

## TAXONOMY

***Myriolepis*, a new genus segregated from *Limonium* (Plumbaginaceae)**M. Dolores Lledó<sup>1</sup>, Matthias Erben<sup>2</sup> & Manuel B. Crespo<sup>3</sup>

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Taxonomic features of *Limonium* subg. *Myriolepis* are reviewed and compared with those of other taxa in Plumbaginaceae. The new genus *Myriolepis* is proposed on the basis of morphological, karyological and phytochemical characters to include two western Mediterranean species of *Limonium* sect. *Myriolepis*: *L. ferulaceum* and *L. diffusum*. Remaining taxa belonging to *L.* subg. *Myriolepis* (those in *L.* sects. *Siphonantha* and *Polyarthron*) are recognised as sections in *L.* subg. *Limonium*. Affinities to other taxa of *Limonium*, sometimes suggested as related to *Myriolepis*, are also discussed.

**KEYWORDS:** *Limonium*, *Myriolepis*, Plumbaginaceae, nomenclature, taxonomy.

*Limonium* Mill. (the sea lavenders) is the largest genus of Plumbaginaceae. Kubitzki (1993) estimated about 350 species of *Limonium*, but the actual number is probably higher as new species continue to be described (Lobin & al., 1995; Brullo & al., 1996; Roselló & al., 1997; Crespo & Lledó, 1998; Sáez & al., 1998; Rizzotto, 1999; Sáez & Roselló, 1999; Artelari & Kamari, 2000; Erben, 2001; among others). The centre of diversity of the genus is the Mediterranean region, where *Limonium* species have an important role in coastal ecosystems, from salt marshes to maritime cliffs. Species of *Limonium* can also be found in other parts of the world mostly with Mediterranean-type climates.

In a wide sense, *Limonium* includes dwarf shrubs and a few herbs with rosulate leaves and scapose inflorescences. Flowers are crowded in 3-bracteate terminal spikelets. The calyx varies in shape, commonly has a ribbed tube with a membranous terminal limb, and is often coloured. Petals are usually free, or more rarely connate only at the base. Styles are free and stigmas are filiform. Fruits are 1-seeded, utriculate (with basal or irregular dehiscence) or sometimes pixidiate (circumscissile).

The taxonomic arrangement of *Limonium* is extremely complex at both infra- and supraspecific levels. The isolated and fragmented nature of habitats where *Limonium* species grow, together with the frequent occurrence of apomixis within the genus, greatly favour

the existence of many geographical variants which are often defined on the basis of little morphological discontinuity (Erben, 1978; Pignatti, 1982: 302; Cowan & al., 1998). Moreover, the circumscriptions of subgenera and sections are not yet satisfactorily defined and many sections appear to be heterogeneous. Currently accepted genera (e.g., *Afrolimon* Lincz., *Ikonnikovia* Lincz.) established on the basis of former sections of the genus when it was known as *Statice* (*nom. rej.* vs. *Armeria*; cf. Greuter & al., 2000: 268), are perhaps no more distinct than some groups still included within *Limonium*. The aim of the present work is to discuss the taxonomic status of one such group, *Limonium* sect. *Myriolepis*. A nomenclatural complication in discussing the taxonomy of *Limonium* should be noted at this point. Until around 1930, the present genus *Limonium* was known as *Statice* (a name now correctly treated as homotypic with *Armeria*), and some sections recognised within *Statice* have never been formally transferred to *Limonium*. For this reason, we also refer to the groups by their former names within *Statice*.

**Historical background: the genus *Limonium* Mill.** — Only a few comprehensive reviews of the whole genus *Limonium* have been published, among which the synopsis of Plumbaginaceae by Boissier (1848) is probably one of the most complete. In his work, Boissier split off genera such as *Acantholimon* (= *Statice* subgen. *Armeriastrum* Jaub. & Spach) or *Goniolimon* (= *Statice*

sect. *Tropidice* Griseb.) from the former *Statice*, and also accepted *Armeria* Willd., *Aegialitis* R. Br. and *Limoniastrum* Heist. ex Fabr. On the basis of floral characteristics he divided the former *Statice* into 12 sections, belonging to two main groups: “*Corolla polypetalata*” (with eight sections) and “*Corolla gamopetalata*” (including four sections). Later, Boissier (1859) completed his compendium when describing the new *Statice* sect. *Schizopetalum* for plants from the Middle East. Boissier’s taxonomic arrangement was followed by several authors with few modifications. In order to fully understand the relationships among taxa included in Boissier’s “*Corolla gamopetalata*” group, to which *S.* sect. *Myriolepis* belongs, further details of the taxonomic changes that this group has undergone are explained.

