 mm longis, foliolis lateralibus foliorum caulinorum inferiorum angustissime ellipticis differt.

Type. Morocco, Reg. Rabat, sommet de lacum consolide de Mehdia près du Phare, sol calcaire, 23 iv 1962, *Sauvages* (holo. RAB).

Morocco, Algeria; calcareous desert areas.

ALGERIA. E d'Oran, versant S, 1 v 1928, *Wilczek & Dutoit* (RAB). [Only specimens seen.]

In spite of the wide distribution gap between the specimens cited above, this is a very distinct race immediately recognisable by the very narrow leaflets of the lower leaves, giving them an almost pectinate appearance. The plant described as *A. vulneraria* var. *angustifolia* by Maire in Contr. ad Fl. Maroc. no. 1001 may be the same. The following records are cited there: Maroc, Debdou, *Wilczek*; Mt Nargechoum près de Taourirt, *Wilczek*. Unfortunately I have not been able to trace these specimens. Two specimens collected by P. & J. Davis [Moyen Atlas, nr Mirt, 1000 m, 9 iv 1969, *Davis* 49289 (E), and Anti-Atlas, Tafraout to Souk Deta de Tasserirt, 1700 m, 27 iii 1969, *Davis* 48806 (E)] are very similar in most respects to subsp. *stenophylloides*, but tend to have somewhat broader leaflets. Further collecting in North Africa may help to settle their status.

25. subsp. **hispidissima** (Sagorski) Cullen in Watsonia 6: 389 (1968).

Syn.: *A. hispidissima* Sagorski in Allg. Bot. Zeitschr. 14:174 (1908).
A. vulneraria var. *hispida* sensu Boiss., Fl. Or. 2:158 (1972) non auct. hispan.
A. irenae Juzepczuk, Sched. ad Herb. Fl. SSSR 4080 (1954).

Type material. Turkey [Adana] Kassan Oghlu ad pagum Gorumsee, 23 v 1859, *Kotschy* It. Cilic. 141 (K, P, W).

Jugoslavia, Greece, Turkey, Caucasus; slopes.

JUGOSLAVIA. Makedonija, Allchar, 1891, *Hoffman* (W). Ibid., 30 v 1893, *Dörfler* 129 (W). M. Kossov prope Zborsko, 26 vi 1893, *Dörfler* 128 (HAL, W).

GREECE. Madhonia, am Alibotuschgebirge, 5 vi 1930, *Dienowski* (RECH).

TURKEY. Amasya, 400–500 m, *Bornmüller* 1889:255 (E). Hatay, Hasanbeyli, *Haradjian* 3204 (E).
USSR. Georgia, in viciniis Bakuriana in summo montis Kochta, in prato alpino, 19 vii 1954, *Juzepczuk et al.* Herb. Fl. SSSR 4080 (*A. irenae* holo. LE; iso BM). Georgia, . . . , *Juzepczuk et al.* 337 (LE). [All the specimens seen.]

Subsp. *hispidissima*, in spite of its wide distribution area, is apparently a very rare plant; its relationships are obscure, and more material is needed.

26. subsp. **corbierei** (Salmon & Travis) Cullen in Watsonia 6:295 (1967).
Syn.: *A. maritima* var. *corbierei* Salmon & Travis in Journ. Bot. 55:320 (1917).
Type. Britain, Anglesey, South Stack, vi 1916, *Travis* (holo. LIV).
W and S coasts of the British Isles; on maritime cliffs.
BRITAIN. Anglesey, South Stack, 29 iii 1958, *Cullen* (LIVU). Rhosneigr, 22 iii 1961, *Cullen* (LIVU). Cornwall, Hazel Towans, vi 1933, *Bullock* (K). Channel Is., Sark, Creux harbour, 11 vi 1929, *Ballard & Golby* (K). [All the specimens seen.]

This race is known from only very few herbarium specimens; however, it forms large, distinct, homogeneous populations in Anglesey in a habitat not occupied by other races of the complex. It retains its distinguishing characteristics in cultivation. At present it is known only from Britain, but it may well occur on sea cliffs in the western part of France (an area from which I have seen very little *Anthyllis* material).

27. subsp. **fruticans** Emberger in Bull. Soc. Hist. Nat. Maroc 26:167 (1935).
Type. Morocco, Moyen Atlas, Callitraies et Chenais de *Quercus ilex* au-dessous Ksiba à 1400–1500 m d'altitude; sol calcaire; fleurit in juillet; fruit 5–6×4 mm, *Emberger* (n.v.).
Morocco; in *Callitris* and *Quercus* woods on limestone.
MOROCCO. Moyen Atlas au dessus de Ksiba, Tizi-n-Ouriah, 1400 m, calc., 21 v 1936, *Emberger* (RAB). Tadla, Callitraies au calc du Tizi-n-Ail-Ouriah, 1400–1500 m, 17 vii 1934, *Emberger* (RAB). *Ibid.*, 12 vi 1939, *Emberger* (RAB). [All the specimens seen.]

A very distinct and remarkable race, characterised by its woody base and the large size of all its parts. It is difficult to decide how it is related to the rest of the complex, so I have grouped it with the two other problematic races (25 & 26); it may, however, be more closely related to subsp. *polyphylla*, which approaches it in size.

Alpestris Aggregate

1. Calyx sericeous, hairs adpressed or subspreading 2
\+ Calyx pilose to hirsute, hairs spreading 7
2. Plant much branched, with branches from most axils; stem and leaf indumentum canescent . . . . . 33. subsp. *iberica*
\+ Plants without axillary branches; stem and leaf indumentum not canescent, inconspicuous 3
3. Calyx red-tipped; standard, and usually the rest of the petals, pink 4
\+ Calyx usually concolorous (yellowish); at least some of the petals (usually all of them) yellow . . . [28. subsp. *carpatica*] 5

4. Calyx indumentum very sparse, closely adpressed 31. subsp. *pyrenaica*
+ Calyx indumentum dense, subspreading . 32. subsp. *iframensis*
5. Corolla pale yellow; leaves mainly borne close to the base of the stem . . . . . 28a. subsp. *carpatica* var. *carpatica*
+ Corolla deep yellow, or some petals pink; leaves distributed along the stem, at least to the middle 6
6. At least the standard pink; stems 10–20(–30) cm . . . 28c. subsp. *carpatica* var. *versicolor*
+ All petals yellow; stems 15–60 cm . . . . . 28b. subsp. *carpatica* var. *pseudovulneraria*
7. Stems spreading pilose below: corolla pink 30. subsp. *subscaposa*
+ Stems adpressed sericeous below; corolla yellow . . . 8
8. Calyx (12–)13–18 mm with smoke-grey indumentum 29. subsp. *alpestris*
+ Calyx 9–12 mm with white to yellow indumentum . . . 9
9. Stem 10–15 cm; sinus between upper two calyx teeth wide, obvious . . . . . 35. subsp. *borealis*
+ Stem 20–40 cm; sinus between upper calyx teeth obscure, narrow . . . . . [34. subsp. *lapponica*] 10
10. Leaves with ± obtuse leaflets; heads dense, many-flowered . 34a. subsp. *lapponica* var. *lapponica*
+ Leaves with ± acute leaflets; heads rather loose, few-flowered . 34b. subsp. *lapponica* var. *fennica*

28. subsp. **carpatica** (Pant.) Nyman, Consp. Suppl. 2, 1:87 (1889).

