A NEGLECTED MEDITERRANEAN FUMANA

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Fumana (Dunal) Spach (containing about 12 species) is the only genus in Cistaceae to have its centre of distribution in Anatolia, whence 9 species (of which 3 are endemic) are now recorded. When the Turkish species were being revised, certain plants were found that appeared to represent a distinct species that we at first thought to be undescribed. This was evidently the plant erroneously referred by Boissier (Flora Orientalis 1: 448) to *F. spachii* Gren. & Godr. (i.e. *F. ericoides* (Cav.) Gand.), and from which it differs in several important features. A protracted search of Mediterranean material and the literature dealing with it revealed that we had detected a widespread but neglected Mediterranean species, for which several forgotten names were already available. All these were based on plants from the West Mediterranean; the earliest appears to be *F. scoparia* Pomel, described from Morocco. As the taxonomy of these plants has been misunderstood by those botanists who have revised the genus (Grosser, 1903; Janchen, 1909, 1920; Guinea, 1954), we have gone into it rather fully below, and attempted to clarify the taxonomy of that group about which most confusion has centred.

Fumana scoparia Pomel, Mat. Fl. Atlant. 10 (1860). Plate 1.

Syn.: *F. ericoides* (Cav.) Gand. forma *glandulosa* Pau, Not. Botán. Fl. Esp. 2: 12 (1889).

F. racemosa Pau in Act. Soc. Esp. Hist. Nat. 28: 92 (1899).

F. ericoides (Cav.) Gand. var. *glandulosa* (Pau) Maire, Contrib. Étud. Fl. Afr. Nord, Fasc. 25: 338 (1937) in Bull. Soc. Nat. Hist. de l'Afrique Nord.

F. ericoides (Cav.) Gand. var. *scoparia* (Pomel) Maire, *loc. cit.* (1937).

Differs from *F. ericoides* (Cav.) Gand. in its distinct, terminal inflorescence which is densely glandular-pubescent, small bracts, and widely spreading capsule valves which retain the seeds for at least some time after dehiscence.

Shrublet 10–20 cm tall, with ascending, ± glandular pubescent branches. *Leaves* alternate, exstipulate, linear, thick, mucronulate, the median leaves 6–12 mm long, usually with an indumentum of viscid hairs, the lowermost often conferted and smaller. *Inflorescence* terminal, with straight, many-celled, non-capitate, spreading, glandular hairs (0·1–)0·2–0·3(–0·5) mm, and with bracts much smaller than the foliage leaves, bearing 2–3 flowers. *Pedicels* spreading, recurved towards the tip (5–)7–12(–16) mm long, much longer than the bracts, and about twice as long as the calyx. *Inner sepals* often with viscid hairs, ovate, acutish, persisting after the dehiscence of the capsules. *Petals* yellow. *Capsules* ovate-triquetrous, 4–5 mm long, glabrous, dehiscing *in situ*, afterwards opening very wide and retaining the seeds for at least some time, finally falling from the tip of the pedicels with the calyx

attached. *Seeds* (6–)8–9(–12) in number, purplish-black, smooth when dry and mucilaginous when wet, about 2 mm long. *Embryo* ± circinnately curved.

Type: (Algeria) Djebel Amour, *Pomel* (P!).

The following specimens have been seen:

MOROCCO: Collines incultes: Mazafran, *Claus.* (?)! Djebel Sidi Fars au sud de Maroc, 1200 m, a. 1867, *Balansa*! Atlantis, Rifano, Aknoul, 100–1200 m, *Maire*! Atlantis majoribus montibus supra oppid. Amismiz, 1500 m, *Maire*! Melilla, Hidum (?), a. 1934, *Sennen & Mauricio*!

ALGERIA: Batna, *Lefrère*! Batnas, les bois, a. 1853, *Balansa*! Batna, Djebel Iteh Ali, *Letourneux*! Constantine, *Cosson!* Prov. Constantine, Djebel Trigour, 22 v 1853, *Cosson*!

TUNISIA: Nobeul, prope Cap Bon, 13 v 1853, *Cosson et al.*!

LIBYA: Tripolitania, Garian plateau near Tebedut, 700–750 m, 25 iv 1939, *Sandwith* 2810!

SPAIN: "El Gabatio", Segorbe, a. 1898, *Pau*! En los montes de Segorbe, iv 1896, *Pau*! Segorbe, Castellón, 17 ix 1898, *Pau!* Segorbe, in collibus, "certe hybridus!!", 11 v 1902, *Pau*! Valencia, Segorbe, *Sennen* 652! Valencia, Segorbe, vi 1867, *Pau*! Catal. occid., Serra la Llena, 800 m, 23 vi 1918, *Font Quer*! Dehesa de la Canada, Valencia, iv 1962, *Borja*!