**The “*Corolla gamopetalata*” group.** — The four sections in “*Corolla gamopetalata*” as defined by Boissier (1848) are characterised as follows: *S.* sect. *Polyarthrion* Boiss. for plants with many sterile branches in the lower regions of the stems and pink corollas (*S. caesia* Girard); *S.* sect. *Myriolepis* Boiss. for plants with leaves vestigial or absent, articulate branches densely covered with whitish scales and a convolute inner floral bract (*S. ferulacea* L. and *S. diffusa* Pourr.); *S.* sect. *Siphonantha* Boiss. for plants with scorpioid spikes in the inflorescence and calyx lobes shortly bifid, hyaline-bicuspidate, with an awn arising from the notch (*S. tubiflora* Delile); and *S.* sect. *Psylliostachys* Jaub. & Spach. for annual plants with long cylindrical-spicate inflorescences, lobed leaves and bibracteate spikelets (*S. spicata* Willd., and related taxa). The last-named group was later raised to generic rank as *Psylliostachys* (Jaub. & Spach) Nevski.

Hooker (1876) rearranged the “*Corolla gamopetalata*” group as *S.* sect. *Siphonantha* (including Boissier’s *S.* sects. *Myriolepis*, *Siphonantha* and *Polyarthrion*). He also accepted *S.* sect. *Psylliostachys* and described the new *S.* sect. *Pterolimon* for two unusual plants: *S. plumosa* Phil. from the Atacama Desert (Chile) and *S. peruviana* Kuntze *nomen illeg.* from territories formerly included in Peru, but nowadays part of Chile. A similar classification was adopted by Pax (1891), who raised *S.* sect. *Siphonantha* to subgeneric rank and included three sections in it: *S.* sect. *Psylliostachys*, *S.* sect. *Eusiphonantha* (in the same sense as Hooker’s *S.* sect. *Siphonantha*), and *S.* sect. *Pterolimon*. *Statice* sect. *Pterolimon* was later elevated to generic rank by Linczevski (1968) as *Bakerolimon* Lincz. The last taxon to be described that is related to the “*Corolla gamopetalata*” group was the monotypic *S.* sect. *Arthrolimon* (Mueller, 1878) for a plant growing in desert areas of Western Australia. Mueller called this species *Statice salicorniacea* F. Muell., since it is similar in habit to some taxa of *Salicornia*. Linczevski (1982) established the monotypic genus *Muellerolimon* on the basis of *Statice* sect.

*Arthrolimon* F. Muell.

Sections commonly included in Boissier’s “*Corolla gamopetalata*” group and more recently described related taxa form a highly heterogeneous group, only sharing long, apparently connate petals. *Statice* sect. *Psylliostachys* is now widely accepted as the separate genus, *Psylliostachys* (Jaub. & Spach) Nevski. Most modern floras follow this treatment (e.g., Rechinger & Shaiman-Czeika, 1974; Kubitzki, 1993) and phylogenetic analyses based on plastid DNA sequences have shown that *Psylliostachys* is more closely related to *Armeria* than to *Limonium* (Lledó & al., 1998, 2000). Other taxa sometimes related to Boissier’s gamopetalous group, such as *Bakerolimon* or *Muellerolimon*, are to be excluded since they have petals only connate at the base and have morphological peculiarities warranting recognition as separate genera (Kubitzki, 1993).