28a. var **carpatica**

Syn.: *A. carpatica* Pantocsek in Mag. Nov. Lap. 6:162 (1882).
A. vulneraria var. *vulgaris* Koch in Röhl., Deutschl. Flora 124 (1839); Gams in Hegi. Ill. Fl. Mitteleur. 4, 3:1359 (1927).
A. vulgaris (Koch) Kerner, Sched. ad Fl. Exsicc. Austr.-Hung. 434 (1883); Sagorski in Allg. Bot. Zeitschr. 14:42 (1908); Becker in Beih. Bot. Centr. 27, 2:282 (1910).
A. vulneraria subsp. *vulgaris* (Koch) Corb., Nouv. Fl. Norm. 148 (1894); Asch. & Graebn., Syn. 6, 2:621 (1908) *pro parte*; Hayek, Prodr. Fl. Balc. 1:890 (1926).
A. affinis Britt. in Mertens & Koch, Deutschl. Fl. 5:124 (1839); Sagorski in Allg. Bot. Zeitschr. 14:4 (1908); Becker in Beih. Bot. Centr. 27, 2:282 (1910).
A. vulneraria var. *affinis* (Britt.) Wohlf. in Koch, Syn., ed. 3, 1:530 (1891); Gams in Hegi, Ill. Fl. Mitteleur. 4, 3:1359 (1927).
A. vulneraria prol. *A. communis* Rouy in Rouy & Foucaud, Flore de France 4:286 (1897) *pro max. parte* (—vars. *genuina*, *gracilis* & *affinis*).
A. vulneraria subsp. *communis* (Rouy) Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:34 (1950).

Type. None cited.

C Europe, mainly in the Alps (France, Italy, Germany, Switzerland, Austria, Hungary, Czechoslovakia, Poland); in alpine valleys. Fig. 6.

FRANCE. Rhône, Buisante prés Villefranche, 18 v 1878, *Tillet* (MANCH). Hautes Alpes, Gap, vi 1853, *Blanc* Fl. Gall. et Germ. Exsicc. 1154 (CGE, LIVU). Côte d'Or, Gevrey-Chambertin, 30 v 1912, *Gerard* Soc. Fr. 400 (AMD, M). Cher, Morthomier, 29 vii 1861. *Déséglise* Fl. Gall. et Germ. Exsicc. 3560 (LIVU, MANCH, non CGE).

GERMANY. Tübingen, am linken Neckarufer, 4 v 1893, *Correns* (M). Ammerseegebeit, Seefeld-Erling, 3 vi 1956, *Gutermann* 226 (M). Bayreuth, *Mayer* (W). Ratisbon (Regensburg), 25 v 1883, *Richter* (HAL).
SWITZERLAND. Arosa, 1800 m, 1917, *Rechinger* (RECH); Neuchâtel, les Brazils, 30 v 1961, *Heywood* (LIVU). Zürich, 2 v 1874, *Walters* (MANCH).
AUSTRIA. Vorarlberg, Frastanz, 23 vi 1934, *Schneider* (W). Tirol, Eisaktal, 7 ix 1908, *Heimerl* (HAL). Ost-Tirol, Lienz, 18 vi 1928, *Schneider* (W). Steiermark, pr. Sochau, v 1905, *Sabransky* Fl. Stir. Exsicc. 128 (BM, E, MANCH, W). Graz, 900 m, 2 iv 1882, *Preissmann* (W). Kärnten, Raibl, 1000 m, *Preissmann* (W). Salzburg, Salzachufer, 27 iv 1913, *Rechinger* (RECH). Oberösterreich, Steyr, 17 vi 1885, *Pehersdorfer* (W). Niederösterreich, inter Laab und Alt-Lengbach, 500 m, *Heimerl* Fl. Exsicc. Austr.-Hung. 434 (C, E, HAL, K, M, P, RECH, W). Semmering, *Kerner* Fl. Exsicc. Austr.-Hung. 436 I (BM, C, E, HAL, K, M, MANCH, W). Pernitz, 6 vii 1921, *Rechinger* (RECH). Gloggnitz, 5 vi 1885, *Richter* in Schulz Hb. Norm. 1956 (BM, M, MANCH, W).
ITALY. Adige, Bozen (Bolzano), 200 m, 10 v 1911, *Pfaff* (W).
HUNGARY. Mt Choc, 700–1000 m, *Pantocsek* Fl. Exsicc. Austr.-Hung. 436 II (C, E, MANCH, RECH, W). Thebner Kogel, 20 v 1909, *Vetter* (W).
CZECHOSLOVAKIA. Gross Pistyan, 23 vii 1886, *Ronniger* (W). Kuchina, 29 v 1923, *Rechinger* (RECH).
POLAND. Posen, Ft Winary, 9 viii 1912, *Mayer* (M).

Subsp. *carpatica* is a polymorphic race; vars. *pseudovulneraria* and *versicolor* represent stabilised intermediates between it and other races (see below), which appear to form relatively homogeneous populations and to have circumscribed distribution areas. However, in eastern central Europe subsp. *carpatica* forms a series of intermediates with subsp. *polyphylla* (see above), which covers the whole morphological range between the two, and therefore cannot conveniently be treated as a variety of either. Such forms are quite widespread; and have probably been introduced into some areas by cultivation, as with subsp. *polyphylla*. The solution of this problem adopted here is to treat those plants which most resemble either of the putative parent races as those races (i.e. subsp. *polyphylla* and *carpatica*), leaving a residue of totally intermediate types unassigned. The following are representative of this completely intermediate type:
SWITZERLAND. Ticino, Lago Maggiore, Ascona, 24 vii 1931, *Aellen* (BM, K, M, W).
AUSTRIA. Tirol, bei Ried, 1350 m, 9 viii 1926, *Handel-Mazzetti* (W). Kärnten, Weizbachtal bei Wiez, vii 1911, *Sabransky* (W). Steiermark, Altenmarkt a.d. Enns, 400 m, v 1904, *Pehersdorfer* Fl. Stir. Exsicc. 127 (W). Oberösterreich, Windischgarten, 900 m, 18 vii 1906, *Niederer* (M, MA). Niederrösterreich, Mödling, 1884, *Heimerl* (HAL, W). Cult. als Futterpflanze bei Augen im Marchfeld, 26 vi 1903, *Korb* (W). Krems, 3 v 1914, *Schneider* (W). Burgenland, Wieden am See, versus Neusiedl, 1 v 1926, *Rechinger* (RECH).
HUNGARY. M. Kis Szenashegy, Pilissentivan, 300 m, 26 v 1918, *Degen* Fl. Hung. Exsicc. 685 III (M, W). Buda, vii 1875, *Richter-Lajos* Soc. Dauph. 746 (P).
CZECHOSLOVAKIA. Brno pr. Koberice, 260 m, *Volak* Fl. Exsicc. Rp. Boh. Slov. 814 III (BR, C, W). Visoka, *Schneider* (W).

