



Anales del Jardín Botánico de Madrid

ISSN: 0211-1322

anales@rjb.csic.es

Consejo Superior de Investigaciones

Científicas

España

Mercadal i Corominas, Gabriel; Martínez Azorín, Mario; Crespo, Manuel B.
Confirmation of the presence of *Ornithogalum umbellatum* (Hyacinthaceae) in the Iberian
Peninsula

Anales del Jardín Botánico de Madrid, vol. 74, núm. 1, 2017, pp. 1-6

Consejo Superior de Investigaciones Científicas

Madrid, España

Available in: <http://www.redalyc.org/articulo.oa?id=55651825003>

- How to cite
- Complete issue
- More information about this article
- Journal's homepage in redalyc.org

redalyc.org

Scientific Information System

Network of Scientific Journals from Latin America, the Caribbean, Spain and Portugal

Non-profit academic project, developed under the open access initiative

Confirmation of the presence of *Ornithogalum umbellatum* (Hyacinthaceae) in the Iberian Peninsula

Gabriel Mercadal i Corominas^{1*}, Mario Martínez Azorín² & Manuel B. Crespo²

¹Laboratori d'Anàlisi i Gestió del Paisatge, Departament de Ciències Ambientals, Facultat de Ciències, Universitat de Girona, Campus Montilivi s.n., 17071 Girona, Spain; g.mercadal.corominas@gmail.com

²dCARN & CIBIO (Instituto Universitario de la Biodiversidad), Universidad de Alicante, P.O. Box 99, ES-03080 Alicante, Spain.

Abstract

Mercadal, G., Martínez Azorín, M. & Crespo, M.B. 2017. Confirmation of the presence of *Ornithogalum umbellatum* (Hyacinthaceae) in the Iberian Peninsula. *Anales Jard. Bot. Madrid* 74(1): e049.

The study of plant material from three populations in northeastern Spain and southern France revealed the presence of *O. umbellatum* as a new record for the Iberian flora. Although this species had been cited in the Iberian Peninsula by various authors within the last two centuries, its presence in this territory could not be confirmed in recent years. A complete description is presented for *O. umbellatum* and an identification key is included to cover all species of *Ornithogalum* s. str. (*O.* subgen. *Ornithogalum*) of the Iberian Peninsula, as an amendment for their taxonomic treatment in *Flora iberica*.

Keywords: Iberian Peninsula, *Ornithogalum baeticum*, *Ornithogalum bourgaeum*, *Ornithogalum divergens*, *Ornithogalum umbellatum*, Taxonomy.

Resumen

Mercadal, G., Martínez Azorín, M. & Crespo, M.B. 2017. Confirmación de la presencia de *Ornithogalum umbellatum* (Hyacinthaceae) en la Península Ibérica. *Anales Jard. Bot. Madrid* 74(1): e049.

Se da a conocer la existencia de *O. umbellatum* en la Península Ibérica a partir de la localización y el estudio de tres poblaciones en el noreste de España y el sureste de Francia. Durante los dos últimos siglos esta especie ya había sido citada de la Península Ibérica por varios autores, pero no se había podido confirmar su presencia en dicho territorio hasta ahora. Así mismo, se presenta una descripción completa de *O. umbellatum* y se proporciona una clave dicotómica para la identificación de todos los táxones de *Ornithogalum* s. str. (*O.* subgen. *Ornithogalum*) de la Península Ibérica, como adición al tratamiento taxonómico de *Flora iberica*.

Palabras clave: *Ornithogalum baeticum*, *Ornithogalum bourgaeum*, *Ornithogalum divergens*, *Ornithogalum umbellatum*, Península Ibérica, taxonomía.

ORCID ID: G. Mercadal (<http://orcid.org/0000-0001-6992-8243>); M. Martínez Azorín (<http://orcid.org/0000-0002-2605-9575>); M.B. Crespo (<http://orcid.org/0000-0002-3294-5637>).

Received: 10-XII-2015; **accepted:** 1-VI-2016; **published online:** 3-V-2017; **Associate Editor:** Enrique Rico.

Copyright: © 2017 CSIC. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial (by-nc) Spain 3.0 License.

INTRODUCTION

The taxonomy of *Ornithogalum* L. s. str. (i.e., according to Martínez-Azorín & al., 2011) in the Iberian Peninsula within the last two centuries can be considered diverse and confusing. The concept of taxa in this group were used in different ways in the Iberian and western European floras (Zahariadi, 1980; Pignatti, 1982; Aeschmann & al., 2004; Martínez Azorín & al., 2010; Lambinon & Verloove, 2012; Lauber & al., 2012; Stace, 2014; Tison & Foucault, 2014; Tison & al., 2014). Moreover, identification of plants in this group is usually complicated, especially when the subterranean parts or fruits are not available. This led for a complex taxonomy in the group in which up to 11 species, among them *O. umbellatum* L., were cited in the Iberian Peninsula, most of them being initially described from other territories (Martínez Azorín & al., 2010).