The other three sections included in Boissier’s “*Corolla gamopetalata*” (*S.* sects. *Myriolepis*, *Siphonantha* and *Polyarthrion*) currently form *Limonium* subg. *Myriolepis* following Pignatti’s system (1971, 1982), and are the focus of our discussion. Despite the descriptions provided by Boissier (1848) and followed by later authors, the petals are free and imbricate in his *S.* sects. *Polyarthrion* and *Siphonantha*, only when dry giving the wrong impression that the corolla forms a tube. The only representative of the “*Corolla gamopetalata*” group truly matching the name is the former *Statice* sect. *Myriolepis* [= *L.* sect. *Myriolepis* (Boiss.) Sauv. & Vindt], in which the petals are truly coherent and stick together forming a tube longer than the calyx (Fig. 1C, E). The misplacement of his *S.* sects. *Siphonantha* and *Polyarthrion* [= *L.* sect. *Siphonantha* (Boiss.) Sauv. & Vindt and *L.* sect. *Polyarthrion* (Boiss.) Sauv. & Vindt] in the “*Corolla gamopetalata*” group by Boissier (1848) and later authors was probably due to studies based only on dried material, but the character can be easily recognised in fresh specimens. In addition to the tubular corolla, other characters also differentiate the members of *L.* sect. *Myriolepis* from those of *L.* sects. *Siphonantha* and *Polyarthrion*. In *L.* sect. *Myriolepis* the inner bract is convolute and completely conceals the calyx, as well as in other genera of Plumbaginaceae not related to *Limonium* such as *Muellerolimon* and *Limoniastrum*. Moreover, the calyx is hyaline and ecostate, the stems are articulate and the leaves are vestigial and present only in springtime (*L. diffusum*) or completely absent (*L. ferulaceum*). Stems and branches are completely covered with long acuminate, subimbricate white scales giving rise to the epithet “*myriolepis*” (Figs. 1 and 2). The fruit is circumscissile, a characteristic only present in a few deviant sections of *Limonium* such as *L.* sects. *Pteroclados*, *Ctenostachys* and *Jovibarba*. These particular morphological features of *L. ferulaceum* and *L. dif-*

