



## Article

### A new diploid species of *Leucanthemum* (Asteraceae, Anthemideae) from Liguria (northwestern Italy)

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#### Abstract

A new diploid ( $2n = 18$ ) species, *Leucanthemum ligusticum*, is described from siliceous outcrops in eastern Liguria (northwestern Italy). This species differs from *L. pluriflorum*—endemic to northwestern Spain, Galicia and Asturias—and *L. monspeliense*—endemic to northeastern Spain and central and southern France—mainly by longer petioles of basal and lower cauline leaves, shorter teeth of lower cauline leaves, and narrower ligulate florets and involucre bracts. This new species has western European affinities. Because *L. ligusticum* is diploid, it is one of the "basic units" of *Leucanthemum* and therefore a key species for inferring evolutionary relationships in this genus.

**Key words:** endemic, Italian flora, karyology, taxonomy

#### Introduction

The genus *Leucanthemum* Miller (1754: 759) (Asteraceae, subfam. Asteroideae, tribe Anthemideae) is composed of ca. 70 taxa (Vogt 1991), of which 55 occur in Europe and 19 in Italy (Greuter 2006–2009, Greuter 2009). About half of them belong to the "*Leucanthemum vulgare* aggregate" (a group of related species with similar morphology), which is characterized by dark involucre bracts, entire or sub-entire basal leaves and a lack of pappus on the disk cypselae (Heywood 1976, Pignatti 1982). *Leucanthemum* is well known for its exceptionally variable karyology. The genus contains a few diploid ( $2n = 18$ ) taxa and many polyploids which range from  $3x$  to  $22x$  (Favarger 1959, 1975, Favarger & Villard 1965, Mircović 1966, Villard 1970, Bazzichelli 1972, Marchi 1972, Marchi & Illuminati 1974, Papeš 1975, Wilcox 1982, Marchi *et al.* 1983, Marchi 1984, Vogt 1991, Konowalik *et al.* 2011). Widespread polyploid species, such as *L. ircutianum* De Candolle (1838: 47) and *L. adustum* (Koch 1837: 378) Gremler (1898: 272), were recently shown to be of allopolyploid origin (Oberprieler *et al.* 2011). Hence, diploid species are particularly relevant as "basic units" for inferring evolutionary relationships in the genus (Greiner *et al.* 2011) and for exploring the evolution of polyploidy (Konowalik *et al.* 2011, Greiner *et al.* 2012). Most diploids, except the widespread *Leucanthemum vulgare* (Vaillant 1754: 539) Lamarck (1779: 137), are stenochorous or narrow endemics (Greuter 2009).

The Liguria region is located in northwestern Italy, between the Alps and the Ligurian Sea. According to a recent estimate (Pierini *et al.* 2009), Liguria ranks second of the 20 Italian regions in terms of floristic richness, with 3131 specific and subspecific taxa in a relatively small area (5421 km<sup>2</sup>). Large portions of this region are poorly explored and studied (Barberis *et al.* 2005).

The discovery in eastern Liguria of several populations of a *Leucanthemum* species with *L. vulgare*-like cypselae, but pinnati- or bipinnatipartite basal leaves (a very unusual feature within the *L. vulgare* aggregate) stimulated a comparison between these plants and specimens of other *Leucanthemum* populations. According to several Italian floras and checklists (e.g., Pignatti 1982, Conti *et al.* 2005), the Ligurian plants are different from any known taxon. Further bibliographical research indicated some morphological similarity with other European species with dissected leaves, such as: *L. corsicum* (Lessing 1832: 254) De Candolle (1838: 47) subsp. *fenzlii* Gamisans (1972: 194) - endemic to central Corsica, *L. vulgare* subsp. *pujiulae* Sennen (1929: 33) and *L. gaudinii* Dalla Torre in Sonklar *et al.* (1882: 244) subsp. *cantabricum* (Font Quer & Guinea in Guinea 1947: 347) Vogt (1991: 98) - both endemic to Spain, and *L. monspeliense* (Linnaeus 1753: 889) Coste (1903: 342) - endemic to northeastern Spain and central and southern France. *Leucanthemum corsicum*, *L. gaudinii* and *L. monspeliense* grow (albeit *L. gaudinii* not exclusively) on siliceous substrates (Gamisans 1972, Vogt 1991). However, the species that is most similar to the Ligurian plants is *L. pluriflorum* Pau (1902: 31) - endemic to northwestern Spain, Galicia and Asturias. This species belongs to the *L. vulgare* aggr. and also grows on siliceous substrates (Vogt 1991). The aim of our study was to clarify the taxonomic status of the Ligurian plants.

## Material and Methods

For morphological investigation, we sampled 17 specimens from three populations in eastern Liguria (Rocchetta di Vara and Rocche di Valletti, Province of La Spezia; Ponte di Lagoscuro, Province of Genova). These plants were compared with the descriptions of similar taxa available in the literature and with herbarium specimens from the herbaria B, FI, GE, MA, PI and the private Herbarium of Jean-Marc Tison (L'Isle D'Abeau, France). For a complete list of studied specimens see Appendix 1.