In the frame of the works towards the taxonomic revision of *Ornithogalum* for *Flora iberica*, Martínez Azorín & al. (2013) reduced the number of Iberian species of *Ornithogalum* s. str. (*O.* subgen. *Ornithogalum*) to three: *O. bourgaeum* Jord. & Fourr., *O. divergens* Boureau, and *O. baeticum* Boiss., the presence of *O. umbellatum* being not confirmed.

The extreme cytotype variation found in the aggregate of *O. umbellatum*, in which many ploidy levels ($2n = 27, 36, 45, 54, 72, 90, 108$; cf. Neves, 1952; Tornadore & Garbari, 1979;

Garbari & al., 2003) occur together with diploids and aneuploids, is perhaps in the origin of the wide taxonomic and nomenclatural confusion. These ploidy levels have been connected to two or three morphotypes (Gadella, 1972; Gadella & Raamsdonk, 1981; Moret 1991, 1992; Moret & Favereau, 1991; Moret & Galland, 1991, 1992; Raamsdonk 1999; Speta, 2000; Garbari & al., 2003, 2008; Aquaro & Peruzzi, 2006), in which at least two biological entities are well differentiated. *Ornithogalum divergens* is usually applied to hexaploid plants ($2n = 54$) with wide pseudocorymbose inflorescences, bearing very long and patent or slightly reflexed lower pedicels, with short bracts not reaching half of the length of the subtending pedicel in fruit, and with bulbs producing many small, spherical, long pedicellate bulbils, usually not leaved and attached to the basal plate. Plants of the triploid cytotype ($2n = 27$), to which the name *O. umbellatum* is commonly applied, produce corymbose inflorescences with the lowermost pedicels erect-patent in flower, rarely reflexed in fruit, and bulbs bearing sessile, medium size bulbils, commonly generating leaves in their first year.

Recently three populations of *O. umbellatum* s. str. were found in northeastern Spain and southern France by G. Mercadal in the frame of his PhD thesis, in the meadows of the Mediterranean areas of Catalonia. They are the first full-checked records of this species in the Iberian flora.

* Corresponding author

The name *O. umbellatum* has been widely misapplied to populations from northeastern Iberian Peninsula and south-eastern France, which indeed correspond to *O. divergens* and even *O. bourgaeum*. In the *Flora dels Països Catalans* (Bolòs & Vigo, 2001), a single species, *O. umbellatum*, is accepted for *Ornithogalum* s. str. (i.e., according to Martínez Azorín & al., 2011), in which three subspecies are included. The first subspecies, *O. umbellatum* subsp. *umbellatum*, that includes *O. divergens* as synonym, was used to name plants of *O. divergens* sensu Martínez Azorín & al. (2009, 2010, 2013). The second and third subspecies, *O. umbellatum* subsp. *monticolum* (Jord. & Fourr.) O. Bolòs & Vigo and *O. umbellatum* subsp. *baeticum* (Boiss.) O. Bolòs & Vigo are used to name plants belonging to *O. bourgaeum* sensu Martínez Azorín & al. (2010, 2013). In the *Flora Manual del Països Catalans* (Bolòs & al., 2005), two species are accepted for *Ornithogalum* s. str., *O. umbellatum* to name *O. divergens* sensu Martínez Azorín & al. (2009, 2010, 2013), and both *O. orthophyllum* subsp. *monticola* (Jord. & Fourr.) O. Bolòs & al. and *O. orthophyllum* subsp. *baeticum* (Boiss.) Zahar. to name plants of *O. bourgaeum* sensu Martínez Azorín & al. (2010, 2013). Therefore, it seems that recent Catalan floras did not recognise the differences between *O. umbellatum* and *O. divergens*, as triploid and hexaploid cytotypes of the polyploid complex of *O. umbellatum*, as explained above, and merged both cytotypes in a single taxon, *O. umbellatum*. It is worth mentioning that according to our data *O. orthophyllum* and *O. baeticum* do not occur in Catalonia (Martínez Azorín & al., 2010). Other works in Europe (v. gr., Prevost, 2002; Lambinon & Verloove, 2012; Jauzein & Nawrot, 2013; Stace, 2014) accept *O. divergens* as a subspecies of *O. umbellatum*.