In addition to the specimens discussed above, several more—from France and Belgium—have also been referred to this intermediate series. It is difficult to explain these occurrences except by assuming that the intermediate type has been cultivated there. Ascherson & Graebner have reported that subsp. *polyphylla* has been grown as a forage plant in central Europe; and Jalas (op. cit.) mentions the cultivation of subsp. *carpatica* for the same purpose, and there is evidence that the intermediate type was cultivated in Austria (cf. the specimen from Augen, cited above). Therefore it seems possible that cultivation is responsible for the records, which are as follows:
FRANCE. Calvados, Arromanches, 3 vii 1862, *Anon.* (BR). Dieppe, 11 vi 1883, *Richter* (HAL). Seine Maritime, Cap d'Antifer, 7 vi 1924, *Senay* (DIDIER, LIVU).

BELGIUM. Olloy, vi 1894, *Sladden* (BR). Willerzies, 1866, *Gravet* (BR) entre Deurne et Wyneghem, v 1876, *Vandenbroek* (BR). Entre Kermt et Schulen, v 1884, *Bamps* (BR). Dave, v 1867, *Coomans* (BR). Hamoir a Sy, 1892, *Sladden* (BR).

28b. subsp. **carpatica** var. **pseudovulneraria** (Sagorski) Cullen, **stat. nov.**
Syn.: *A. vulneraria* Unterrasse *A. pseudovulneraria* Sagorski in Allg. Bot. Zeitschr. 14: 129 (1908) *pro max. parte.*
Type. See below.
N and C Europe. Italy, France, Switzerland, Austria, Belgium, Luxembourg, Germany; sporadic and fugitive in Britain, usually in waste places near cultivation. Fig. 6.
FRANCE. Isere, Villard de Lans, 28 ix 1949, *Sandwith* 3542 (K). Seine et Oise, Maisse, 20 vii 1879, *Delacour & Verlot* Soc. Dauph. 2422 (K, P). Gironde, St Andrae de Cubzac, vi 1879, *Jarris* Soc. Dauph. 2421 (K). Seine, St Maur, 11 vi 1909, *Rothkegel* (BR).
SWITZERLAND. Puschlav (Poschiavo), La Presa, 26 viii 1928, *Weisenbeck* (M). Zentralalp, Disentis, 1120 m, v 1922, *Winterhalter* Fl. Rhae. Exsicc. 546 (W).
AUSTRIA. Kärnten, Himmelberg, 19 vi 1931, *Schneider* (W). Steiermark, Hum bei Tüffer, 21 vi 1909, *Korb* (W). Niederösterreich: Reith nächst Zöbing, 29 vi 1922, *Zerny* (W); Mödling, 20 vi 1909, *Ronniger* (W).
GERMANY. Weimar, vii 1908, *Bornmüller* (W). Oppenheim, vii 1867, *Wirtgen* Hb. Fl. Rhen. 952 (BR, CGE, C, LIVU, MANCH, P). Grossheim bei Zabeltitz, 17 vi 1910, *Hofmann* Pl. Cr. Sax. 318 (FR, M). Burgwenden, 20 vii 1904, *Sagorski* (FR, W).
LUXEMBOURG. Palmberg, Ahn, 11 vi 1950, *Toyrnay* 58 (BR).
BELGIUM. Entre Matagne-le-Grand et Dourbes, 16 v 1955, *Lawalree* 6748 (BR). Petit Modave, 25 v 1884, *Errard* (BR). Heppen, vii 1952, *de Ruyver* (BR).
BRITAIN. Surrey, Epsom downs, 21 vi 1925, *Britton* 2761 (K). Berkshire, Vale of White Horse, 30 v 1959, *Cullen* T 11 (LIVU). Oxfordshire: Stonesfield, 5 viii 1930, *Montford, Summerhayes & Turrill* 2130 (K); ibid., 25 v 1944, *Turrill & Hubbard* 11789 (K). Suffolk, Fox hole heath, 11 viii 1951, *Summerhayes* 2420 (K). Nottinghamshire, Anstro Stores wood, 5 vii 1946, *Summerhayes* 1570 (K). Lancashire, Liverpool, Gateacre, railway siding, 9 vii 1959, *Cullen* (LIVU). Isle of Man, Ramsey, Dog Mills, 1 vi 1950, *Summerhayes* 2164 (K).

Var. *pseudovulneraria* appears to be a relatively stabilised intermediate between subsp. *vulneraria* and subsp. *carpatica*, perhaps spread to some extent by cultivation. In the British Isles it seems to be only casual, persisting in dry waste places for a few years only; its status in the rest of Europe is uncertain. The taxon was first described by Sagorski, who cited no specimens with the name; instead, he states: 'Ich sah diese Form aus England, Frankreich von zahlreichen Stellen, aus der Schweiz, Südtirol, Istrien, Kroatien, Dalmatien, Albanien . . . und Niederösterreich". Obviously Sagorski has confused more than one taxon in this list: I have seen no specimens of this race from Jugoslavia, Albania, etc., and suspect that Sagorski has included here specimens intermediate between subsp. *polyphylla* and *weldeniana* (see no. 22), which bear a superficial resemblance to var. *pseudovulneraria*. There is no doubt, however, that his description fits with the western European plant, and I have therefore taken up the name.

28c. subsp. **carpatica** var. **versicolor** (Sagorski) Cullen, **comb. nov.**
Syn.: *A. dillenii* var. *versicolor* Sagorski in Allg. Bot. Zeitschr. 14:133 (1908).
Type. See below.
S/C Europe. Switzerland, Italy, Austria, Jugoslavia; on slopes and hillsides. Fig. 6.