We studied qualitative and quantitative morphological characters deemed to be diagnostic for the recognition of the taxonomic units belonging to this genus (Heywood 1976, Pignatti 1982, Vogt 1991).

The morphological characters of *L. gaudinii* subsp. *cantabricum* and *L. vulgare* subsp. *pujiulae* used in the identification key were taken from descriptions and drawings published by Vogt (1991).

For the karyological analyses, squashes were made from root tips of plants cultivated in pots in the Botanical Garden of the University of Pisa. The root tips were pre-treated in 0.4% colchicine solution for 4 hours, fixed in Farmer's solution (3 parts ethanol, 1 part acetic acid) for at least 1 hour, hydrolyzed in 1N HCl for 7 min at 60°C, and stained with leuco-basic fuchsin for 3 hours. Karyotype formulas and terminology follow Levan *et al.* (1964). At least four individuals (eight metaphase plates each) from each studied population (Rocchetta di Vara, Rocche di Valletti, and Ponte di Lagoscuro) were measured to obtain an idiogram. The chromosomes were measured using ImageJ (Rasband 1997–2009).

## Description of a new species

A morphological comparison of the Ligurian *Leucanthemum* populations, *L. monspeliense* and *L. pluriflorum* is presented in Table 1. The plants from eastern Liguria are described here as a new species, *L. ligusticum*.

### *Leucanthemum ligusticum* Marchetti, Bernardello, Melai & Peruzzi, *sp. nov.* (Figs. 1–2)

**Type:**—ITALY, Liguria. Val di Vara (La Spezia), Rocchetta di Vara, alla base del M. Nero, ca. 225 m, 7 May 2011, D. Marchetti *s.n.* (holotype: PI!; isotype: B!, FI!, GE!)

A *L. plurifloro* Pau flore ligulato 2.5–3.8(4.8) non (3.0)3.5–5.5(6.0) mm lato, flore tubuloso max. 3 mm non (3.1)3.8–4.6(5.0) mm longo, squama involucrali (0.9)1.0–1.5(1.9) non (0.8)1.8–2.2(2.5) lata, petiolo foliorum caulis inferiorum [(15)20–41(49) pro (13)16–21(22) mm] longiore, dentibus foliorum caulis inferiorum (1.0)1.5–2.7(3.0)