A complete morphological description is presented for *O. umbellatum* to complete the information of the genus of *Flora iberica*. An identification key is also presented for the Iberian species of *Ornithogalum* s. str., *O. baeticum*, *O. bourgaeum*, *O. divergens*, and *O. umbellatum*, which complements that presented by Martínez-Azorín & al. (2013).

MATERIAL AND METHODS

We studied 17 populations of *Ornithogalum* s. str. in north-eastern Spain and south eastern France, of which 7 belong to *O. bourgaeum*, 7 to *O. divergens*, and 3 to *O. umbellatum*. One herbarium voucher from each population was prepared and deposited in the Herbari de la Universitat de Girona (HGI; see Appendix 1). Morphological characters were studied on both fresh and dry specimens (Table 1, Figs. 1-3). The identification key was build up exclusively with data from Iberian and French plants.

TAXONOMIC TREATMENT

Ornithogalum umbellatum L., Sp. Pl.: 307 (1753)

Geophyte, deciduous. Bulb 16-20(30) × 15-18(25) mm, pyriform in early stages and ovoid to slightly depressed at maturity; outer tunic whitish, surrounded by numerous solid bulbils. Bulbils of different sizes; the largest 6-8(10) × 4-6(8) mm, usually bearing leaves their first year of life, pyriform to ovoid, being larger than ca. 35% of mother bulb size; the smallest 3-4(5) × 2-3 mm, lacking leaves, ovoid to spherical, lacking pedicles or very shortly pediculate. Floral stem (8)10-18(20) cm long, green, smooth, glabrous. Leaves 13-15 × 0.25-0.4(0.5) cm, (2)4-8(10) per floral stem, green, strap-like, canaliculate, glabrous, with a whitish or translucent central longitudinal band 0.2-1.2 mm wide on the adaxial side, usually longer than the inflorescence, withering at the upper portions. Inflorescence a corymbose raceme, 3-8 × 3-8 cm, with few flowers, usually with 4-7, up to 14; lowermost pedicels in flower 3-6(11) cm long, spreading; lowermost pedicels in fruit erect-patent, rarely slightly reflexed with incurved apex. Bracts 2.5-3 cm long, usually longer than the half length of the lowermost pedicels in fruit. Flowers 26-42 mm in diameter, stellate, slightly fragrant. Tepals lanceolate, acute to obtuse, white on the adaxial side and white with a broad longitudinal green band on the abaxial side; outers 18-24 × 5-8 mm, lanceolate-obovate; inners 8-16 × 3-6 mm, lanceolate. Stamen 1/2 to 2/5 the length of the tepals; filaments lanceolate-oblong, with the widest portion in the basal part, progressively tapering to the apex, the outers 8-12 × 1.5-2 mm, the inners 9-13 × 1.8-2.5 mm; anthers oblong, pale yellow, pollen yellow. Ovary 5-9 × 4-6 mm, pale to dark green, oblong and truncate in lateral view, with 6 distinct, equidistant ribs in transversal section; style (2.5)2.8-3.5(4) mm long, usually 2/5 the length of the ovary; stigma slightly trilobate-punctiform. Capsule 8-14 × 5-8 mm, oblong-ovoid to obovoid, at maturity with 6 equidistant ribs in section, more rarely in pairs. Seeds 1-15 per capsule, 1.5-1.7 × 1.3-1.5 mm, black, globose, slightly apiculate. $2n = 27$ (triploid).

Geographic distribution, habitat, phenology, and curiosities

Ornithogalum umbellatum inhabits crops, grasslands, gardens, meadows, and disturbed grounds; altitude: from 0 to 100 m. It blooms from April to May.

Table 1. Main diagnostic characters of *Ornithogalum* s. str. species in the Iberian Peninsula.

Character	<i>O. baeticum</i>	<i>O. bourgaeum</i>	<i>O. divergens</i>	<i>O. umbellatum</i>
Number of flowers per inflorescence	(3)4-18(21)	(2)4-15(36)	6-18(20)	4-7(14)
Secondary bulbils	absent	absent (rarely 1-3)	numerous	numerous
Secondary bulbils with leaves	absent	absent	absent or very scarce	numerous
Secondary bulbils pediculate	absent	absent or very scarce	numerous	absent or scarce
Capsule in transversal section	6 equidistant ribs	6 ribs grouped by pairs	6 equidistant ribs	6 equidistant ribs
Lower pedicels in fruit	erect to erect-patent	erect to erect-patent	patent-reflexed	erect-patent
Bract / lower pedicel length relation in fruit	> 50%	> 50%	< 50(60)%	> 50%
Secondary bulbils / mother bulb size relation	-	-	< 35%	> 35%