ITALY: Apulia; Gargano, in pascuis mts. St. Angelo, 2–400', 26 iv 1875, *Porta & Rigo*! All sheets of *Fumana* that we have seen from the island of Giglio have been of *F. scoparia:* e.g. Sopra la Cala dell' Allume, abunde, 26 iv and 4 vii 1895, *Fiori*!

ALBANIA: Supra Santi Quaranta, (Sarandoë), v 1897, *Matcovich* (for *Baldacci*)!

GREECE: Near Anavryta, Kephissia, at the foot of Mount Pentelici, Attica, 250 m, 27 iv 1862, *Heldreich* 808! Attica, in evergreen shrubs near Kephissia, 300 m, 8 v 1891, *Heldreich* 1119!

TURKEY: Sakarya: near Geyve, 100 m, *Davis & Coode, D.* 36,299! Seyhan: 5 miles from Adana to Kozan, 150 m, *Davis* 26,625 p.p.! Seyhan: Misis, near Adana, 30 m, 11 iv 1934, *Balls & Gourlay* 723A! Içel: Tarsus to Namrun, 100 m, 14 iv 1933, *Balls* 173! Içel: Bouloukli near Mersin, 15 iv 1855, *Balansa* 438! Gaziantep: 36 km from Gaziantep to Nisib, *Davis & Hedge, D.* 27,910!

SYRIA: Alep (Aleppo), *Aucher* 1997!

From the above records it can be seen that *F. scoparia* has a wide, but disjunct, distribution throughout the Mediterranean. In the West, its range overlaps with that of *F. ericoides*, but it is much commoner than the latter in North Africa and replaces it in the East Mediterranean (see map 1). Although Hayek (Prodr. Fl. Balc. 1: 499 (1927)) records *F. ericoides* from many parts of the Balkan peninsula, we have seen material from Dalmatia only. Elsewhere *F. scoparia* may have been misidentified as *F. ericoides* or as *F. procumbens* (Dun.) Gren. & Godr., a species which has often been confused in herbaria with diffuse forms of *F. ericoides*, which is very variable in habit.

F. bonapartei Maire & Petitm. (*F. ericoides* forma *malyi* Janchen) has also been involved in this confusion (cf. Janchen 1909: 111).

It remains to give some account of the names which have been applied (or misapplied) to this neglected species, and of its taxonomic treatment. Type material has been seen of the taxa we have cited above as synonyms of *F. scoparia*.

Pomel's original description of *F. scoparia* is not very helpful, but is amplified on p. 348 of the same pagination series (Nouv. Mat. Fl. Atl.: 1875); here the terminal pedunculate raceme with small bracts and glandular indumentum is specifically mentioned. Examination of an Algerian specimen in Paris (from Sidi-bou-Zid, Djebel Amour, *Pomel*—evidently part of the type gathering) leaves no doubt that the Turkish plant must be equated with the North African *F. scoparia*. On the same page as the first description of *F. scoparia*, Pomel also first described *F. montana*, whose type we have not seen, but since this plant is described as having glabrous peduncles (pedicels?), there seems no justification for adopting it for our species. It seems surprising that when Grosser (1903, p. 128) combined this epithet as *F. ericoides* forma *montana* (Pomel) Grosser he applied it to the glandular plants from N. Africa, while treating *F. scoparia* as a synonym of *F. ericoides*.

The confusion between *F. montana* and *F. scoparia*, however, has persisted in the literature, and is to be found in the work of Janchen (1909, p. 111; 1920, p. 22). Although we must leave the status of *F. montana* in doubt, we need not discuss it further here.

F. ericoides forma *glandulosa* Pau was described from Spain (Segorbe). According to Janchen (1909, 111), and also on the evidence of Pau's herbarium labels, Pau believed that it represented a hybrid between *F. ericoides* and *F. thymifolia* var. *thymifolia* (*F. viscida* Spach, *F. glutinosa* Boiss.)—a most improbable hypothesis in view of the opposite, stipulate leaves of the latter. Forma *glandulosa* was later treated as a species by Pau (1899), under the name of *F. racemosa* Pau—a binomial which has failed to get into *Index Kewensis*. This plant was wrongly considered a juvenile form of *F. ericoides* by Grosser (1903: 128). Janchen (1909), however, recognised that *F. racemosa* was indeed a distinct taxon, and cited specimens of it from Italy and Greece. Thus Janchen was the first botanist to realise that the taxon was widely distributed, but nevertheless failed to connect it with the North African *F. scoparia*.