ITALY. Bergamo, Piano de Resinelli, 1900–2000 m, 2 viii 1956, *Gutermann* 765 (M). Parma, M. Prinzera, 500–800 m, 13 v 1951, *Merxmüller* (M). Como, Lecco, Val Meria, 23 v 1907, *Ronniger* (W). Bei Olcio gegen Mandello, 200–300 m, 9 vi 1957, *Gutermann* (M). Verona, ad Malcesine, 30 v 1933, *Rechinger* (RECH). Adige, Monte Baldo, 1600–1800 m, 21 vi 1881, *Porta* (W). Judicarien, Val di Ledro, 1000–1400 m, 19 vi 1886, *Porta* (MANCH). Salurn, 29 vi 1910, *Pfaff* (FR, W).
JUGOSLAVIA. Wocheinersee, 31 vii 1913, *Ronniger* (W). Bohinjske Jezero, 523 m, 25 vii 1953, *Merxmüller* (M). Idria, *Pittoni* (W).
SWITZERLAND. Ticino, St Salvatore, 14 iv 1886, *Taggi* (K).
AUSTRIA. Steiermark, Rax, 4 vii 1862, *Simony* (W). Niederösterreich, Rodaun, 16 vii 1919, *Ronniger* (W).

This race is intermediate between subsp. *carpatica* and subsp. *weldeniana*, forming stable populations, at least in northern Italy. Like var. *pseudovulneraria*, no specimens were cited by Sagorski when describing the taxon. However, his description and comment: "Südtirol, bei Bozen, Trient und im ganzen Gardasee-Gebiet" leaves no doubt as to the correct application of the name.

29. subsp. **alpestris** (Kit. ex Schultes) Asch. & Graebn., Syn. 6, 2:627 (1908); Hayek, Prodr. Fl. Balc. 1:889 (1926).

Syn.: *A. vulneraria* var. *alpestris* Kit. ex Schultes, Oesterr. Flora 2:317 (1814); Gams in Hegi, Ill. Fl. von Mitteleur. 4, 3:1358 (1927).
A. alpestris (Kit. ex Schultes) Reichb., Fl. Germ. Exc. 515 (1832); Sagorski in Allg. Bot. Zeitschr. 14:55 (1908); Becker in Beih. Bot. Centr. 27, 2:280 (1910); Rothmaler in Feddes Rep. 50: 186 (1941).
A. vulneraria var. *calcicola* Schur, Enum. Pl. Transs. 150 (1866).
A. alpicola Brügger in Jahresb. Naturf. Ges. Graubündens 29:25 (1886).

Type. Described from Austria, no specimen cited.

Cantabrian mountains, Alps, Carpathians, mountains of the Balkan peninsula; in alpine pastures. Fig. 5.

SPAIN. Vizcaya, Bilbao, Pena Gorbeya, 1300 m, 21 vi 1926. *Font-Quer* (ROTH). Ibid., *Guinea* Phytotheca Selecta 539 (LIVU, MA).
FRANCE. Hautes Alpes, La Grave, Le Chazelet, 300 m, 27 vii 1899, *Ronniger* (W). Briancon, 10 vii 1879, *Reverchon* (MANCH). Isere, Mt. Senappe prés Mothe-le Bains, 9 vii 1855, *Verlot* Fl. Gall. et Germ. Exsicc. 3560 (BR, CGE, LIVU, MANCH). Alpes de Larche, Pnte de la Signora, 2600–2700 m, 14 viii 1957, *Gutermann* 439 (M).
GERMANY. Bayern, Berchtesgaden, Hundstadt, *Spitzel* (M). Tocheralm am Walchensee, 6 vii 1899, *Goldschmidt* (FR).
SWITZERLAND. Vaud, Vallon des Martinets, 1500 m, 24 vi 1882, *Masson* (C, MANCH). La Doie au Vuarrens, 1400 m, 28 vi 1949, *Palazieux* Soc. Fr. 945 (BR). À Bonatchesse, 1530 m, 24 vi 1909, *Marret* 238 (C). Jura, Mt Hassenmatt, 1000 m, 11 vi 1934, *de Retz* (BR). Ticino, Crepe du Chien to Sils, Baseglia, vii 1929, *Weisenbeck* (M).
AUSTRIA. Vorarlberg, Innsbruck, 1867, *Kerner* (W). Toril, Mt Blaser supra Trins, 2300 m, 1878, *Kerner* (FR, HAL, MANCH); Unter Krummholz, nächst dem Salztorl bei Hall, 19 vii 1925, *Vetter* (W). Nordkette, Kreuzjochel, 2121 m, 20 ix 1936, *Rechinger* (RECH). Ad Trins in valle Gschnitz, 1800–2400 m, *Kerner* Fl. Exsicc. Austr.-Hung. 435 (BM, C, E, HAL, K, M, MANCH, P, RECH, W). Ost Tirol, Prägarten, 2000–2200 m, *Rechinger* (RECH). Virgen, 1866, *Ganderp* (LIVU, P). Kals-Matreier Torl, 1800 m, 14 ix 1934, *Rechinger* (RECH). Kärnten, Kappel, Hochobir, 1800 m, 13 vi 1929, *Schneider* (W). Mauthen, c. 1900 m, 4 viii 1901, *Keller* (W). Heiligenblut, Gipper, 1500 m, 29 vii 1906, *Jeanpert* (P). Steiermark, Eisenhuttes bei Turrach, 14 vii 1924, *Vetter* (W). Admont, Mt Sparrfeld, 2000 m, 16 ix 1929, *Rechinger* (RECH). Gross Buchstein, 2300 m, 13 viii 1932, *Wyatt* (K). Salzburg, Zwieselalpe, 26 vii 1905, *Korb* (W). Mt Kalkspitz, 2000 m, 24 viii 1927, *Rechinger* (RECH). Hoher Göll, 1800–2000 m, 10 viii 1928, *Rechinger* (RECH).

Oberösterreich, Laussathal, vii 1883, *Steininger* (K). Niederösterrreich, Schneeberg, vii 1888, *Richter* (C, HAL, W). Reissalpe pr. Lilienfeld, 18 vi 1911, *Vetter* (W). Semmering, vi 1884, *Woloszczak* (W).
ITALY. Adige, Val di Ledro, 1200–1700 m, 7 vi 1882, *Porta* (HAL, MANCH). M. Gavardina, 1300–1800 m, vi 1894, *Porta* in Schulz, Hb. Norm. 4514 (C, E, MANCH, P, W). Dosso Alto, Pso. de Marriva, 1690 m, 29 vi 1956, *Gutermann* 350 (M). Venezia, Vazolla, 17 vi 1903, *Murray* (BM). Piemonte, Colle de Siestre, 2100–2300 m, 23 vii 1937, *Zerny* (W).
CZECHOSLOVAKIA. M. Nizke Tatry, M. Sina, 1563 m, vi 1938, *Deyl* (C, W). Krivan, 1700 m, 29 vi 1901, *Brancsik* (MANCH, W). M. Sivyvrch pr. Zuberez, 1800 m, 17 viii 1928, *Rechinger* (RECH).
JUGOSLAVIA. Herzegovina, Mt Velez, 10 vii 1911, *Schneider* (W). Mt Treskavica, 1800 m, 9 viii 1903, *Maly* (K). Karlovac, 18 vi 1955, *Rechinger* 16156 (RECH). Mangart, vi 1897, *Eggers* (W).
GREECE. Mt Smolika, supra pag. Kerasovo, 1500 m, 9 vii 1958, *Rechinger* 21071 (W).