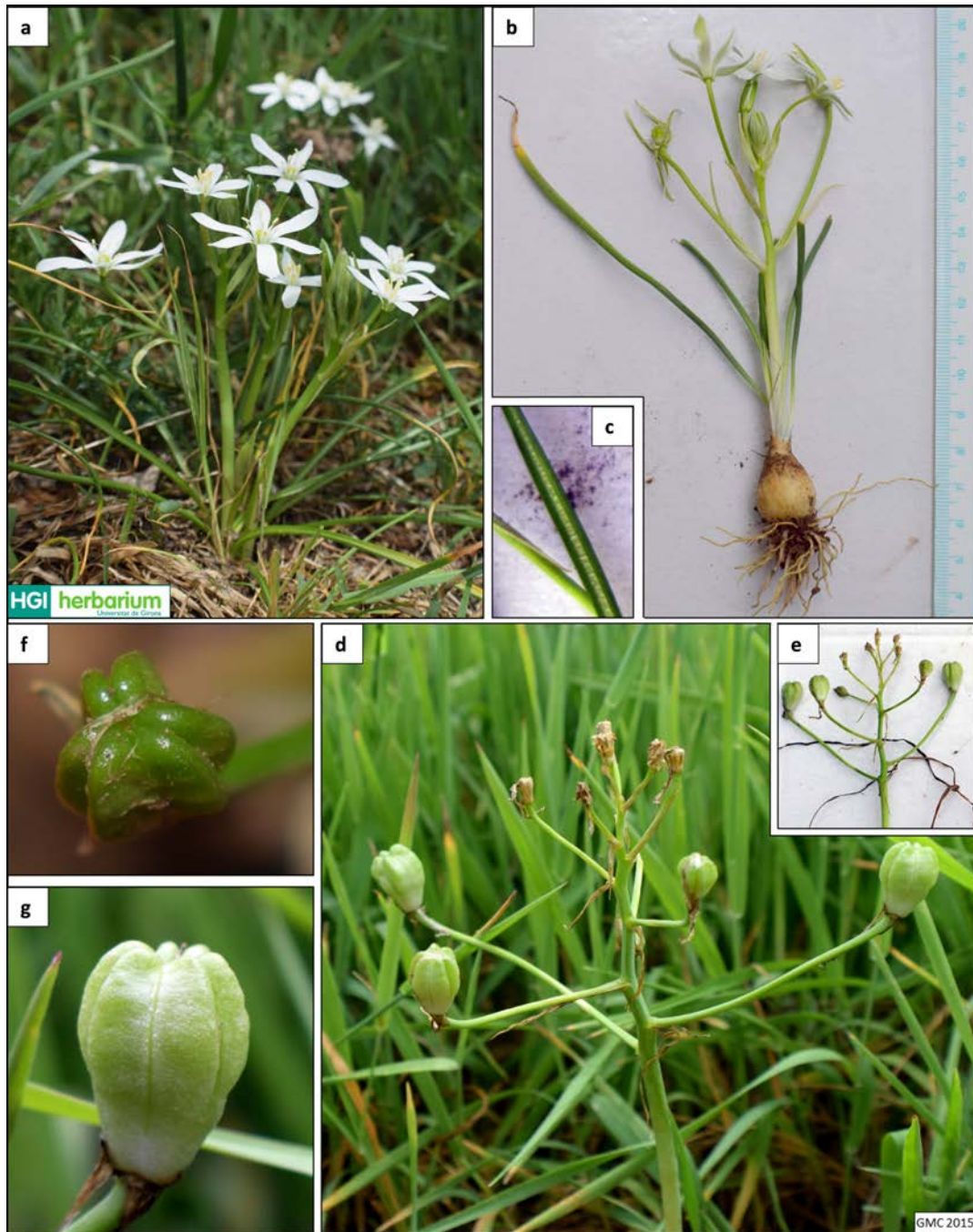


Fig. 1. *Ornithogalum bourgaeum*: **a**, habit of the epigeal part; **b**, habit of complete plant with bracts longer than half of the length of the pedicels, pedicels erect and bulb lacking bulbils; **c**, leaf bearing a central, longitudinal white or translucent band; **d**, plant in fruit with erect-patent pedicels; **e**, detail of the erect-patent pedicels; **f**, apical view of capsule showing the ribs grouped by pairs; **g**, lateral view of capsule [a, HGI 22691; b, c, HGI 22697; d-f, HGI 22745; g, HGI 22698].