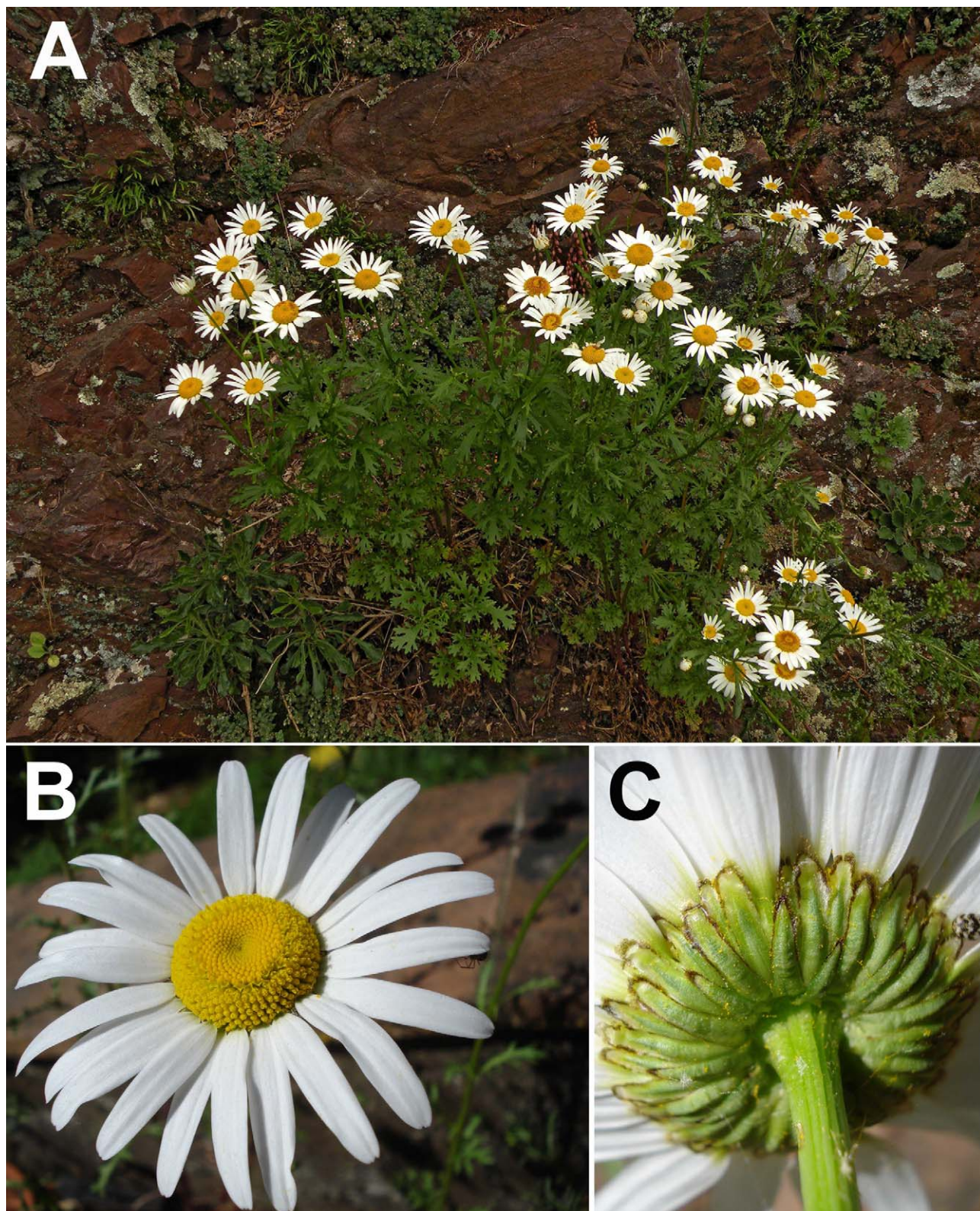


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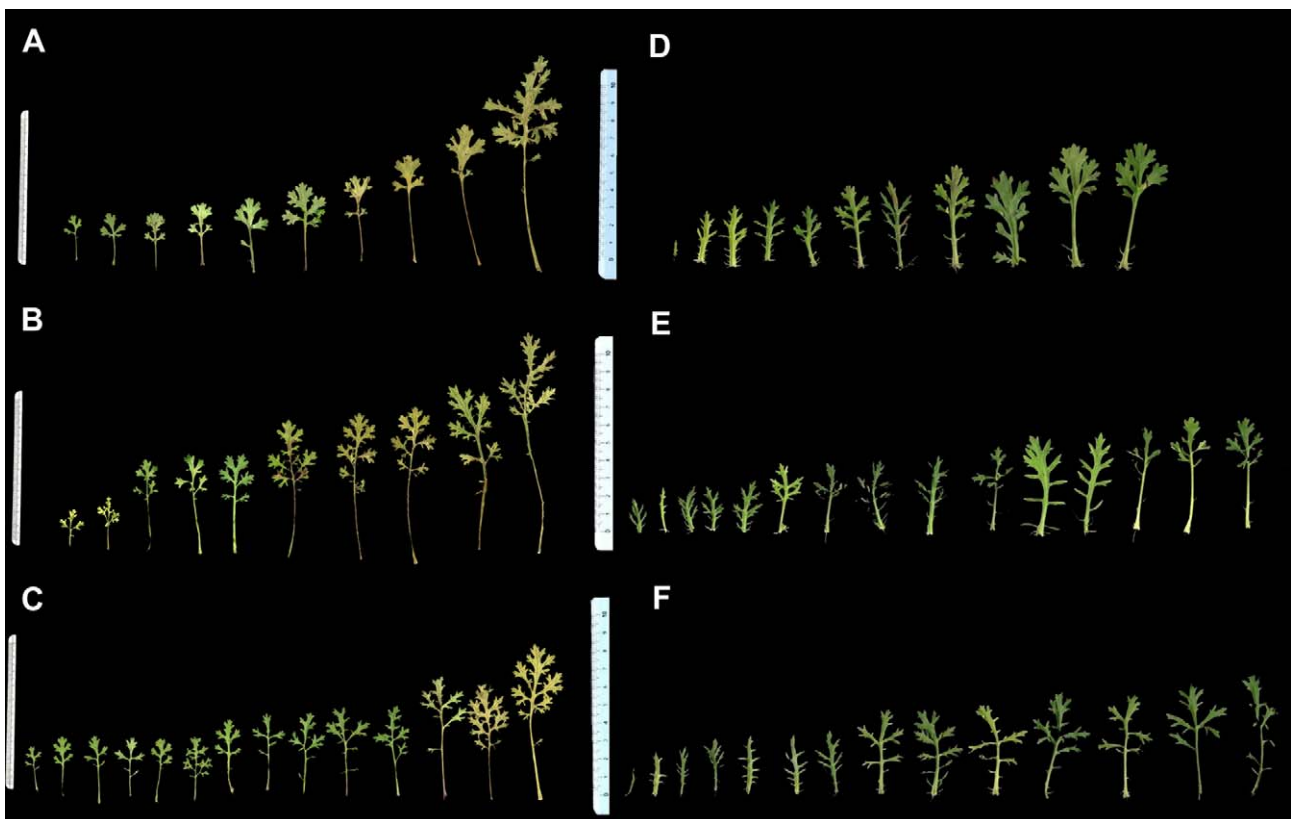
mm non (2.7)2.8–4.3 mm longis, foliis caulibus superioribus longioribus [(18)19–28(33) pro (7)8–19(21) mm], differt. A *L. monspeliensi* (L.) H. J. Coste flore ligulato 2.5–3.8(4.8) non (3.3)3.4–3.9(4.0) mm lato, squama involucri (0.9)1.0–1.5(1.9) non (1.2)1.3–1.9(2) mm lata, foliis basalibus longioribus [(31)32–68(80) vs. (16)17–29(32) mm] et latioribus [(19)22–40.8(58) vs. (9)10–17.5 mm], pluribus dentibus praeditis [(24)25–72(78) pro (12)13–16(17)] et petiolo longiore [(32)38–96(103) pro (27)30–44(45) mm], foliis caulibus inferioribus petiolum longiorem ferentibus [(15)20–41(49) pro (17)18–28(29)], differt.