Subsp. *alpestris* has a somewhat disjunct distribution, being absent from the Pyrenees, where it is replaced by subsp. *pyrenaica*. A curious form of the race occurs in the area around Zermatt in Switzerland; here the plants are very dwarf, and the corolla appears to be reddish. This variant has been called *A. vallesiaca* Beck (Ann. Nat. Hofmus. Wien 11:65, 1896), but does not appear, from the evidence available to me, to be worth recognition; this is perhaps a problem that could be resolved by population studies.

Subsp. *alpestris* forms intermediates to subsp. *carpatica* at moderate elevations in the Alps; and to subsp. *pulchella* in the Balkans—these plants are morphologically close to subsp. *alpestris*, but rather dwarf, and with red-tipped calyces.

30. subsp. **subscaposa** Cullen, **subsp. nov.**

A subsp. *alpestris* caulibus inferiore patento-hirsutis, corollis roseis, calycibus albidis, sparse pilosis differt.
Type. [USSR Caucasus] Plantae Abchasicae, Predzybsky Massif, Per. Sinelnikova, Sukhoy alpiinsky luch', 4 iv 1936, *P.S. Panjutin* 1091a (holo. LE).
Caucasus; in dry pastures and meadows.
USSR. Ser., Cauc., . . . , 26 viii 1947, *Borissova* 311 (LE). Carthalinia, Achalzych, 7 vi 1881, *Brotherus* (BM, LE). Cauc. bor., . . . , 23 vii 1926, *Radionowa* (LE); Caucasus, 5 viii 1895, *Lipsky* (LE). Daghestan, distr. Arawak prope p. Chergeb in ascensu m. Zubercha in pratis siccis, 28 v 1901, *Alexeenko* (LE); distr. Samur, prope pag. Gedym, in herbidis borealis abruptis, 2300 m, 17 viii 1900, *Alexeenko* 9043 (LE). Terskaya Obl., 6 viii 1911, *Busch* (LE). [All the specimens seen.]

This new subspecies is quite widely distributed in the Caucasus; it clearly belongs to the *Alpestris* aggregate on characters of leaves, bracts and calyces, but it is remarkable in having a much denser indumentum than other races in the group. One specimen from the Abkhazyan region (in montosis Imeretiae ad Malitzkoi-post, *Szovits* (LE)) is intermediate between subsp. *subscaposa* and subsp. *polyphylla*.

31. subsp. **pyrenaica** (Beck) Cullen in Feddes Rep. 79:52 (1968).
Syn.: *A. coccinea* forma *pyrenaica* Beck in Ann. Nat. Hofmus. Wien 11:65 (1896).
A. pyrenaica (Beck) Sagorski in Allg. Bot. Zeitschr. 14:185 (1908); Becker in Beih. Bot. Centr. 27, 2:284 (1910); Rothmaler in Feddes Rep. 50:187 (1941).

Type material. France, Hautes Pyrénées, Gèdre, 1000 m, vii 1876, *Bordère* (FR, HAL, MANCH, W).

Cantabrian mountains, Pyrénées; in alpine pastures and on slopes. Fig. 4.

FRANCE. Hautes Pyrénées, Gedre nr road to Gavarnie, 1000 m, *Hutchinson, Matthews & Riley* (E, K). St. Sauveur, 3500 m, 17 iv 1932, *Meinertzhagen* (BM). Vignemale, Haiguelle d'Ossau, *Rechinger* (RECH). Basses Pyrénées, Pic Bergons, 1500–1900 m, 21 v 1908, *Mayer* (M). Garonne, Luchon to St Aventin, 11 vii 1951, *Verleur* (AMD).

SPAIN. Huesca, Froningal du Sallent, 1900 m, 11 vii 1906, *Pau* (MA). Gerona, Camprodon, Font del Boie, 17 vii 1926, *Cuatrecasas* (MAF). Lerida, Espot, 1350 m, 4 vii 1934, *Rothmaler* (ROTH). Leon, Puerto de Ponton, 13 vii 1927, *Wilmott* (BM). Oviedo, Picos de Europa, 19 vii 1927, *Wilmott* (BM).

This race forms intermediates to subsp. *vulnerarioides* where the two overlap in the Pyrenees (these forms having been named *A. dertosensis* Rothm.); and also to subsp. *forondae* in the Pyrenees and Cantabrian mountains—plants with sparse, spreading hairs in the lower part of the stem, which have been named *A. cantabrica* by Rothmaler (Feddes Rep. 50:191, 1941).

32. subsp. **iframensis** Cullen, **subsp. nov.**

A subsp. *pyrenaica* indumento calycis denso, subadpresso, vexillo roseo, carina alba differt.

Type. Morocco, Moyen Atlas Central, Ifram, station de biologie, 25 v 1950, *Sauvages* 1645 (holo. RAB).

Morocco. Lesser Atlas.

MOROCCO. Moyen Atlas, nr. Ifrane, c. 1700 m, 8 iv 1969, *P. & J. Davis* 49146 (E). [Only other specimen seen.]

This race, although known from only two specimens, is quite distinct among the north African taxa, being the only one belonging to the *Alpestris* aggregate, clearly related to subsp. *pyrenaica*.

33. subsp. **iberica** (Becker) Jalas in Bull. Jard. Bot. Brux. 27: 409 (1957).

Syn.: *A. spruneri* subsp. *iberica* Becker in Beih. Bot. Centr. 27, 2:270 (1910).
A. vulneraria var. *rubriflora* sensu Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3:333 (1877) non DC.
A. asturiae Becker in Beih. Bot. Centr. 27, 2:284 (1910).
A. vulneraria var. *littorea* Sampaio, Fl. Port. ed. 2, 296 (1947).

Type material. Portugal, Douro litoral, Arredores de Porto, Mattosinhos, iv 1901, *Sampaio* Fl. Lus. Exsicc. 1681 (HAL, P).

Atlantic coasts of Europe (Portugal, Spain, France); on sand dunes and hills near the sea.

PORTUGAL. Douro litoral, Leca, vi 1915, *Sampaio* (W).