In the Iberian Peninsula we have only found *O. umbellatum* in l'Alt Empordà and el Gironès (Girona province), although probably is also present in other regions of Catalonia or even other areas of northern Spain. In southeastern France, we know the species from Tuir, in the region of Perpinyà, from where it spreads northwards to the Loire valley, its *locus classicus*, and other central European countries. We suggest to revisit the localities where *O. umbellatum* has been cited in the Iberian Peninsula to check the diagnostic characters of this species.

The bulb of *O. umbellatum* is toxic for animals (Villar & al., 2001; Mateos & Álvarez, 2010), but once boiled it loses its toxicity (Texidor, 1871).

Identification key of Ornithogalum s. str. in the Iberian Peninsula

1. Style (3.8)4-6(6.5) mm long; leaves glaucous at early stages ***O. baeticum***

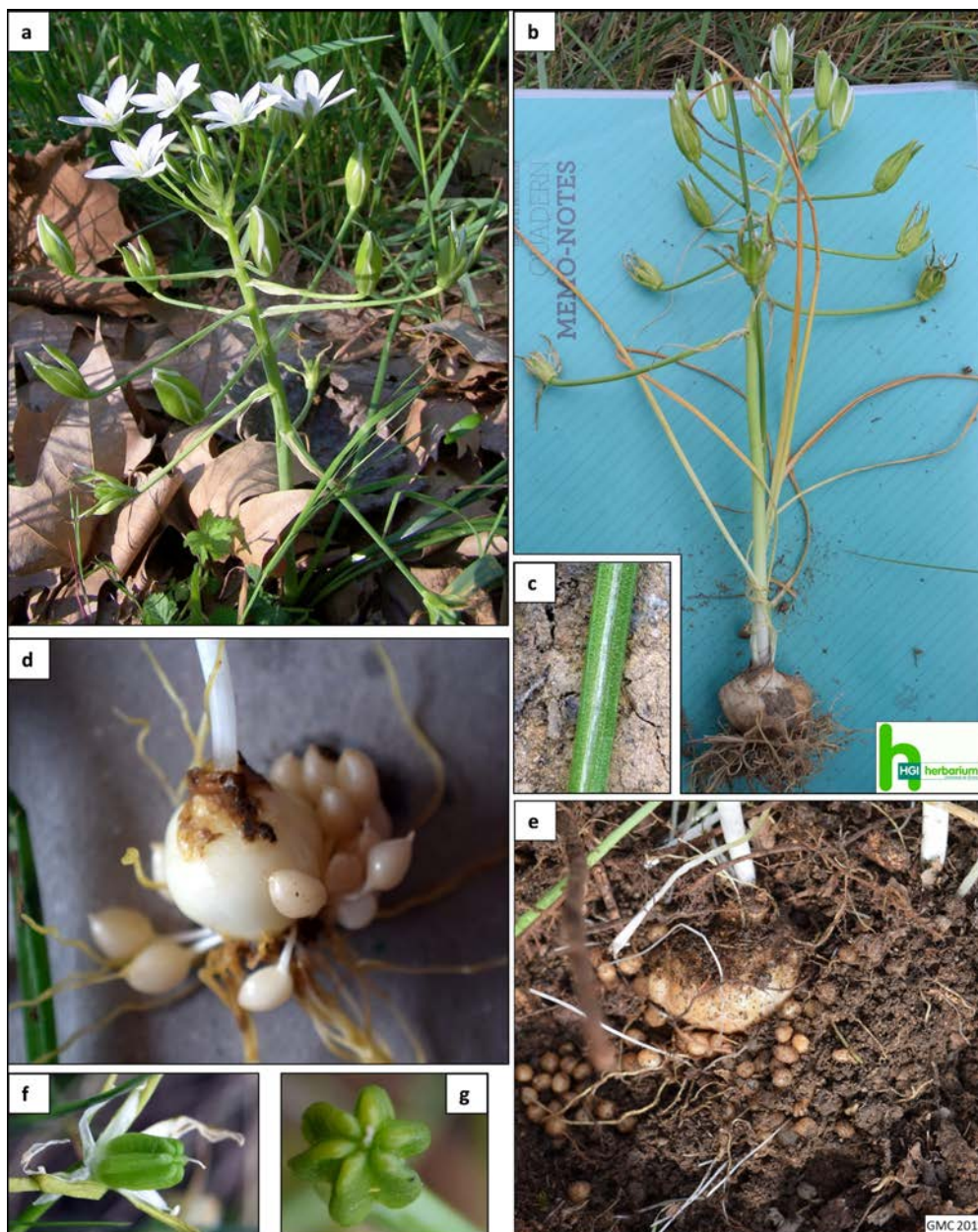


Fig. 2. *Ornithogalum divergens*: **a**, habit of the epigeal part with numerous flowers; **b**, habit of complete plant, bracts shorter than half of the length of the pedicels, basal pedicels patent to reflexed and bulb with numerous bulbils; **c**, leaf bearing a central, longitudinal white or translucent band; **d**, bulb with numerous pediculate bulbils; **e**, detail of the bulb surrounded by numerous bulbils; **f**, lateral view of capsule; **g**, apical view of capsule showing six equidistant ribs [a, c, d, HGI 22689; b, HGI 22703; e-g, HGI 22700].