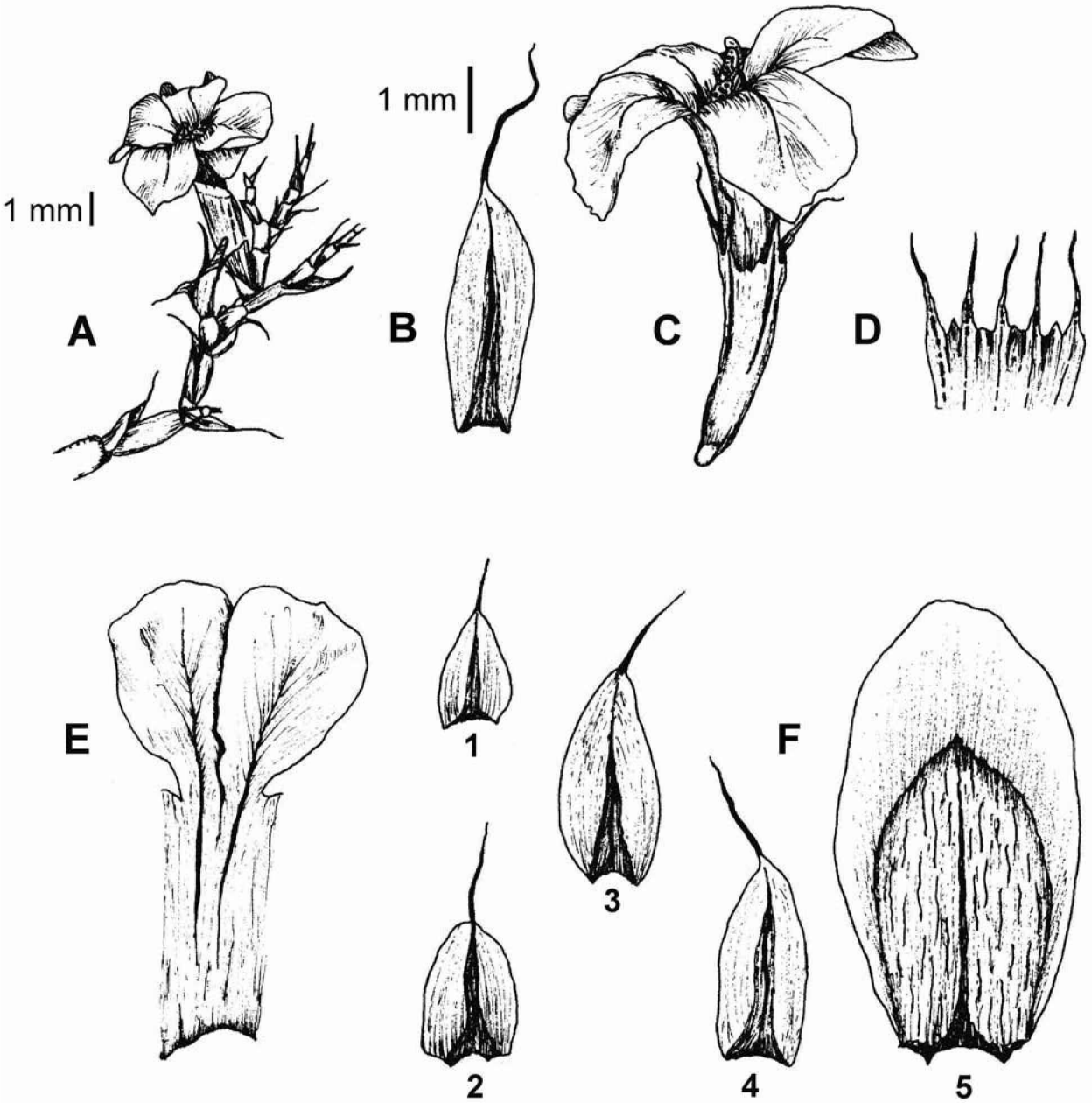


Fig. 1. *Myriolepis ferulacea*. A, flowering branchlet; B, hyaline scale of the stem; C, single flower; D, apex of the calyx; E, part of the corolla tube; F, bracts and scales surrounding the spikelet (1, outer scale of the branchlet, 2, inner scale; 3, outer bract of the spikelet, 4, middle, 5, inner). B–F, same scale.

*fusum* are present in neither *L.* sect. *Polyarthrion* nor *L.* sect. *Siphonantha*. Stem articulation and branching pattern and spikelet structure are unique in *L.* sect. *Myriolepis* (Fig. 2). Spikelets are situated at the top of short branches surrounded and hidden by two hyaline caulinar bracts, and the single flower thus appears to be protected by five and not three bracts (Fig. 2) as erro-

neously reported by Pount (1979) and then clarified by Erben (1981). The outer and the middle bracts of the spikelets are long-aristate or mucronate and almost completely hyaline, and the inner bract is convolute and conceals the calyx (Pount, 1979; Erben, 1981, 1993).

Morphological relationships among those peculiar taxa are also supported by chemical features (Hanson &

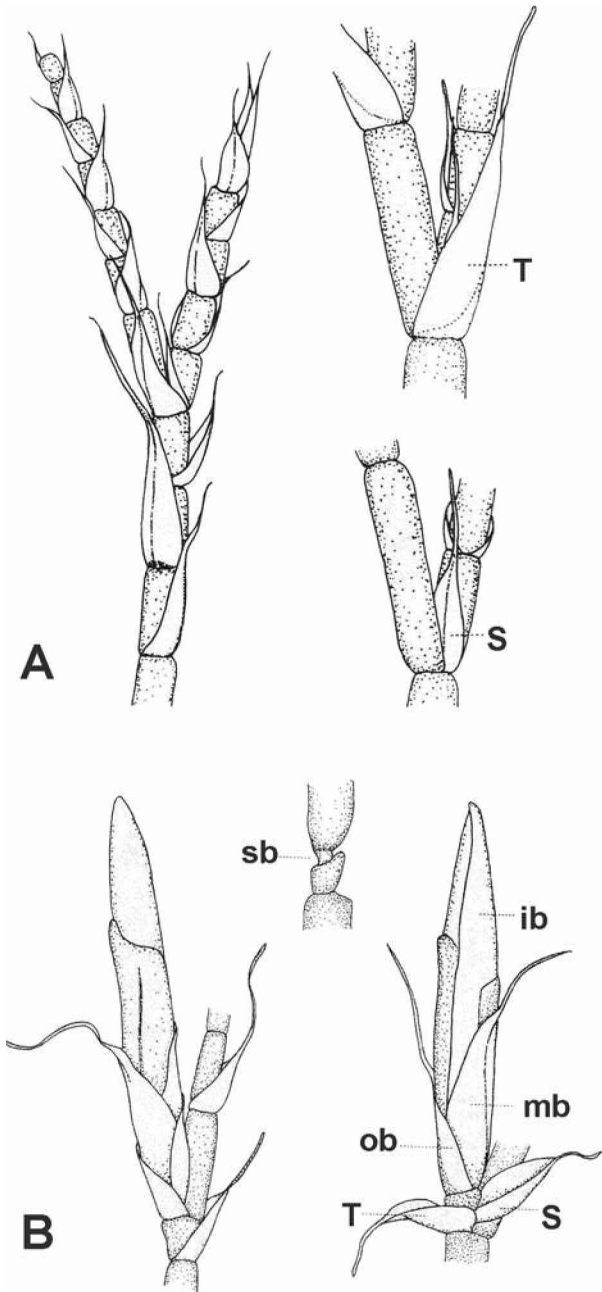


Fig. 2. A, branching pattern of stems (A) and spikelets (B) in *Myriolepis*. T, outer scale from which the branchlet arises; S, first inner scale of the branchlet itself (outer scale removed in A); sb, short internode at the top of which the spikelet is inserted; ob, outer bract of the spikelet; mb, middle bract; ib, inner bract. Modified from Erben (1981).

