

Juncus fernandez-carvajaliae sp. nov. (Juncaceae) from Castilla-La Mancha, central Spain

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Juncus fernandez-carvajaliae Romero Zarco & Arán sp. nov. (Juncaceae), collected from Castilla-La Mancha in central Spain, is described and illustrated. The main distinguishing features of the new species are compared with allied species of *J.* sect. *Tenageia*.

According to Kirschner et al. (2002), *Juncus* sect. *Tenageia* Dumort. includes eleven species characterized by the presence of a pair of floral bracteoles below each flower and by an annual habit. The annual species of the genus *Juncus* are especially abundant in the western Mediterranean, where the section *Tenageia* displays its maximum diversity (Cope and Stace 1978, Fernández-Carvajal 1982b, Kirschner et al. 2002, Romero-Zarco 2009, 2010a, 2010b). However, some recent findings suggest that the group's diversity is still insufficiently understood. A new species, *J. maroccanus* Kirschner, was discovered in northern Morocco in 2002 (Kirschner et al. 2004) and subsequently it has been shown that another species of this section, *J. rechingeri* Snogerup, up to then only known from Asia and Africa (central Atlas), is widely distributed in eastern Spain, where it has remained unnoticed as a result of confusion with other species of the group of *J. bufonius* L. (Romero-Zarco 2008).

After the publication of the Juncaceae account in volume 17 of 'Flora iberica' (Castroviejo 2010) the attention of one of us (V. J. Arán) was drawn to an annual species of *Juncus* in the region of Montes de Toledo in central Spain, that is reminiscent of *J. maroccanus* in general appearance and flower measurements. A detailed study of this plant led to the conclusion that it was a new species, closer to *J. tenageia* Ehrh. ex L. fil. than to the remaining members of the section, as it shares with it the general appearance of the plant and a character so far unique in the group: the presence of leaf sheath auricles. We describe below the new species and list the available data on distribution and habitat, as well as the main differences from its closest relatives: *J. tenageia* and *J. maroccanus*. An isotype of *J. maroccanus* (PRA acc. no. 0031) was studied for comparison.

Juncus fernandez-carvajaliae Romero Zarco & Arán sp. nov. (Fig. 1)

Inter species sectionis Tenageiae Dumort. primo aspectu et vagina foliorum auriculata Junco tenageiae accedens, sed tepalis longioribus, capsulam superantibus, tribus exterioribus 3.8–4.0 mm longis, tribus interioribus 3.2–3.4 mm longis, antheris 1.5–1.8 mm longis, filamentis ipsis 3–4-plo longioribus ab eo recedens.

Type: Spain, Ciudad Real province, Retuerta del Bullaque, near the north shore of Embalse de la Torre de Abraham, UTM (MGRS, European Datum 1950): 30SUJ932629, 675 m a.s.l., 15 May 2011, V. J. Arán 7636 and M. J. Tohá (SEV 271159, holotype; MA, MAF, VAL, COA, ABH, SESTAO, SEV 271963, Hb. Arán 135-02-22b, isotypes).

Etymology

The specific epithet is dedicated to Dr M.C. Fernández-Carvajal, who published an extensive taxonomic revision of the genus *Juncus* in the Iberian Peninsula (Fernández-Carvajal 1981, 1982a, 1982b, 1983).

Description

Annual herb, 18–27 cm tall, tufted, glaucescent when young and reddish when mature. Stems 100–220 × 0.3–0.6 mm, cylindrical. Basal leaves 1–4, the cauline 1–2, located in the lower half of the stem; sheath auriculate with scarious margins, auricles 0.3–0.4 mm, rounded; blade 25–70 × 0.3–0.4 mm, canaliculate, inrolled when dried. Inflorescence 40–120 mm, 1/3–2/5 of the total length of the plant, terminal, in composed anthelae, 2–4 times branched, formed by sickle-shaped cymes, lax, with 6–55 flowers. Lower bract