Involved in this species complex is *F. paradoxa* Heywood (1954), described from the Sierra de Cazorla in Spain (map 1). It was suggested that this taxon, characterised by its small, almost constantly 6-seeded capsules, may be the product of hybridisation between *F. ericoides* and *F. procumbens*. The original gatherings show an exceptional range of variation, and some of them (e.g. *Heywood* 1515) certainly approach *F. scoparia* in characters of the inflorescence and indumentum; *Heywood & Davis* 485 even has an indumentum like that of *F. paphlagonica* Bornm. & Janchen. However, the holotype and most of the other paratypes are different, so that it does not seem necessary to treat *F. paradoxa* as synonymous with *F. scoparia*, though the latter may have been involved in the origin of Heywood's taxon. As originally constituted, Heywood's name possibly covers more than one taxon, and is therefore not included in the table below.

Table of distinctions between *F. procumbens*, *F. paphlagonica*, *F. scoparia* and *F. ericoides*

	procumbens	*paphlagonica*	*scoparia*	*ericoides*
HABIT	Procumbent; leaves upcurved at ends of branches.	Procumbent; leaves not so upcurved.	Usually ascending; leaves not so upcurved.	Erect or straggling-ascending; leaves not so upcurved.
INDUMENTUM	Eglandular. Young stems, leaves and pedicels with ± sparse indumentum of minute, crisped or straight, multicellular hairs.	Eglandular. Stems with dense, white, felted hairs of unequal lengths. Hair-cells irregular in size and shape.	Often as on young parts of *F. ericoides*, but inflorescence always with longer viscid hairs. Hairs straight, spreading, evenly tapering, multicellular and non-capitate.	Of minute, even, viscid hairs or, when plant papillose or pruinose, absent; pedicels occasionally sparsely pilose.
LEAVES	All ± equal. Longest (8–)10–18 mm.	Often diminishing slightly above. Longest 7–13 mm.	Variable — usually short below, longest (6–10(–12) mm) in the middle, and much shorter above.	Variable — often short below, longest ((3–)6–13(–15) mm) in the middle and slightly shorter above.
LEAF SPACING	Regular. Below lowermost flower (5–)10–16(–20) per inch.	± regular. Below lowermost flower (7–)9–11(–13) per inch.	Variable — usually conferted below and widely spaced above.	Variable — often conferted below, and slightly more scattered above.
INFLORESCENCE	Flowers scattered, solitary, all lateral.	Flowers scattered, solitary and lateral or in leafy groups towards the ends of branches.	Inflorescence distinct, terminal, with bracts much smaller than foliage leaves; foliage leaves absent here.	Flowers scattered, lateral or subterminal, usually with many leaves between them.
FRUITING PEDICELS	(0·4–)0·6–1·2(–2·5) × as long as adjacent leaf; recurved from base.	(1·0–)1·6–2·4(3·5) × as long as adjacent leaf; spreading and deflexed at tip.	1·5–5·5(–10·0) × as long as adjacent bracts; spreading and deflexed at tip.	1·5–3·5(–6·5) × as long as adjacent leaf; spreading and deflexed at tip.
CAPSULE	5–7 mm long. Not opening, shed with calyx and pedicel attached; seeds retained.	4–6 mm long. Usually gaping, shed with pedicel and calyx attached; seeds often dispersed before capsule is shed.	4–5 mm long. Usually gaping, shed, with calyx attached, from tip of pedicel; seeds retained.	3–6 mm long. Tardily dehiscent, shed from tip of pedicel (with calyx?); seeds dispersed.