- Style (2)2.5-3.8(4) mm long; leaves green at early stages 2
- 2. Bulb lacking secondary bulbils (rarely 1-3), although the mother bulb can be split in portions of similar size that share the basal plate and are covered by the outer tunic; mature capsule with 6 ribs grouped in pairs in transversal section (observe different capsules); fruiting pedicels usually ascending, sometimes patent to slightly reflexed; plant mostly occurring in the montane stage (from basal to subalpine stages)..... ***O. bourgaeum***
- Bulb surrounded by numerous secondary bulbils (either on the outside of the outer tunic or covered by it); mature capsule with 6 ribs equidistant in transversal section; fruiting pedicels erect-patent to patent-reflexed; plant mostly occurring in the basal stage (reaching the montane stage) 3
- 3. Bulb surrounded by numerous bulbils that bear leaves in their first year; bulbils of different sizes, the largest pyriform to ovoid, sessile, bearing leaves, the smaller lacking leaves, ovoid, sessile or rarely shortly pediculate; relation between the size of the largest bulbils and the mother bulb > 35%; fruiting pedicels usually erect-patent (rarely reflexed); bracts usually longer than half of the length of the pedicels in fruit; lower pedicels in fruit ≤ 11 cm long (usually ca. 5 cm long); few flowers per stem, 4-7(14) ***O. umbellatum***



Fig. 3. *Ornithogalum umbellatum*: **a**, habit of the epigeal part with bracts longer than half of the length of the lowermost pedicels; **b**, habit of complete plant showing inflorescence with few flowers, basal pedicels erect and bulb with bulbils, some with well developed leaves; **c**, leaf bearing a central, longitudinal white or translucent band; **d**, apical view of flower; **e**, bulb with numerous bulbils bearing leaves; **f**, detail of the bulb surrounded by numerous bulbils; **g**, apical view of capsule showing six equidistant ribs [a, b, HGI 22702; c, e, HGI 22701; d, f, g, HGI 22699].

- Bulb surrounded by numerous bulbils lacking leaves (rarely some could bear shortly developed leaves); bulbils of similar sizes, ovoid, usually distinctly pediculate; relation between the size of the largest bulbils and the mother bulb < 35%; fruiting pedicels usually patent to reflexed; bracts usually shorter than half of the length of the pedicels in fruit; lower pedicels in fruit ≥ 5 cm long, reaching 15 cm long; many flowers per stem, 6-18(20).....*O. divergens*

REFERENCES

- Aeschimann, D., Lauber, K., Moser, D.M. & Theurillat, J.-P. 2004. *Flora alpina. Band 2: Gentianaceae-Orchidaceae*. Haupt, Bern.
- Aquaro, G. & Peruzzi, L. 2006. Reports 1457-1461. In: Kamari, G., Blanche, C. & Garbari, F. (eds.), Mediterranean chromosome number reports-16. *Flora Mediterranea* 16: 386-396.
- Bolòs, O. de & Vigo, J. 2001. *Flora dels Països Catalans, IV*. Barcino, Barcelona.
- Bolòs, O. de, Vigo, J., Masalles, R.M. & Ninot, J.M. 2005. *Flora manual dels Països Catalans*. ed. 3. Pòrtic, Barcelona.
- Gadella, Th.W.J. 1972. Some notes on *Ornithogalum umbellatum* L. and *Ornithogalum divergens* Bor. *Acta Botanica Neerlandica* 21(3): 257-260.
- Gadella, Th.W.J. & Van Raamsdonk, L.W.D. 1981. Biosystematic studies on *Ornithogalum umbellatum* L. s.l. *Boletim da Sociedade Broteriana Serie 2*, 53(2): 745-791. <https://doi.org/10.1111/j.1438-8677.1972.tb00778.x>
- Garbari, F., Giordani, A., Marcucci, R. & Tornadore, N. 2003. The genus *Ornithogalum* L. (Hyacinthaceae) in Italy, XIV: towards a redefinition of infrageneric taxa, with new proposals. *Boccone* 16(1): 269-281.
- Garbari, F., Peruzzi, L. & Tornadore, N. 2008. *Ornithogalum* L. (Hyacinthaceae Batsch) e generi correlati (subfam. Ornithogaloideae Speta) in Italia. *Atti della Società Toscana di Scienze Naturali Memorie Serie B* 114: 35-44.
- Jauzein, P. & Nawrot, O. 2013. *Flore d'île-de-France. Clés de détermination, taxonomie, status*. Éditions Quae, Barcelona.