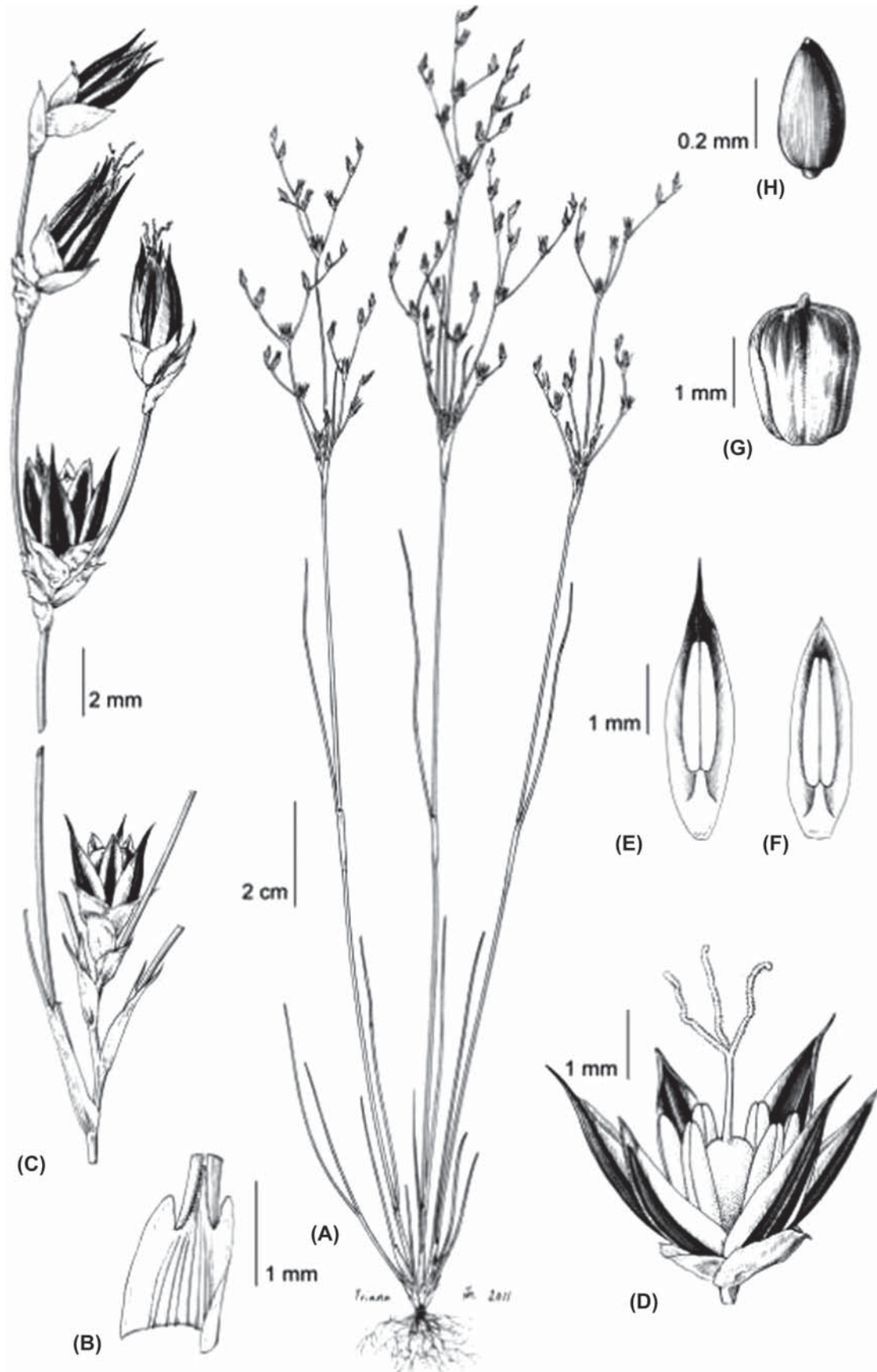


Figure 1. *Juncus fernandez-carvajaliae* sp. nov. (A) habit, (B) auricles, (C) fruiting branch of the inflorescence, (D) flower, (E) adaxial view of an outer tepal with stamen, (F) adaxial view of an inner tepal with stamen, (G) capsule, (H) seed. Drawing by Rodrigo Tavera Mendoza.

up to 60 mm long, shorter than the inflorescence, foliaceous. Primary branches 2–4, erecto-patent, the largest one 15–70 mm. Flowers solitary, with 0.3–0.5 mm long pedicel and 2 involucre bracteoles. Bracteoles 1.4–2.0 mm, broadly ovate, reddish, with membranous-scarious margins. Tepals unequal, lanceolate, with a grayish–green dorsal band and 2 reddish–brown sidebands, with scarious-hyaline margins; outer tepals 3.8–4.0 mm long, acuminate; inner tepals 3.2–3.4 mm long, subacute, with narrower dorsal band and wider scarious margins. Stamens 6, shorter than tepals; filaments 0.4–0.5 mm, anthers 1.5–1.8 mm. Ovary ca 1.5 mm, style 1–2 mm, stigmas 0.5–1.5 mm, exerted at anthesis. Capsule 2.0–2.5 mm (including a 0.2–0.3 mm mucro), shorter than tepals, obovoid or ellipsoid, trigonous, reddish–brown, shiny. Seeds ca 0.4 mm, ovoid, finely ribbed, yellowish–brown, without appendages. Flowering in May, fruiting in June.