**FIGURE 1.** *Leucanthemum ligusticum* sp. nov. General view of the plant (A); closeup of a capitulum in top view (B) and bottom view (C).



Short-lived perennial herb (34)43–72(100) cm tall, sparsely hairy (especially on the lower part of stem and under the capitula), with rosettes arising from an aerial, oblique, violet woody rootstock, up to 20 cm long. Stems several, erect-decumbent, (0.9)1.0–3.3(6.0) mm thick at the base, divided above into several branches, each bearing 1 capitulum. Basal leaves (31)32–68(80) mm long, (19)22–41(58) mm wide, thin, hairless, ovate-spathulate, pinnatifid or, rarely, bipinnatifid, with dentate or deeply dentate margins and (24)25–72(78) teeth, which are (1.8)2–4.5 mm long; petioles (32)38–96(103) mm long, withering at flowering. Lower cauline leaves (15)19–32(40) mm long, (9.5)12–21(25) mm wide, spatulate, pinnatifid or, rarely, bipinnatifid, with dentate or deeply dentate margins and (12)15–24(34) teeth, which are (1.0)1.5–2.7(3.0) mm long; petioles slightly winged, (15)20–41(49) mm long. Middle cauline leaves sessile, (21.5)23.7–47.9(59.0) mm long, (9)10–20(22) mm wide, oblong-linear, pinnatifid or pinnatifid, with lacinate margins and (6)7–24(31) lacinae, which are (1.7)2.3–4.0(5.0) mm long. Upper cauline leaves sessile, (18)19–28(33) mm long, (2.0)2.7–8.0(9.0) mm wide, linear with lacinate margins and (3)4–9(11) lacinae, which are (1.2)1.6–3.0 mm long. Involucre (10.0)12.7–19.3(21.0) mm wide, with pluriseriate, triangular (external) to linear (internal), green phyllaries, (4.0)4.4–5.4(7.0) mm long, (0.9)1.0–1.5(1.9) mm wide, with brownish scarious margins. Receptacle glabrous, slightly convex. Capitula up to 53 mm in diameter. Ligulate florets up to 31, white, with tridentate apex, (8.5)10.0–17.6(20.0) mm long, 2.5–3.8(4.8) mm wide. Disk florets numerous, yellow, up to 3 mm long. Ray cypselae up to 3 mm, brown, with 10 whitish ribs and a tubulose crown-shaped pappus. Disk cypselae similar to ray cypselae, lacking pappus, (1.7)1.9–2.3(2.7) mm long, 0.70–0.74 mm wide, 0.55–0.61 mm thick.



**FIGURE 2.** *Leucanthemum ligusticum* sp. nov. Variability of basal leaves in individuals from Ponte di Lagoscuro (A), Rocche di Valletti (B), Rocchetta di Vara (C). Variability of cauline leaves, upper ones (sx) to lower ones (dx), from Ponte di Lagoscuro (D), Rocche di Valletti (E), Rocchetta di Vara (F). Scale bars: 10 cm.

**Additional specimens examined** (paratypes):—ITALY, **Liguria**. Rocchetta di Vara (province of La Spezia), on siliceous substrate ("diaspro"), 200–240 m a.s.l., 16 May 2008, *D. Marchetti s.n.* (PI!); Rocchetta di Vara (province of La Spezia), on siliceous substrate ("diaspro"), 200–240 m a.s.l., 17 May 2008, *D. Marchetti s.n.* (PI!); Rocchetta di Vara (province of La Spezia), on siliceous substrate ("diaspro"), 200–240 m

a.s.l., 23 June 2010, *M. Melai, D. Marchetti, R. Bernardello et G. Trombetti s.n.* (PI!); Rocche di Valletti (province of La Spezia), on siliceous substrate ("diaspro"), 800 m a.s.l., 21 July 2010, *M. Melai, D. Marchetti et R. Bernardello s.n.* (PI!); Val Graveglia, sotto Naschio (province of Genova), Ponte di Lagoscuro, 250 m a.s.l., 21 July 2010, *M. Melai, D. Marchetti et R. Bernardello s.n.* (PI!).

**Ecology and Phenology:**—*Leucanthemum ligusticum* grows in open rocky places (200–1060 m), on siliceous substrates and deep-oceanic siliceous sedimentary rocks ("diaspri"). It is a hemicyptophyte, flowering from the beginning of May until the first half of July.

**Distribution:**—*Leucanthemum ligusticum* is currently known from few localities in eastern Liguria (provinces of Genova and La Spezia; Fig. 3). Besides the three studied populations, the new species was observed near Bargone (Genova province), Mounts Roccagrande-Tregìn, 400–850 m and near the top of Mount Verruga, at 1060 m.