- Lambinon, J. & Verloove, F. 2012. *Nouvelle Flore de la Belgique, du Grand-Duché de Luxembourg, du Nord de la France et des Régions voisines (Ptéridophytes et Spermatophytes)*, ed. 6. Edition du Jardin botanique de Belgique, Meise.
- Lauber, K., Wagner, G. & Gygas, A. 2012. *Flora Helvetica. Flore illustrée de Suisse*, ed. 4. Haupt, Berne.
- Martínez-Azorín, M., Crespo, M.B. & Juan, A. 2009. Nomenclature and taxonomy of *Ornithogalum divergens* Boreau (Hyacinthaceae) and related taxa of the polyploidy complex of *Ornithogalum umbellatum* L. *Candollea* 64: 163-169.
- Martínez-Azorín, M., Crespo, M.B. & Juan, A. 2010. Taxonomic revision of *Ornithogalum* subg. *Ornithogalum* (Hyacinthaceae) in the Iberian Peninsula and the Balearic Islands. *Plant Systematics and Evolution* 289: 181-211. <https://doi.org/10.1007/s00606-010-0343-9>
- Martínez-Azorín, M., Crespo, M.B., Juan, A. & Fay, M.F. 2011. Molecular phylogenetics of subfamily Ornithogaloideae (Hyacinthaceae) based on nuclear and plastid DNA regions, including a new taxonomic arrangement. *Annals of Botany* 107: 1-37. <https://doi.org/10.1093/aob/mcq207>
- Martínez Azorín, M., Crespo, M.B. & Juan, A. 2013. *Ornithogalum* L. In: Rico, E., Crespo, M.B., Quintanar, A., Herrero, A. & Aedo, C. (eds.), *Flora iberica* 20: 188-207. Real Jardín Botánico CSIC, Madrid.
- Mateos, J. & Álvarez, M.A. 2010. *Plantas tóxicas españolas. Clave rápida de asistencia al diagnóstico*. Ministerio de Medio Ambiente y Medio Rural y Marino & Real Academia de Ciencias Veterinarias, Madrid.
- Moret, J. 1991. Les strategies de reproduction du complexe polyploïde *Ornithogalum umbellatum* (Hyacinthaceae) en France. *Bulletin du Muséum National d'Histoire Naturelle Section B, Adansonia* 13(1-2): 25-46.
- Moret, J. 1992. Numerical taxonomy applied to a study of some ploidy levels within the *Ornithogalum umbellatum* complex (Hyacinthaceae) in France. *Nordic Journal of Botany* 12(2): 183-195. <https://doi.org/10.1111/j.1756-1051.1992.tb01288.x>
- Moret, J. & Favereau, Y. 1991. Balance reproduction sexuée/multiplication végétative dans un complexe polyploïde du genre *Ornithogalum* (Liliaceae) en Méditerranée occidentale. *Bulletin de la Société botanique de France* 138: 201-214.
- Moret, J. & Galland, N. 1991. Caractérisation des taxons du genre *Ornithogalum*, sous-genre *Heliocharmos* (Hyacinthaceae), en Afrique du Nord et en France: analyse morphologique et biogéographique. *Canadian Journal of Botany* 69: 1787-1794. <https://doi.org/10.1139/b91-227>
- Moret, J. & Galland, N. 1992. Phenetic, biogeographical, and evolutionary study of *Ornithogalum* subg. *Heliocharmos* (Hyacinthaceae) in western Mediterranean basin. *Plant Systematics and Evolution* 181: 179-202. <https://doi.org/10.1007/BF00937443>
- Neves, J.B. 1952. Estudos cariológicos no género *Ornithogalum* L. *Boletim da Sociedade Broteriana Série 2*, 26: 5-192.
- Pignatti, S. 1982. *Flora d'Italia*, vol. 3. Edagricole, Bologna.
- Prevost, M. 2002. *Flore vasculaire de Basse-Normandie* ed. 2, vol. I. Presses universitaires de Caen, Caen.
- Raamsdonk, L.W.D. van. 1999. Der *Ornithogalum umbellatum-angustifolium* komplex in Deutschland. *Floristische Rundbriefe* 33: 104-113.
- Speta, F. 2000. Beitrag zur Kenntnis von *Ornithogalum* L. (Hyacinthaceae) in Oberösterreich. *Beiträge zur Naturkunde Oberösterreichs* 9: 743-792.
- Stace, C. 2014. *New flora of the British Isles* ed. 3. University of Cambridge, Cambridge.
- Texidor, J. 1871. *Flora farmacéutica de España y Portugal*. Imprenta de José M. Ducazcal, Madrid.
- Tison, J.-M. & Foucault, B. de. 2014. *Flora Gallica*. Biotope, Mèze.
- Tison, J.-M., Jauzein, P. & Michaud, H. 2014. *Flore de la France méditerranéenne continentale*. Naturalia, Turriers.
- Tornadore, N. & Garbari, F. 1979. Il genere *Ornithogalum* L. (Liliaceae) in Italia, 3. Contributo alla revisione citotassonomica. *Webbia* 33: 379-423. <https://doi.org/10.1080/00837792.1979.10670128>
- Villar, L., Sesé, J.A. & Fernández, J.V. 2001. *Atlas de la Flora del Pirineo Aragonés* vol. II (Pyrolaceae-Orchidaceae). Consejo de Protección de la Naturaleza de Aragón & Instituto de Estudios Altoaragoneses, Huesca.
- Zahariadi, C. 1980. *Ornithogalum* L. In: Tutin, T.G., Heywood, V.H., Burges, N.A., Moore, D.M., Valentine, D.H., Walters, S.M. & Webb, D.A. (eds.), *Flora europaea* 5: 35-40. Cambridge University Press, Cambridge.