al., 1994). Both species in *L.* sect. *Myriolepis* show a unique pattern of osmoprotective compounds. They lack  $\beta$ -alanine betaine, a compound widely present in Plumbaginaceae (including *L.* sects. *Siphonantha* and *Polyarthrion*) that is absent as well in *Aegialitis*,

*Gladiolimon* Mobayen and genera of subfamily Plumbaginoideae not related to *Limonium*. Moreover, proline betaine, an unusual compound in Plumbaginaceae, is only present in *L. ferulaceum* and *L. diffusum* as well as *Limoniastrum* and *Muellerolimon*. The distribution of osmoprotective compounds in *L.* sects. *Siphonantha* and *Polyarthrion* is the same as for the rest of the sections of *Limonium*, supporting the lack of affinity among members of the former “*Corolla gamopetala*” group, as suggested by morphology. Harborne (1967) also reported the unique occurrence in *L. ferulaceum* of the flavonoid azeleatin, common otherwise in members of subfamily Plumbaginoideae, but not Staticoideae to which *Limonium* belongs. The phenolic compounds of *L. caesium* were similar to the rest of the sections of *Limonium* studied. However, members of *L.* sect. *Siphonantha* were not included in that study.

Cytological studies of several species of *Limonium* (Erben, 1978, 1979) have stressed the peculiarities of karyotypes of *L.* sect. *Myriolepis*. Both *L. ferulaceum* and *L. diffusum* are diploids with  $2n = 16$  chromosomes. However, they always lack the large metacentric chromosome, otherwise typical of diploid taxa of *L.* subg. *Limonium* with  $x = 8$  [e.g., *L. cymuliferum* (Boiss.) Sauvage & Vindt]. The presence of large metacentric chromosomes in members of the subgenus with  $x = 8$  has been interpreted as a reduction from  $x = 9$  after fusion of one pair (Erben, 1978, 1979), but this explanation cannot be applied to *L.* sect. *Myriolepis*, in which two different patterns are present. In the case of *L. ferulaceum*, the chromosomes are more or less metacentric and all equal in length (Fig. 3A), but in *L. diffusum* they are unequal in length (Fig. 3B). The same chromosome number  $2n = 16$  is also present in some species of the *Limonium sinuatum* (*L.*) Mill. group (*L.* subg. *Pteroclados*), but in this case,

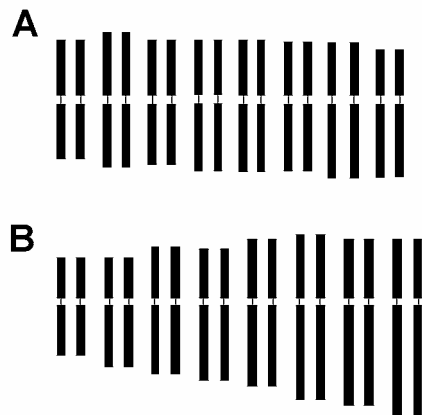


Fig. 3. Karyotypes of *Myriolepis ferulacea* (A) and *Myriolepis diffusa* (B). Original chromosome numbers previously published in Erben (1978), where cytological techniques are fully explained.

all chromosomes are acrocentric and equal in length. Certainly, the base chromosome number  $x = 8$  has arisen several times in the family, and it cannot be taken as an homologous character. Members of *L.* sects. *Siphonantha* and *Polyarthrion* have a chromosome number of  $2n = 18$ . This points to the diploid taxa of *L.* sect. *Myriolepis* as isolated lineages not closely connected to diploids in other sections of *Limonium* with similar base chromosome numbers or to other taxa from *L.* subgen. *Myriolepis*.

Breeding systems have been well studied in Plumbaginaceae (Baker, 1953) but do not provide any more additional characters to differentiate sections within the “*Corolla gamopetala*” group. Both *L. ferulaceum* and *L. diffusum* show the typical pollen-stigma dimorphism widely present in subfamily Statioideae. Wild populations are sexual and self-incompatible, showing the same ratio of combinations A and B (terminology according to Erben, 1979), to species in *L.* sects. *Siphonantha* and *Polyarthrion*. Some populations of *L. ferulaceum* and of species of *L.* sect. *Siphonantha* may show only the self-compatible combination C (Erben, 1978, 1979).