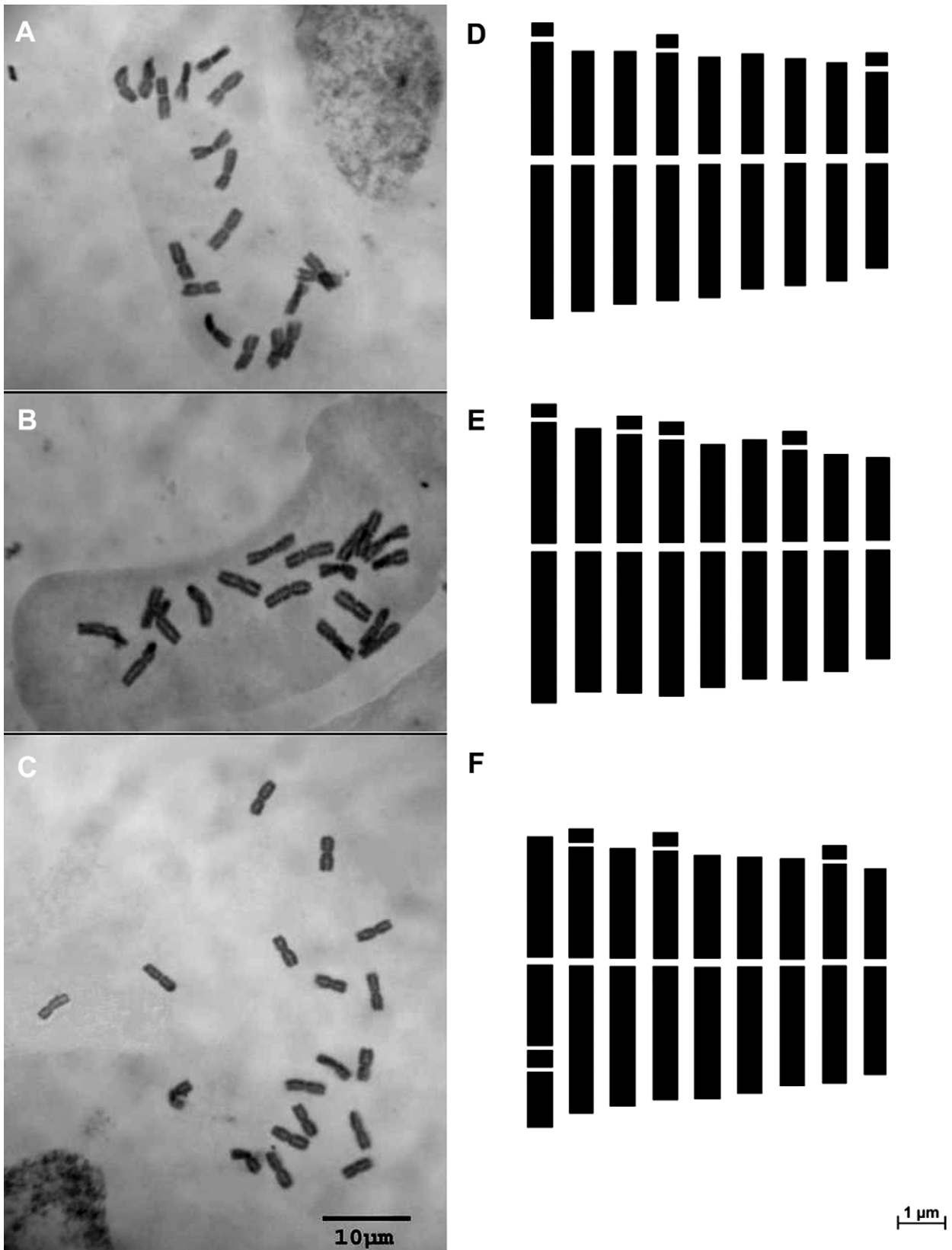


FIGURE 3. *Leucanthemum ligusticum* sp. nov. Known geographical distribution in eastern Liguria (northwestern Italy Italy).

**Karyology:**—The new species is diploid, with  $2n = 18$  chromosomes, at all three localities studied (Liguria; Fig. 4A–C). The karyotype formula is  $2n = 2x = 18 = 2m^{sat} + 4m + 2m^{sat} + 8m + 2m^{sat}$  at Ponte di Lagoscuro,  $2n = 2x = 18 = 2m^{sat} + 2m + 4m^{sat} + 4m + 2m^{sat} + 4m$  at Rocche di Valletti and  $2n = 2x = 18 = 2m_{sat} + 2m^{sat} + 2m + 2m^{sat} + 6m + 2m^{sat} + 2m$  at Rocchetta di Vara (Fig. 4D–F). Chromosome size ranges from 3.60 to 6.5  $\mu\text{m}$ .