APPENDIX 1. Studied material (to be added to that presented by Martínez-Azorín & al., 2010).

Ornithogalum bourgaeum Jord. & Fourr.

SPAIN. **Barcelona**: Fogars de Montclús, a les pastures de can Carbonell, 31TDG5521, 888 m, 4-V-2015, *G. Mercadal* (HGI 22697); Fogars de Montclús, als prats de cal Trompo, 31TDG5525, 1140 m, 4-V-2015, *G. Mercadal* (HGI 22691); Fogars de Montclús, als prats de dall de sobre can Casades, 31TDG5524, 1150 m, 13-VI-2015, *G. Mercadal* (HGI 22745); Montseny, als prats de dall del Puig de Sant Marçal, 31TDG5527, 1072 m, 4-V-2015, *G. Mercadal* (HGI 22688). **Girona**: Porqueres, a les Estunes, damunt de travertins, 31TDG7962, 187 m, 30-IV-2015, *G. Mercadal* (HGI 22698); Riells i Viabrea, als prats de dall de Riells de Montseny, 31TDG5925, 462 m, 9-V-2015, *G. Mercadal* (HGI 22696); Sant Hilari Sacalm, als prats de dall de la Saleta, 31TDG5839, 719 m, 4-V-2015, *G. Mercadal* (HGI 22690).

Ornithogalum divergens Boreau

SPAIN. **Girona**: Castelló d'Empúries, a la Rubina, en una closa de dall, 2m, 31TEG1078, 8-III-2002; *G. Mercadal* (HGI 18868); Cornella del Terri, al veïnat de Sords, al Torrent de Puntís (al bosc de ribera), 31TDG8055, 88 m, 30-IV-2015; *G. Mercadal* (HGI 22689); Fornells de la Selva, al prat de dall de can Gener, 31TDG8440, 90 m, 10-IV-2001, *G. Mercadal* (HGI 17180); Pau, al prat de dall de l'estany del Penardell, 31TEG0883, 7 m, 16-IV-2015, *G. Mercadal* (HGI 22700); Porqueres, als prats de cal Ferrer, 31TDG7964, 184 m, 30-IV-2015; *G. Mercadal* (HGI 22692); Riudellots de la Selva, freixeneda i prat de dall de can Gener, 31TDG8240, 89 m, 11-IV-2015, *G. Mercadal* (HGI 22704); Roses, closes de pastura de les rodalies de la vila, 31TEG1279, 2 m, 16-IV-2015, *G. Mercadal* (HGI 22703).

Ornithogalum umbellatum L.

FRANCE. **Perpinyà**: TUÏR: als prats de dall de la Prada, en els marges, 31TDH8120, 87 m; 17-IV-2015, *G. Mercadal* (HGI 22701).
 SPAIN. **Girona**: Girona, en una gespa de jardí, 31TDG8547, 100 m, 11-IV-2015, *G. Mercadal* (HGI 22699); Sant Pere Pescador, a la closa de Migdedosrius, 31TEG0771, 1,5 m, 14-IV-2015, *G. Mercadal* (HGI 22702).