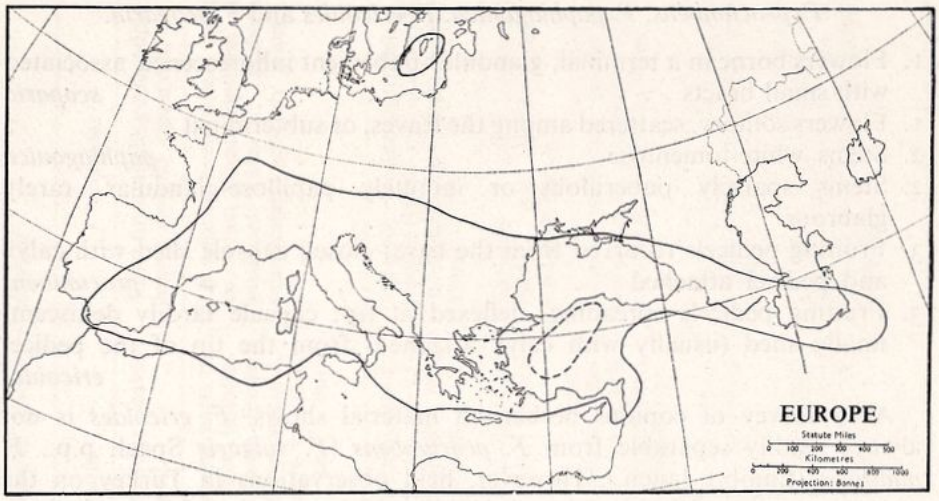
F. procumbens, *F. paphlagonica*. *F. ericoides* and *F. scoparia*.

1. Flowers borne in a terminal, glandular-pubescent inflorescence, associated with small bracts . . . . . *scoparia*
1. Flowers solitary, scattered among the leaves, or subterminal . . . 2
2. Stems white-tomentose . . . . . *paphlagonica*
2. Stems sparsely puberulous or minutely papillose-glandular, rarely glabrous 3
3. Fruiting pedicels recurved from the base; closed capsule shed with calyx and pedicel attached . . . . . *procumbens*
3. Fruiting pedicels spreading, deflexed at tip; capsule tardily dehiscent, finally shed (usually with calyx attached) from the tip of the pedicel *ericoides*

As a survey of copious herbarium material shows, *F. ericoides* is not always readily separable from *F. procumbens* (*F. vulgaris* Spach p.p., *F. nudifolia* (Lamb.) Janch.). However, field observations in Turkey on the posture, manner of dehiscence and shedding of the capsules of *F. procumbens*, *F. scoparia* and *F. paphlagonica* showed that all of these species differ from one another in their dispersal mechanisms. *F. ericoides* (known to us only from herbarium material) also shows distinctive features; it is distinguishable from *F. procumbens* by the capsules being finally shed from the top of the pedicels (which persist on the old stems), instead of complete with the recurved pedicel attached. The characters separating the four species are shown in the accompanying table. Field observations on the dispersal mechanisms of the other species of *Fumana* (including confirmation of these characters in *F. ericoides*) are required, and would evidently be helpful in classificatory and evolutionary studies.

Having worked out a clear picture of *F. ericoides* as distinct from the other taxa with which it has been confused, we see from the specimens that

Map 1. Black circles denote specimens of *F. scoparia* seen; the probable total distribution is enclosed by—1—1—. The solid line encloses all specimens seen of *F. ericoides*, and the broken line encloses the probable total distribution of *F. ericoides*. Triangle shows type locality of *F. paradoxa*.



Map 2. Solid lines enclose probable total distribution of *F. procumbens*. Broken line encloses *F. paphlagonica*.

the published range of this species has been considerably exaggerated in the literature. We have seen specimens from Spain, a very few from North Africa, South France, Italy (Tuscany, Lake Como, Campania and Liguria) and a few from Trieste and Dalmatia. It is partially sympatric in the West and Central Mediterranean with *F. scoparia*, and is replaced by it in the East Mediterranean (map 1). The distribution of *F. scoparia* within the total area is very local and disjunct. *F. procumbens* is more widespread (map 2) than either of these two Mediterranean species with which it is also partially sympatric, and extends throughout many of the drier parts of Europe north to Sweden (Öland) and east to Iran; specimens have also been seen in the Paris herbarium from North Africa (e.g. Algeria: Constantine; Kef Sefsef, 1880, *Cosson!* Medina, foot of Djebel Cheliah, 1879, *Reboud!*).

F. paphlagonica is endemic to Anatolia and belongs to the Irano-Turanian element (map 2). On account of the plant described as *F. vulgaris* forma *alpina* Maire, Janchen subordinated *F. paphlagonica* to *F. procumbens* (as *F. vulgaris* f. *paphlagonica*). We have not seen any material of the Greek f. *alpina*, but on the evidence of the performance of *F. paphlagonica* and *F. procumbens* in Turkey we consider them to be specifically distinct (cf. Table). Although they often grow in the same area of the Anatolian steppe, we have not found them actually growing together nor have intermediates been seen.