**Key to *Leucanthemum ligusticum* and related diploid taxa**

- 1. Basal leaves entire (at most with conspicuous lobes and teeth) ..... 2.
- Basal leaves dissected..... 3.
- 2. Cypselae less than 2 mm long, those of ray florets with scarious pappus at most half of the fruit length (widespread range) ..... *Leucanthemum vulgare* s.l.
- Cypselae more than 2 mm long, those of ray florets with scarious pappus more or less equalling the fruit length (southern Italy)..... *Leucanthemum laciniatum*
- 3. Phyllaries with pale or light brown margins, basal leaves rarely pinnatifid (northeastern Spain) ..... *Leucanthemum vulgare* subsp. *pujiulae*
- 3. Phyllaries with brown margins, basal leaves pinnatifid ..... 4.
- 4. Teeth of basal leaves  $\leq 2$  mm long, plants at most 40(50) cm tall, growing above 1000 m a.s.l. (northern Spain) ..... *Leucanthemum gaudinii* subsp. *cantabricum*
- 4. Teeth of basal leaves generally  $\geq (1.8)2$  mm, plants up to 100 cm tall, growing under 1000 m a.s.l. .... 5.



**FIGURE 4.** *Leucanthemum ligusticum* sp. nov. Examples of metaphasic plates and relative haploid idiograms, from Ponte di Lagoscuro (A, D), Rocche di Valletti (B, E) and Rocchetta di Vara (C, F). Scale bars of metaphasic plates = 10 μm; scale bars of haploid idiograms = 1 μm.

5. Basal leaves (9)10–17.5 mm wide, with (12)13–16(17) teeth (northeastern Spain and central and southern France) ..  
 ..... *Leucanthemum monspeliense*
- Basal leaves (18)22–41(58) mm wide, with (14)22–72(78) teeth ..... 6.
6. Lower cauline leaves with petioles (13)16–21(22) mm and teeth (2.7)2.8–4.3 mm long, disk florets  
 (3.1)3.8–4.6(5.0) mm long (northwestern Spain, Galicia and Asturias)..... *Leucanthemum pluriflorum*
- Lower cauline leaves with petioles (15)20–41(49) mm and teeth (1)1.5–2.7(3) mm long, disk florets less than 3 mm  
 long (northwestern Italy)..... *Leucanthemum ligusticum*

## Discussion

*Leucanthemum ligusticum* is morphologically most similar to *L. pluriflorum* (Table 1; see identification key). However, the ecological preferences of the new species differ from those of *L. pluriflorum*, as the latter grows at lower elevations (0–100 m; Vogt 1991). Moreover, the two species are separated by over 1100 km. *Leucanthemum ligusticum* and *L. pluriflorum* share several morphological features, but *L. ligusticum* has lower cauline leaves with longer petioles, shorter teeth, shorter ligulate florets (usually < 17.6 mm), shorter disk florets [< 3 mm; Vogt (1991) reports (3.1)3.8–4.6(5.0) mm for *L. pluriflorum*], and shorter involucre bracts (usually < 5.4 mm). The karyotype of *L. ligusticum* is also very similar to that of *L. pluriflorum* (Vogt 1991). However, it is distinct in karyotype asymmetry from *L. gaudinii* subsp. *cantabricum* (Vogt 1991) and other diploids in the *L. vulgare* aggregate, such as *L. laciniatum* Huter, Porta & Rigo (1878) (Marchi & Illuminati 1974, Marchi *et al.* 1983) and *L. vulgare* (Mirković 1966, Marchi 1972, Marchi *et al.* 1983, Vogt 1991). *Leucanthemum corsicum* and *L. monspeliense* are both reported as tetraploid ( $2n = 36$ ) (Gamisans 1972, Vogt 1991). However, counts for *L. monspeliense* were recorded in individuals from Spain. Because this species was originally described from near Montpellier in France (Linnaeus 1753; as *Chrysanthemum monspeliense*; a name not yet typified, see Jarvis 2007), topotypical populations might be diploid (R. Vogt, pers. comm.).

Molecular studies are needed to further clarify the phylogenetic relationships of the new species with other diploids and especially *L. pluriflorum* and *L. monspeliense*. However, the morphological and karyological data available suggests that *L. ligusticum* is best placed in the *L. vulgare* aggregate.

Currently, 12 diploid *Leucanthemum* taxa are known (Greiner *et al.* 2011). The discovery of an additional diploid species from eastern Liguria is particularly relevant for understanding the evolutionary history of the genus. In addition, its morphological similarities with narrow endemics from the western Mediterranean region emphasize a close biogeographic connection between this region and Liguria. In addition, the discovery of *Leucanthemum ligusticum* also underlines the phylogeographical, evolutionary and conservation significance of eastern Liguria and is a noteworthy addition to the endemic flora of the region: *Santolina ligustica* Arrigoni (1977: 129) (Torricelli *et al.* 2000) from Asteraceae tribe Anthemideae, *Centaurea veneris* (Sommier 1894: 88) Béguinot in Béguinot & Landi (1931: 90) (Cela Renzoni & Viegi 1983) and *C. aplolepa* Moretti (1826: 154) subsp. *levantina* (Arrigoni 2003: 62) Greuter (2003: 249) from Asteraceae tribe Cardueae, *Helleborus liguricus* Thomsen *et al.* (2006: 237) (Ranunculaceae), and *Festuca veneris* Rossi *et al.* (1996: 22) (Poaceae).