**Conclusions: taxonomic proposals.** — On the basis of the evidence reviewed here, we believe that *L. ferulaceum* and *L. diffusum* (comprising *Limonium* sect. *Myriolepis*) are morphologically distinct from other taxa in *Limonium* (including other taxa currently subordinated to *L.* subg. *Myriolepis*) and should be regarded as a different genus formally recognised below because it appears to be more closely related to taxa outside *Limonium* than to the members of this genus. Both *Limonium* sects. *Siphonantha* and *Polyarthrion* should be treated at least for the moment as sections within *L.* subg. *Limonium*, to which they show the greatest morphological, karyological and phytochemical affinities. The genus *Limonium* as a whole needs further taxonomic study that may result in the re-arrangement of several taxa. Nevertheless, without a more comprehensive study, we believe that attempts to reclassify the genus *Limonium* are, at this moment, premature.

***Myriolepis* (Boiss.) Lledó, Erben & M. B. Crespo, *stat. nov.*** Basionym: *Statice* sect. *Myriolepis* Boiss. in DC., Prodr. 12: 667. 1848.  $\equiv$  *Limonium* sect. *Myriolepis* (Boiss.) Sauvage & Vindt, Fl. Maroc 1: 47, 74 (1952).  
= *Limonium* subgen. *Myriolepis* (Boiss.) Pignatti in Bot. J. Linn. Soc. 64(4): 361. 1971 [excl. *Statice* sect. *Polyarthrion* Boiss., loc. cit., atque *S.* sect. *Siphonantha* Boiss., op. cit.: 668. 1848]. – *Statice* subgen. *Siphonantha* (Boiss.) Pax sect. *Eusiphonantha* Pax in Engl. & Prantl, Nat. Pflanzenfam. 4(1): 125. 1891, pro min. parte, typo

excluso. Lectotypus (hic designatus): *Statice ferulacea* L., Sp. Pl. ed. 2: 396. 1762  $\equiv$  *Limonium ferulaceum* (L.) Chaz., Dict. Jard., Suppl. 2: 35. 1790  $\equiv$  *Myriolepis ferulacea* (L.) Lledó, Erben & M. B. Crespo.

Dwarf shrubs, glabrous. Basal leaves absent or present only at springtime, small, subulate, one-nerved. Stems numerous, usually prostrate or ascendent, densely covered with subimbricate, spirally arranged and long acuminate or mucronate whitish-hyaline scales. Flowering stems with many sterile branches. Spikelets one-flowered, at the top of very short branches that are hidden by two whitish-hyaline scales; inner bract convolute and completely concealing the calyx; middle and outer bracts almost completely membranous, whitish-hyaline, long aristate or mucronate. Calyx slender without prominent ribs, weakly 5-nerved, with nerves ending in a short mucro or a long arista, without limb. Petals fused in the lower half to two-thirds, forming a tube much longer than the calyx. Fruit a circumscissile capsule. Chromosome number  $2n = 16$ , all more or less metacentric.

Ecology and distribution: The only two known species grow on periodically submerged soils in salt marshes and saline steppes of coastal areas. They are discontinuously distributed along the central and western coast of the Mediterranean region.

***Myriolepis ferulacea* (L.) Lledó, Erben & M. B. Crespo, *comb. nov.*** Basionym: *Statice ferulacea* L., Sp. Pl. ed. 2: 396. 1762. – Lectotypus (designated by Erben, 1979: 398); LINN 395.20.  $\equiv$  *Limonium ferulaceum* (L.) Chaz., Dict. Jard., Suppl. 2: 35. 1790. Ind. loc.: “Habitat in Barbaria, Lusitania, Hispania”. Icon: Reichb., Icon. Fl. Germ. Helv. 17, pl. 1147, I 1–2. 1855.

Diagnostic characters: Leaves absent; spikelets 5–7 mm, densely crowded at the apex of the flowering branches; outer bract with a long arista 1–2.5 mm; inner bract 5.5–6.5 mm, truncate and hyaline-membranous in the apical third; calyx 4.5–5 mm, glabrous, with long aristate teeth; corolla 5–6.5 mm in diameter; petals 9–10 mm long, the lower 2/3 fused to form a tube.

Distribution: Western Mediterranean Region. Coastal areas of Sicily, the Balearic Islands, southern France, southwestern and northeastern Iberian Peninsula, northern Morocco and Tunisia.