EMBRYOS, SEEDS AND SUBGENERA

Janchen, in *Pflanzenfamilien* 2 (21): 311 (1925), has set out the following division of the genus *Fumana:*

Subgenus *Eufumana* (Willk.) Janchen (i.e. subgenus *Fumana*—syn.: genus *Fumana* (Dun.) Spach emend. Pomel).
Embryo coiled; placentas with 4 "seed-positions", with both ovules in lower seed-positions only semi-anatropous; seeds dimorphic. This subgenus

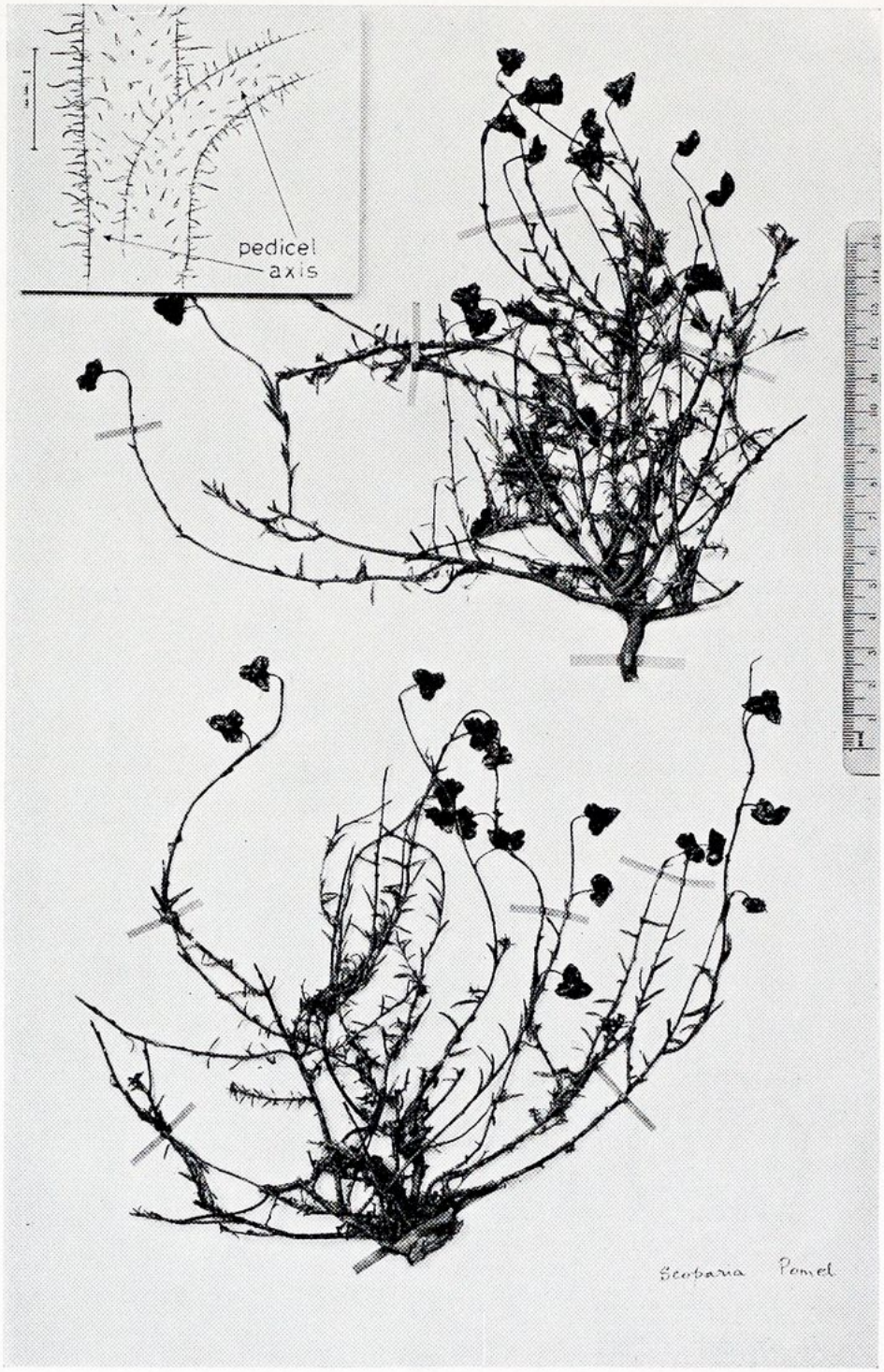


PLATE 7. *Fumana scoparia* Pomel., from Turkey, A2, Sakarya: nr. Geyve, 100 m., *Davis & Coode, D.* 36299. The drawing shows the junction of pedicel and axis, with glandular hairs to scale.

includes *F. arabica* (*F. viscidula* Juz.), *F. ericoides*, *F. procumbens*, *F. calycina* (L.) Claus.; *F. paphlagonica* and *F. scoparia* are also referable here.