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**TABLE 1.** Morphological comparison of *Leucanthemum ligusticum*, *L. monspeliense* and *L. pluriflorum*. Quantitative values are expressed as 10–90 percentile intervals, with minimum and/or maximum in brackets.

	<i>L. ligusticum</i> sp. nov.	<i>L. pluriflorum</i>	<i>L. monspeliense</i>
<b>plant size</b> (cm)	(34)43–72(100)	(10)30–80(100)	(33)36–84(92)
<b>stem diameter</b> (mm)	(0.9)1–3.3(6)	(1.6)2–2.9(3.5)	2.5–3.2(3.5)
<b>lamina of the leaves</b>	thin, hairless	thin, hairless	thin, hairless
<b>basal leaves:</b>			
shape	ovate-spathulate, pinnatifid or, rarely, bipinnatifid	ovate or elliptical, pinnatifid or, rarely, pinnatisect	ovate, bipinnatifid or pinnatisect
margin	incised, dentate or deeply dentate	incised, dentate or deeply dentate	incised, dentate or deeply dentate
length (mm)	(31)32–68(80)	(21)32–66(68)	(16)17–29(32)
width (mm)	(19)22–41(58)	(18)22–36(39.5)	(9)10–17.5
teeth (mm)	(1.8)2–4.5	(3.1)3.3–5.1(5.4)	(1.8)2–2.7(2.8)
number of teeth	(24)25–72(78)	(14)29–54(56)	(12)13–16(17)
petiole (mm)	(32)38–96(103)	(26)28–43(62)	(27)30–44(45)
<b>lower cauline leaves:</b>			
shape	spathulate, pinnatifid or, rarely, bipinnatifid	ovate, pinnatifid, or bipinnatifid	ovate, bipinnatifid, or pinnatisect
margin	incised, dentate or deeply dentate	incised, dentate or deeply dentate	incised, deeply dentate
length (mm)	(15)19–32(40)	(14)24–42(44)	(21.5)22–32
width (mm)	(9.5)12–21(25)	(11.5)20–27(28)	16.5–20(21)
teeth (mm)	(1)1.5–2.7(3)	(2.7)2.8–4.3	(2)2.3–3.9
number of teeth	(12)15–24(34)	(12)17–35(36)	18–32(36)
petiole (mm)	(15)20–41(49)	(13)16–21(22)	(17)18–28(29)
<b>middle cauline leaves:</b>			
shape	oblong-linear, pinnatifid or pinnatifid	oblong-linear, pinnatifid or pinnatifid	oblong-linear, pinnatifid or pinnatifid
margin	lacinate	lacinate	long-lacinate
length (mm)	(21.5)23.7–47.9(59)	(18)30–39.5(42)	(25.5)27–52(56)
width (mm)	(9)10–20(22)	(12)16–23(24)	(13)14–19
teeth (mm)	(1.7)2.3–4(5)	(1.5)1.6–2.8(3)	(2)2.2–4.1
number of teeth	(6)7–24(31)	(10)11–17(32)	(18)19–24
petiole (mm)	absent	0(13.1)	absent
<b>upper cauline leaves:</b>			
shape	linear	linear	linear
margin	lacinate	lacinate	long-lacinate
length (mm)	(18)19–28(33)	(7)8–19(21)	(16.5)18–21
width (mm)	(2)2.7–8(9)	(2.5)2.9–4.3(6)	(3)4–9.5(10.2)
teeth (mm)	(1.2)1.6–3	(1)1.3–2.4	(1.7)2.3–6.6(7.1)
number of teeth	(3)4–9(11)	(3)4–9(10)	5–7
petiole (mm)	absent	absent	absent
<b>receptacle diameter</b> (mm)	(10)12.7–19.3(21)	(10)12–17(21)	15.9–19.9(20)
<b>involucral bracts:</b>			
shape	linear-acute or triangular	linear-acute or triangular	linear-acute or triangular
margin colour	brownish	brownish	brownish or green
length (mm)	(4)4.4–5.4(7)	(4)5–6.5	(4.2)4.3–5(5.1)
width (mm)	(0.9)1–1.5(1.9)	(0.8)1.8–2.2(2.5)	(1.2)1.3–1.9(2)
<b>ligulate florets:</b>			
length (mm)	(8.5)10–17.6(20)	(9.7)15–25(28)	(8.3)9.5–14.1(14.4)
width (mm)	2.5–3.8(4.8)	(3)3.5–5.5(6)	(3.3)3.4–3.9(4)
<b>disk cypselae length</b> (mm)	(1.7)1.9–2.3(2.7)	2–2.2(2.3)	2.4–2.8



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**APPENDIX 1.** Studied specimens of diploid *Leucanthemum* species.

*L. monspeliense* (L.) H. J. Coste (4 specimens)—FRANCE: Var, Bormes, Vallée du Pansard, 1 May 1992, *J.-M. Tison s.n.* (Herb. Tison); Aude, Brousse-et-Villaret, Vallée de la Dune, 1 May 2005, *J.-M. Tison s.n.* (Herb. Tison); Ardèche, Gravières, 1 May 1987, *J.-M. Tison s.n.* (Herb. Tison); Ardèche, Pereyre, 1 June 1993, *J.-M. Tison s.n.* (Herb. Tison).