***Myriolepis diffusa* (Pourel.) Lledó, Erben & M. B. Crespo, *comb. nov.*** Basionym: *Statice diffusa* Pourr.,

Mém. Acad. Sci. Toulouse 3: 330. 1788. – Lectotypus (hic designatus vide etiam Aymonin, 1963): “(France) Le long de la mer”, “*Statice diffusa* Pourr.” (LY – Herb. Pourret). ≡ *Limonium diffusum* (Pourr.) Kuntze, Revis. Gen. 2: 395. 1891. Ind. loc.: “A la mer, à Gruissan, Ste. Lucie, la Nouvelle, & c.” Icon: Reichb., Icon. Fl. Germ. Helv. 17, pl. 1147, II 3–4. 1855.

Diagnostic characters: Leaves present only in the springtime, vestigial, small, subulate, one-nerved, 4–14 × 0.3–1.0 mm, withered at the anthesis; spikelets 3–3.5 mm, loosely disposed along flowering branches; outer bract 2.5–3.0 mm with a short mucro up to 0.5 mm; inner bract 3.4–4.0 mm, oblique truncate and hyaline-membranous only at the apex; calyx 2.5–3.5 mm, shortly and laxely pubescent, with short mucronate teeth, corolla 3–4 mm in diameter; petals 6–7 mm, fused in the lower half.

Distribution: Western Mediterranean Region. Coastal territories of southeastern France, the Atlantic coast of southwestern Iberian Peninsula and northern Morocco.

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## LITERATURE CITED

- Artelari, R. & Kamari, G.** 2000. *Limonium messeniicum* (Plumbaginaceae), a new species from S. Peloponnissos (Greece). *Bot. Chronika* 13: 45–49.
- Aymonin, G. G.** 1963. Problèmes de typification pour quelques taxa de la Flore française (Herbiers de Paris). *Bull. Soc. Bot. France* 110: 128–141.
- Baker, H. G.** 1953. Dimorphism and monomorphism in the Plumbaginaceae. II. Pollen and stigmata in the genus *Limonium*. *Ann. Bot.* 67: 433–454.
- Boissier, E.** 1848. Plumbaginales. Pp. 617–696 in: Candolle, A. P. de (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis*, vol. 12. Treuttel et Wurz, Paris.
- Boissier, E.** 1859. *Diagnoses Plantarum Orientalium Novarum*, ser. 2, 4: 61–71. Leipzig, Paris.
- Brullo, S., Marcenò, C. & Romano, S.** 1996. *Limonium melancholicum* Brullo, Marcenò et Romano (Plumbaginaceae), a new species from Sicily. *Candollea* 51: 99–102.
- Cowan, R., Ingrouille, M. J. & Lledó, M. D.** 1998. The taxonomic treatment of agamosperms in the genus *Limonium* (Plumbaginaceae). *Folia Geobot.* 33: 353–366.
- Crespo, M. B. & Lledó, M. D.** 1998. *El género Limonium Mill. (Plumbaginaceae) en la Comunidad Valenciana: taxonomía y conservación*. Colección Biodiversidad 3. Generalitat Valenciana. Valencia.
- Erben, M.** 1978. Die Gattung *Limonium* im südwestmediterranean Raum. *Mitt. Bot. Staatssamml. München* 14: 361–631.
- Erben, M.** 1979. Karyotype differentiation and its consequences in Mediterranean *Limonium*. *Webbia* 34: 409–417.
- Erben, M.** 1981. Bemerkungen zur Taxonomie der Gattung *Limonium* II. *Mitt. Bot. Staatssamml. München* 17: 485–510.
- Erben, M.** 1993. *Limonium* Mill. Pp. 2–143 in: Castroviejo, S., Aedo, C., Cirujano, S., Laínz, M., Montserrat, P., Morales, R., Muñoz-Garmendia, F., Navarro, C., Paiva, J. & Soriano, C. (eds.), *Flora Iberica*, vol. 3. Real Jardín Botánico, CSIC, Madrid.
- Erben, M.** 2001. Bemerkungen zur Taxonomie der Gattung *Limonium* VII. *Sendtnera* 7: 53–87.
- Hanson, A. D., Rathinasabapathi, B., Rivoal, J., Burnet, M., Dillon, M. O. & Gage, D. A.** 1994. Osmoprotective compounds in the Plumbaginaceae: a natural experiment in metabolic engineering of stress tolerance. *Proc. Natl. Acad. Sci. U.S.A.* 91: 306–310.
- Harborne, J. B.** 1967. Comparative biochemistry of the flavonoids - IV. Correlations between chemistry, pollen morphology and systematics in the family Plumbaginaceae. *Phytochem.* 6: 1415–1428.
- Hooker, J. D.** 1876. Plumbaginaceae. Pp. 623–628 in: Bentham, G. & Hooker, J. D. (eds.), *Genera Plantarum ad Exemplaria Imprimis in Herbariis Kewensibus Servata Definita*, vol. 2. Reeve & Co, London.
- Greuter, W., McNeill, J. Barrie, F. R., Burdet, H.-M., Demoulin, V., Filgueiras, T. S., Nicolson, D. H., Silva, P. C., Skog, J. E., Trehane, P., Turland, N. J. & Hawksworth, D. L.** (eds.). 2000. *International Code of Botanical Nomenclature (Saint Louis Code) adopted by the Sixteenth International Botanical Congress, St. Louis, Missouri, July–August 1999*. Koeltz Scientific Books, Königstein. [Regnum Veg. 138.]
- Kubitzki, K.** 1993. Plumbaginaceae. Pp. 523–530 in: Kubitzki, K., Rohwer, J. G. & Bittrich, V. (eds.), *The Families and Genera of Vascular Plants*, vol. 2. Springer, Berlin.
- Linczevski, I. A.** 1968. Tentamentum systematis ordinis Plumbaginalium Lindl. *Nov. Syst. Vyssh. Rast.* 1968: 171–177.
- Linczevski, I. A.** 1982. A new Australian genus, *Muellerolimon* (Limoniaceae). *Bot. Zhurn.* 67: 675–678.
- Lledó, M. D., Crespo, M. B., Cameron, K. M., Fay, M. F. & Chase, M. W.** 1998. Systematics of Plumbaginaceae based upon cladistic analysis of *rbcL* sequence data. *Syst. Bot.* 23: 21–29.
- Lledó, M. D., Crespo, M. B., Cox, A. V., Fay, M. F. & Chase, M. W.** 2000. Polyphyly of *Limoniastrum* Mill. (Plumbaginaceae): evidence from sequences of plastid *rbcL*, *trnL* intron and *trnL-F* intergene spacer. *Bot. J. Linn. Soc.* 132: 175–191.
- Lobin, W., Leyens, T., Kilian, N., Erben, M. & Lewejohann, K.** 1995. The genus *Limonium* (Plumbaginaceae) on the