Subgenus *Fumanopsis* (Pomel) Janchen (genus *Fumanopsis* Pomel).
Embryo U-shaped. Placentas with 2(–1) seed-positions, ovules completely anatropous. Seeds isomorphic. (*F. aciphylla* Boiss. and *F. oligosperma* Boiss. & Kotschy with which Janchen was probably not familiar, and *F. trisperma* Hub.-Mor. & Reese which was described later, consistently have only one ovule per loculus). Apart from the three species just given, this subgenus includes *F. thymifolia* (L.) Verl. (*F. viscida* Spach, *F. glutinosa* Boiss.), *F. laevipes* (L.) Spach, *F. bonapartei* Maire & Petitm., and reputedly *F. grandiflora* Jaub. & Spach. Since the latter has only been collected once, its placing here should be treated as provisional; in facies it comes nearest to the North African *F. calycina*.

In his discussion of *F. paradoxa*, Heywood stated that his new species had an embryo intermediate in shape between those of the two subgenera—it was only just incurved, not completely inrolled. We have dissected out many embryos of *F. procumbens*, *F. paphlagonica*, *F. scoparia* and *F. ericoides* from the full range of each species, and find the described shape of *F. paradoxa* to fit comfortably into the wide variation found in those species. The criterion appears to be whether the tip of the cotyledons curl in, even only slightly (Subgen. *Fumana*)—or out like a crozier (Subgen. *Fumanopsis*). In addition, our few dissections of *F. aciphylla* and *F. thymifolia* show that these members of subgenus *Fumanopsis* have green embryos, while those of the type subgenus are white. It is worth mentioning that mature seeds are necessary to show the final embryo state, as the embryos appear to develop very late. So far as the embryo characters are concerned, *F. paradoxa* does not break down the delimitation of the two subgenera.

Most authors state confidently that *F. arabica*, *F. ericoides* and *F. procumbens* have 12 seeds; that *F. thymifolia* has 6; and *F. aciphylla* 3. We have found very few capsules with 12 seeds, although the figures given for *F. thymifolia* and *F. aciphylla* are often found. The commonest numbers for the first three species are 8 and 9. This we often found to be so in *F. scoparia* and *F. paphlagonica*. Janchen's word "seed-positions" is better than "seeds", as sometimes aborted ovules are found which bring the total number to 12—but not always. Heywood gives the seed number for *F. paradoxa* as 6 (–12–14), but gives the ovule number as 4 per placenta (the first column of the table given on pages 178–9 in Guinea's monograph), noting there is abortion of the ovules. Certainly in *F. paradoxa* 6 seeds are usual, but these seeds are notable (as Heywood points out) in filling the loculus. Those of *F. ericoides*, *F. procumbens*, *F. paphlagonica* and *F. scoparia* appear to "leave room for" those ovules which never develop. Therefore, in this respect, perhaps *F. paradoxa* is indeed intermediate between Janchen's subgenera, resembling *F. thymifolia* in capsule characters. It is interesting to note that Pau, when describing *F. racemosa* (i.e. *F. scoparia*), said that the possession of a distinct inflorescence also "invalidates one of the characters which authors have used for dividing the genus *Fumana* into 2 sections".* This would also apply to those specimens of *F. paradoxa* which have an inflorescence; but in this sense the sections are as defined by

*We are indebted to Dr. J. Cullen for the translation from the original Spanish.

Willkomm and not as defined (as subgenera) by Janchen. *F. pinatzii* Rech. fil., recently described from Euboea, differs from *F. arabica* in having a 6-seeded capsule; its specific status requires confirmation.

If *Fumana* were not such a small genus, the problem of subgenera would be more acute. For the purpose of identification (as distinct from classification), subgenera erected largely on embryo-characters seem of very limited use. Furthermore, in view of their heterogeneous content (e.g. each subgenus contains stipulate and exstipulate species), there must be some doubt whether the subgenera represent natural groups.

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ACKNOWLEDGEMENTS

This work has been supported by a grant for the preparation of a Flora of Turkey from the Department of Scientific and Industrial Research. Our thanks are due to the Directors of the Vienna, Geneva, Madrid and Florence herbaria for the loan of material, and to Dr. V. H. Heywood and Dr. H. Heine (Paris) for their assistance.