SPAIN. Pontevedra, Monteferro, 21 vi 1935, *Schafer* (BM, K). Coruna, La Coruna, 4 ix 1852, *Lange* (C). Leon, N of Riano, 8 vii 1927, *Wilmott* (BM). Oviedo, Gijon, 6 v 1864, *Bourgeau* 2637 (BM, E, C, W-type of *A. asturiae*). Vizcaya, Bilbao, v 1850, *Willkomm* 66 (BM, C, M, W). Santander, 17 iv 1935, *Gourlay* G7 (K). Guipuzcoa, Pasajes, iv 1895, *Gandoger* 89 (C, K, MA).

FRANCE. Basses Pyrénées, Falaises à Biarritz, vi 1870, *Bordère* (C, HBG, K, LIVU). St. Jean de Luz, 1950, *Lefebvre* (BR). Gironde, Bedenac, vi 1932, *Bouchon*, Soc. Fr. 6593 (BR). Morbihan, Quiberon, 11 v 1894, *Gadeceau* (BM). Finisterre, Santec, 29 v 1882, *Miciol* (HAL). Seine Maritime, Le Treport, vi 1900, *Bewirt* (W). Pas de Calais, Berck, vii 1882, *Wignier* Fl. Gall. sept. et Belge 272 (BR, K, MANCH).

This race was first noted by Willkomm in 1877, and for it he took up the name "*A. vulneraria* var. *rubriflora* Ser." This name, applied by Seringe (in DC., Prodr.) to many of the red-flowered races of the complex, is based on a figure (413) in Dillenius' *Hortus Elthamensis*. The plant figured was collected by Lloyd (Llwhyd), and is part of the intermediate series between subsp. *vulneraria* vars. *vulneraria* and *coccinea* (see nos 1a & 1c), and is therefore not applicable in the present case.

A. dillenii Schultes ex Loudon is also based on the same Dillenius figure, and therefore, in spite of Rothmaler's conclusions to the contrary (1941, p. 188), this name is also incorrect for the present race. The name '*A. dillenii*' was wrongly used by Beck for his 'Gesamtart *A. dillenii*', which includes all the normally red-flowered races of the complex regardless of other characters. In this treatment he was followed by Sagorski and Ascherson & Graebner.

As mentioned above (no. 1b) subsp. *iberica* grades into subsp. *vulneraria* in northern France and Britain, forming the taxon here referred to as subsp. *vulneraria* var. *langei*. Usually, such plants are very similar to subsp. *vulneraria* sens. str., but have the much branched, prostrate habit of subsp. *iberica*. Occasional plants from S Wales (Pembrokeshire) are much closer to subsp. *iberica*.

34. subsp. **lapponica** (Hyl.) Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:38 (1950).

34a. var **lapponica**.

Syn.: *A. vulneraria* var. *lapponica* Hylander, Upps. Univ. Årsskr. 7:226 (1945).

A. kuzenuvae Juzepczuk in Not. Syst. Herb. Inst. Bot. Acad. Sci. URSS 13:34 (1950).

Type. [Photograph.] Lagerberg, Svenska Fjällblommor 2:f. 70 (1940).

N Europe (Ireland, Scotland, Norway, Sweden, Finland); cliffs, rocky places, stony slopes. Fig. 5.

IRELAND. Mayo, Mulcrany, 18 viii 1947, *Ross-Craig & Sealy* 1533 (K). Connemara, 1 km W of Roundstone, 14 vii 1946, *Ross-Craig & Sealy* 1202 (K). Sligo, Ben Bulben, vii 1843, *Ball* (E).

BRITAIN. Hebrides, Eigg, 24 v 1949, *Henderson* (E). Angus, 2 m N of Arbroath, 9 vii 1904, *Marshall* 2809 (E). Perthshire, Ben Lawers, viii 1921, *Jay* (BM). Aberdeenshire, Braemar, *Somerville* (E). Sutherland, Bettyhill, 23 vi 1959, *Gordon* (LIVU). Orkney, mainland, nr Vinguin Hill, 20 vi 1928, *Johnstone* 3897 (E, K). Fair Isle, near the school, 7 vii 1957, *Martin* (CGE). Shetland, Unst, Burrafirth cliffs, 31 viii 1887, *Beeby* 852 (C, CGE).

NORWAY. Opland, Vardal, Mastad, 7 vii 1936, *Holmboe* (K). Veteralen, Hadselo bei Melbo, 8 ix 1887, *Peter* (M). Noerdland, W coast, lat. 66° N, *Fielden* (CGE). Hordaland, Hardanger Fjord, 19 vi 1958, *Womersley* E58 (K). Troms, Harstad, vii 1921, *Walton* (MANCH). Finmark, Altafjord, Talvik, 7 viii 1947, *Coombs & White* (BM).

SWEDEN. Uppsala, vii 1867, *Ahlberg* (CGE, K, MANCH). Stockholm, vii 1856, *Nyman* (MANCH). Alvsborg, Amal, vii 1898, *Walderstrom* (W). Smaland, Grenna, 19 vi 1896, *Lindequist* (W). Ostergotland, Linköping, 1867, *Kindberg* (HAL). Norbotten, Jukkasjarvi, sn. Njuonjarvi, 17 vii 1920, *Smith* (W); Lule Lappmark, Njunnats, 1869, *Andersen* (BR, W).

FINLAND. Uusimaa, Lappvik, 5 vii 1908, *Holmberg* Pl. Finl. Exsicc. 757 (C, K, P, W).

The type of this race is a photograph—fortunately a very good photograph, so that there is no doubt as to the application of the name.

Jalas (op. cit.) concluded that *A. kuzenuvae* Juz. from the Cibiny mountains of the Kola peninsula (USSR) belonged to subsp. *lapponica*; I have seen no material from this region.

34b. subsp. **lapponica** var. **fennica** (Jalas) Cullen, **stat nov.**
Syn.: *A. vulneraria* subsp. *fennica* Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:35 (1950).
Type. Finland, Mikkel, Joroinen, Torstila, 29 vii 1942, *Lindberg* Pl. Finl. Exsicc. 1991 (K, W).
Finland; dry pastures and slopes.
FINLAND. Hame, Tavastia, Tavastihus, 25 vii 1923, *Fellstrom* (C, RECH). Kuopio, Riistavesi, 18 vii 1947, *Jalas* (JALAS, LIVU).

35. subsp. **borealis** (Rouy) Jalas in Ann. Bot. Soc. "Vanamo" 24, 1:40 (1950).
Syn.: *A. vulneraria* prol. *A. borealis* Rouy in Rouy & Foucaud, Flore de France 4:285 (1897).
Type. None cited.
Iceland. Fig. 3.
ICELAND. M. Hekla, 1835, *Robert* (P). Esja, 16 viii 1938, *Polunin* 12321 (BM). Njardvik, 21 vii 1894, *Jonsson* 32 (C). Hafnafjord, 24 vii 1951, *Grontved* (C).