- Cape Verde Islands, W. Africa. *Willdenowia* 25: 197–214.
- Mueller, F.** 1878. *Fragmenta Phytographiae Australiae*. 11(88). J. Ferres, Melbourne.
- Pax, F.** 1891. Plumbaginaceae. Pp. 116–125 in: Engler, A. & Prantl, K. (eds.), *Die natürlichen Pflanzenfamilien*, vol. 4. Engelmann, Leipzig.
- Pignatti, S.** 1971. Studi sui *Limonium*, VIII. In Heywood, V. H. (ed.), *Florae Europaea. Notulae Systematicae ad Floram European spectantes*. *Bot. J. Linn. Soc.* 64: 353–381.
- Pignatti, S.** 1982. *Flora d'Italia*, vol. 2. Edagricole. Bologna.
- Pount, H.** 1979. Les bractées des inflorescences élémentaires des *Limonium* de la section *Myriolepis*. *Bull. Soc. Hist. Nat. Toulouse* 115: 191–196.
- Rechinger, K. H. & Schiman-Czeika, H.** 1974. Plumbaginaceae. In: Rechinger, K. H. (ed.), *Flora des Iranischen Hochlandes und der umrahmenden Gebirge*. Akademische Druck- u. Verlagsanstalt, Graz.
- Rizzotto, M.** 1999. Research on the genus *Limonium* (Plumbaginaceae) in the Tuscan Archipelago (Italy). *Webbia* 53: 241–282.
- Roselló, R., Stübing, G., Peris, J. B. & Cirujano, S.** 1997. *Limonium cordovillense* y *L. pinillense* (Plumbaginaceae), dos nuevas especies de la flora española. *Anales Jard. Bot. Madrid* 55: 471–475.
- Sáez, L., Curcó, A. & Rosselló, J. A.** 1998. *Limonium vigoii* (Plumbaginaceae), a new tetraploid species from the northeast of the Iberian Peninsula. *Anales Jard. Bot. Madrid* 56: 269–278.
- Sáez, L. & Rosselló, J. A.** 1999. Is *Limonium cavanillesii* Erben (Plumbaginaceae) really an extant species? *Anales Jard. Bot. Madrid* 57: 47–55.
- Sauvage, C. & Vindt, J.** 1952. Flore du Maroc. Spermatophytes 1. *Trav. Inst. Sci. Chérifien* 4: 1–148.