*Leucanthemum vulgare* aggr. (34 specimens)

*L. laciniatum* Huter & al. (21 specimens)—ITALY: Appennino Calabro-Lucano, Serra del Prete, garighe e pascoli del versante meridionale a 1650-2000 m (gruppo di M. Pollino), 23 Jul 1972, *E. Nardi, R. Bavazzano, V. Posca s.n.* (FI); Selva Fronte di Mola, sul M. Serra delle Ciavole (gruppo del Pollino) a 1800 m (Basilicata), Jul 1936, *O. Gavioli s.n.* (FI); Appennino Calabro-Lucano, Pascoli di Piano Ruggio (gruppo di M. Pollino), 24 Jul 1972, *E. Nardi, R. Bavazzano, V. Posca s.n.* (FI); Appennino Calabro-Lucano, Faggeta di Serra del Prete presso il Belvedere, a 1600 m (gruppo di M. Pollino), 23 Jul 1972, *E. Nardi, R. Bavazzano, V. Posca s.n.* (FI); M. Alburno, pascoli rocciosi al Passo del Figliolo, 1250 m (Campania), 1 Jun 1952, *G. Moggi, R. Corradi s.n.* (FI); M. Alburno, da Petina a C. Aresta, castagneto oltre il cimitero, 700-850 m (Campania), 28 May 1951, *A. De Philippis, G. Moggi s.n.* (FI); M. Alburno, Polla-Vallescura da S. Tommaso al Passo (Campania), 7 Jun 1948, *A. De Philippis s.n.* (FI); M. Alburno, pascoli rocciosi al Passo del Figliolo, 1250 m (Campania), 1 Jun 1952, *R. Picchi Sermolli, G. Moggi s.n.* (FI); Pollino (Calabria), 12 Jul 1907, *G. Rigo s.n.* (GE); Pollino (Calabria), 29 Jun 1898, *G. Rigo s.n.* (GE); Vetta di Monte S. Angelo di Cana, 26 Jun 1910, *M. Guadagno s.n.* (PI); M. Faito, Castellamare, Jun 1903, *M. Guadagno s.n.* (PI); Strada del Conte Giusso, 14 Jun 1897, *M. Guadagno s.n.* (PI); Piano di Faito, sopra Castellamare, Jul 1909, *M. Guadagno s.n.* (PI); M. Cerreto, rocce sotto la vetta, 7 Jun 1908, *M. Guadagno s.n.* (PI); M. Faito, Castellamare, 950 m, Jun 1909, *M. Guadagno s.n.* (PI); Colle dell'Acquario, 11 Jul 1911, *M. Guadagno s.n.* (PI); Monte S. Angelo di Cana, all'Acquasanta, 13 Jul 1911, *M. Guadagno s.n.* (PI); tra Ravello e Sambuco (Salerno), in boschi e pascoli umidi, 14 Jun 1911, *Di Palma s.n.* (PI); M. Sant'Angelo, Castellamare di Stabia, (Napoli), su suolo siliceo a 900 m, 10 Jul 1912, *G. Pellanda s.n.* (PI).

*L. pluriflorum* Pau (6 specimens)—SPAIN: Lugo; San Ciprián, 14 Mar 1905, *P. Merino s.n.* (MA); Lugo, 50–100 m, 15 Jul 1985, *R. Vogt s.n.* (B); La Coruña: Punta Candelara, 100 m, 16 Jul 1985, *R. Vogt s.n.* (B); La Coruña: Santa Mariña, near Camariños, between the rocks near the sea (10 m), 17 Jul 1985, *R. Vogt s.n.* (B); La Coruña: Santa Mariña, near Camariños, between the rocks near the sea (10 m), 17 Jul 1985, *R. Vogt s.n.* (B); Oviedo, Capo Vidio, 50 m, 12 Jul 1985, *R. Vogt s.n.* (B).

*L. vulgare* (Vaill.) Lam. (7 specimens)—ITALY: M. Senario versante Nord (Firenze), 500 m, 18 May 1958, *B. Lanza s.n.* (FI, sub *L. praecox* Horvatić var. *praecox*); Liguria, 2 Aug 2005, *Leco s.n.* (GE, sub *L. praecox* Horvatić var. *praecox*); Liguria, 23 Jun 2010, *s.c. s.n.* (GE, sub *L. praecox* Horvatić var. *praecox*); Isolano, Lunigiana (Massa-Carrara), 29 Jul 1998, *D. Marchetti s.n.* (PI, sub *L. praecox* Horvatić s.l.); Tra Antona e Pian della Fioba (Massa-Carrara), 26 Jun 2004, *D. Marchetti s.n.* (PI, sub *L. praecox* Horvatić s.l.); Fossa Gattanera, Arena Metato (Pisa), 3 Aug 1999, *M. L. Pedullà s.n.* (PI, sub *L. praecox* Horvatić s.l.).

SPAIN: Castilla, 30 Jun 1908, *H. Elias s.n.* (GE).