No type was cited with the original publication of *A. borealis*; the first specimen cited above seems a clear choice should a lectotype be needed. Subsp. *borealis* is very similar to the north Scandinavian forms of subsp. *lapponica*; the difference between the two races in the upper calyx teeth was first described and figured by Jalas.

Intermediates

The various intermediate types occurring in the complex have been mentioned individually under the subspecies in the foregoing revision. All this information is brought together in the diagram (fig. 7) which shows the linkage of many of the major taxa in a reticulum. The subspecies are shown

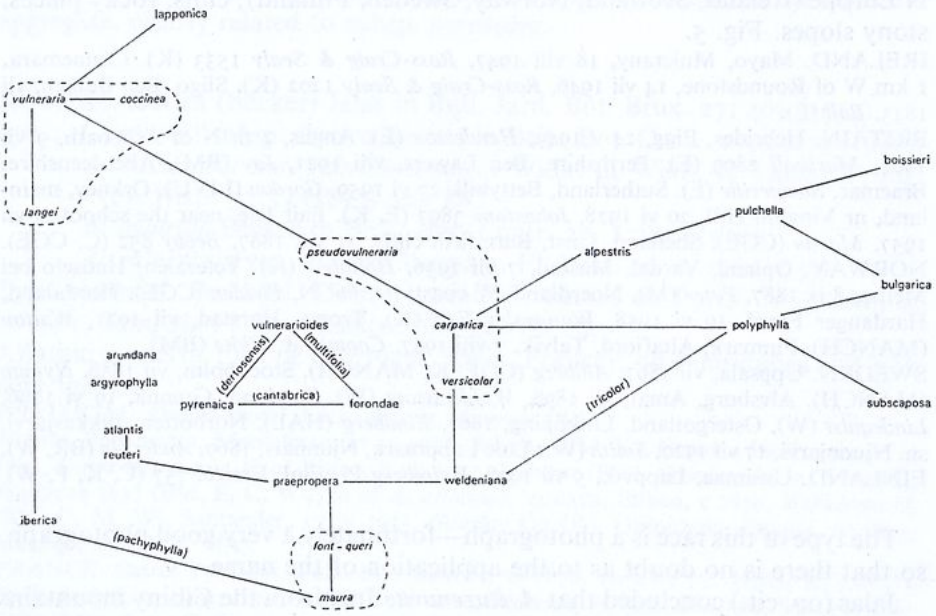

FIG. 7. Diagram to show the linkage of the major taxa within the *Anthyllis vulneraria* complex.

by their names, or, in the case of those divided into varieties, a dotted outline containing the names of the varieties in italic type; lines linking the various taxa show the occurrence of intermediate types between them. Names applied to intermediate types are shown in parentheses along the lines linking the subspecies.

The following subspecies do not show any intermediates: *maritima*, *abyssinica*, *saharae*, *variegata*, *rifana*, *fatmae*, *matris-filiae*, *pindicola*, *lusitanica*, *stenophylloides*, *hispidissima*, *corbierei*, *fruticans*, *inframensis*, *borealis*. This lack of intermediate types may well reflect, in many cases, a lack of sufficient knowledge.

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Index to numbered specimens seen

(Intermediates are indicated by an oblique stroke)

Adamovic: 70, *pulchella*; 264, *praepropera*. Alava: 4750, *praepropera*. Alexeenko: 9043, *subscaposa*. Alston & Sandwith: 1436, 1759, *praepropera*; 1844, *pulchella*. Alston & Simpson: 37605, *maura* v. *maura*. Apold et al.: 105, *boissieri*. Archibald: 916, *maura* v. *maura*.

Baenitz, Hb. Eur.: 6, *maritima*. Baldacci: 1877:205, *pulchella*; 268, *bulgarica*; 1898:114, *pulchella*. Ball & Wagstaffe: 627, 694, *bulgarica*. Balls: 1296, *variegata*; 2472, *maura* v. *maura*. Becker: 49, 109, 169, 213, *boissieri*. Beeby: 405, *vulneraria* v. *vulneraria/coccinea*; 852, 853, *lapponica* v. *lapponica*. Blanco: 122, 123, *reuteri*. Boom & van Ootstrom: 11543, 15445, *carpatica* v. *pseudovulneraria*. Bor: 31, *vulneraria* v. *vulneraria*. Bourgeau: 146, *maura* v. *maura*; 242, *vulnerarioides*; 1114, *atlantis*; 2637, *iberica*. Borissova: 165, *boissieri*; 311, *subscaposa*. Bornmüller: 255, *hispidissima*; 485 *praepropera*; 1324, 1825, 3371, *pulchella*. Brash: 39, *vulneraria* v. *langei*. Britton: 2761, *carpatica* v. *pseudovulneraria*. Brummitt: 60E:403 *vulneraria* v. *vulneraria*; 436, 596, 719, 889, 978, *maura* v. *maura*. Brummitt, Gibbs & Ratter: 392, *reuteri*; 490, *forondae*; 658, 735, 872, *reuteri*; 890, *forondae*.

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Davis & co-collectors: 772/GB, *vulneraria* v. *langei*; 15956, *pulchella*; 17589, *alpestris*; 19378, 19779, *variegata*; 34955, *praepropera*; 37061, 38369, 47259, *boissieri*; 49146, *iframensis*; 49355, *maura* v. *maura*. Debray: 10544,

10586, 10596, 10599, 10609, 10734, 10752, *carpatica* v. *pseudovulneraria*. Devall: 12, *vulneraria* v. *langei*. Dörfler: 128, 129, *hispidissima*; 204, 324, *pulchella*; 825, *praepropera*.

Easton: 3, *maura* v. *maura*. Ellman & Nelmes: 238, *maura* v. *maura*. Exell: 1697, *vulneraria* v. *langei*.

Fairchild: 328, *maura* v. *maura*. Fl. Bohem. Morav. Exsicc: 471, *polyphylla*. Fl. Dalmat. Exsicc. 33, *praepropera & weldeniana*. Fl. Exsicc. Austro-Hungar.: 430, *polyphylla/weldeniana*; 431, *polyphylla*; 432, *weldeniana;* 433, *praepropera*; 434, *carpatica* v. *carpatica*; 435, *alpestris*; 436, *carpatica* v. *carpatica*. Fl. Exsicc. Republ. Bohem. Sloven.: 814.I, *polyphylla*; 814.III, *polyphylla/carpatica*; 815.I, 815.II, *polyphylla*. Fl. Gall. German. Exsicc.: 1154, *carpatica* v. *carpatica*; 3560, *carpatica* and *alpestris*; 3560 bis, *praepropera*. Fl. Gallia Sept. et Belge: 272, *iberica*. Fl. German. Exsicc.: 272, *maritima*; 346, *praepropera*. Fl. Hung.: 5990, *polyphylla*. Fl. Hungar. Exsicc.: 685.I & II, *polyphylla*; III, *polyphylla/carpatica*. Fl. Iber. Select.: 35, *arundana*. Fl. Italica Exsicc.: 2110; *carpatica* v. *carpatica*; 2112, *carpatica* v. *versicolor*. Fl. Lusitan. Exsicc.: 1681, *iberica*. Fl. Select. Exsicc.: 1123, *praepropera*. Fl. Raetica Exsicc.: 546, *carpatica* v. *pseudovulneraria*. Fl. Styriaca Exsicc.: 127, *polyphylla/carpatica*; 128, *carpatica* v. *carpatica*. Font-Quer: 205, *maura* v. *ajmasiana*; 134, 206, 265, *maura* v. *maura*. Forsyth-Major: 829, *praepropera*. Fragmenta Fl. Algerica: 325, *maura* v. *maura*.

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Pailler: 870, 1233, *maura* v. *maura*. Panjutin: 9091a, *subscaposa*. Pinto da Silva et al.: 7060, 7508, 7605, *lusitanica*. Pitard: 3888, *maura* v. *maura*. Phytotheca Select.: 539, *alpestris*. Pl. Criticae Saxonicae: 318, *carpatica* v. *pseudovulneraria*. Pl. Finlandiae Exsicc.: 756, *vulneria* v. *vulneraria*; 757, *lapponica* v. *lapponica*; 1991, *lapponica* v. *fennica*. Pl. Suecicae Exsicc.: 1070, 1071, *vulneraria* v. *coccinea*. Polunin: 12321, *borealis*. Porta & Rigo: 141, 437, *arundana*; 469, *reuteri*; 631, *atlantis*; 701, *reuteri*.

Rechinger & co-collectors: 130, *praepropera*; 185, *bulgarica*; 218, *weldeniana*; 226, *vulnerarioides*; 373, *weldeniana*; 422, *praepropera*; 445, *bulgarica*; 521, 721, *praepropera*; 845, *bulgarica*; 1013, *praepropera*; 1059, 1607, *bulgarica*; 1611, *pulchella*; 1795, *bulgarica*; 3722, 4385, 4614, 4913, 5092, 5155, 7368, *praepropera*; 8774, 8919, 9390, 10645, *bulgarica*; 10885, *pulchella*; 12530, *praepropera*; 15490, *bulgarica*; 15990, *pindicola*; 16156, *alpestris*; 16281, 16424, 16787, *praepropera*; 17391, *bulgarica*; 18270, *alpestris*; 19650, *pindicola*; 20190, 20426, 20449, *praepropera*; 20721, *pindicola*; 20999, *pulchella*; 21070, *alpestris*; 23231, *pindicola*. Reijnders: 3517, *maura* v. *font-queri*; 3852 (p.p.), *argyrophylla*. Reverchon: 1893: 863, *atlantis/reuteri*; 1896:26, *maura* v. *maura*; 1900:1184, 1901:1184, *arundana*; 1291, *atlantis*; 1903:1321, *reuteri*; 1904:1184, 1291, *arundana*; 1341, *maura* v. *font-queri*; 1906:3121, *reuteri*; 1341, *maura* v. *font-queri*; 1907: 1184, *arundana*; 1341, *maura* v. *font-queri*. Robert: 353, *maura* v. *maura*. Rsoliny Polskie: 196, *polyphylla*. Ross-Craig & Sealy: 1202, 1533, *lapponica* v. *lapponica*. Rothmaler: 214, *iberica*; 15122, *maura* v. *maura*.

Sandwith: 3037, *vulneraria* v. *vulneraria*; 3542, *carpatica* v. *pseudovulneraria*, Sauvages: 1645, *iframensis*; 16836, *fatmae*; 17150, *maura* v. *maura*. Schimper: 616, *abyssinica*. Schultz, Herbarium normale: 454, *praepropera*; 463, *polyphylla*; 1339, *polyphylla/weldeniana*; 4514, *alpestris*. Sennen, Plantes d'Espagne: 1942, *forondae*; 1943, *vulnerarioides*; 2588, *maura* v. *font-queri*; 5644, *reuteri*; 5695, 5696, *forondae*; 7235, *reuteri*; 7535, *maura* v. *maura*; 8618, *praepropera*; 8764, *rifana*. Siehe: 1911:167, *pulchella*; 1912:572: *boissieri*. Sintenis: 1883:160, 160b, *praepropera*; 1889:2564, 1894:5968, *boissieri*. Sitz: 2, *maura* v. *maura*. Société Dauphinoise: 746, *carpatica/polyphylla*; 2421, 2422, *carpatica* v. *pseudovulneraria*. Société Francaise: 400, *carpatica* v. *carpatica*; 556, *maura* v. *maura*; 557, *vulneraria* v. *langei*; 945, *alpestris*; 6593, *iberica*. Société Lineenne Seine Maritime: 558, *vulneraria* v. *vulneraria*. Société Rochelaise: 2831, *vulneraria* v. *vulneraria*. Stephenson: 288, *iberica*. Sterneck: 162, *praepropera*. Summerhayes: 1570, 2164, *carpatica* v. *pseudovulneraria*; 2263, *vulneraria* v. *vulneraria*; 2420 *carpatica* v. *pseudovulneraria*. Szovits: 31, *polyphylla*.

Teles & Rainha: 816, *lusitanica*. Thompson: 606, *pulchella*. Tournay: 58, *carpatica* v. *pseudovulneraria*; 95, *vulneraria* v. *vulneraria*. Tuntas: 963, *praepropera*. Turrill: 64/57, 4338, *vulneraria* v. *langei*. Turrill & Hubbard: 11789, *carpatica* v. *pseudovulneraria*. Turrill & Montford: 2110, *vulneraria* v. *vulneraria*; 2130, *carpatica* v. *pseudovulneraria*.

Urumoff: 21, 101, *polyphylla/bulgarica*.

Vincent: 8, *vulneraria* v. *langei*.

Wilczek & Dutoit: 253, 739, *maura* v. *maura*. Willkomm: 66, 217b, *iberica*; 632, *maura* v. *maura*. Wilmott: 676, 2128, *vulneraria* v. *vulneraria*. Wisniewski: 3221, *polyphylla*. Witte: 14369, *vulneraria* v. *vulneraria*. Wittman: 145, *boissieri*. Womersley: E58, *lapponica* v. *lapponica*. Wyatt: 158, *alpestris*.

INDEX TO EPITHETS

As most names in the *Anthyllis vulneraria* complex exist in numerous combinations at various ranks, the following index simply includes epithets, without reference to rank. Intermediates are indicated by an oblique stroke.