Habitat

Pastures on seasonally wet soils with siliceous substrate. It is locally frequent, with *Juncus tenageia*, *J. minutulus*, *J. tingitanus*, *J. capitatus*, *J. pygmaeus*, *Centaureum maritimum*, *Ornithogalum concinnum*, *Scilla ramburei*, *Ranunculus pseudomillefoliatus* and *Cicendia filiformis*.

Distribution

The known distribution area of the species is restricted to the Guadiana river basin, in the western half of Ciudad Real province. The holotype locality is situated in the Bullaque river basin, a right tributary of Guadiana river in the north-west of the province, in the Montes de Toledo region, where it has been found in pastures near a reservoir. The second place is located 63 km south of the former, in the basin of Tirteafuera, a left tributary of the same river, in the Campo de Calatrava area. Small endorheic places locally called ‘navazos’ are frequent in both territories. So, the potential distribution area of the new species could be much larger.

Similar species

Within *Juncus* sect. *Tenageia*, according to Kirschner et al. (2002), the *J. bufonius* aggregate and other related species (*J. foliosus* Desf. and *J. rechingeri*) have ovoid to ellipsoid, (2.5)3.0–6.0 mm long capsules. On the contrary, *J. tenageia* and its relatives, viz. *J. sphaerocarpus* Nees and *J. amuricus* (Maxim.) V. I. Krecz. & Gontsch., have subglobose to globose, up to 3 mm long capsules. *Juncus fernandez-carvajaliae* has obovoid or ellipsoid, 2.0–2.5 mm long capsules. This, together with the presence of leaf sheath auricles, separates the new species from *J. bufonius* and its allies. *Juncus fernandez-carvajaliae* is related to *J. tenageia*, but there are several important differences between the two species, mainly in the length of the tepals and the proportion of the stamens (Table 1). The new species resembles *J. maroccanus* in general appearance and flower dimensions, but it differs by the presence of leaf sheath auricles, the reddish colour when ripe, and obovoid or ellipsoid capsule, proportionally shorter compared to the perianth (Table 1). Other species related to *J. tenageia* and *J. fernandez-carvajaliae* are *J. sphaerocarpus* and *J. amuricus*, both without auricles and

Table 1. Morphological comparison between *Juncus fernandez-carvajaliae* sp. nov., *J. tenageia* (measurements made on herbarium material from Spain) and *J. maroccanus* (data from Kirschner et al. 2004).

Character	<i>J. tenageia</i>	<i>J. fernandez-carvajaliae</i>	<i>J. maroccanus</i>
Auricle length (mm)	(0.2)0.5–2.0	0.3–0.4	absent
Outer tepal length (mm)	1.6–2.8	3.8–4.0	3–4
Inner tepal length (mm)	1.5–2.6	3.2–3.4	2.5–3.7
Anther length (mm)	0.2–0.6	1.5–1.8	1.5–2.0
Style length (mm)	ca 0.1	1–2	0.5–0.8
Capsule shape and length (mm)	subglobose 1.5–2.6	obovoid or ellipsoid 2.0–2.5	ovoid 2.3–3.0

with smaller inner tepals (2.0–3.2 mm) and shorter anthers (0.2–0.6 mm).

The larger size of the anthers and style suggests that the flowers of *J. fernandez-carvajaliae* are chasmogamous and its reproductive system is possibly more open than that of *J. tenageia*. There is a similar relationship between another pair of annual species related to each other belonging to the section *Ozophyllum*: *J. pygmaeus* Rich. ex Thuill., a cleistogamous species widely spread across the Mediterranean, and *J. tingitanus* Maire & Weiller, a rare chasmogamous species only known from a few localities in northern and central Morocco and central Spain (Romero-Zarco 2010a).

Additional specimens examined (paratypes)

Spain, Ciudad Real province, Retuerta del Bullaque, near the north shore of Embalse de la Torre de Abraham, UTM (MGRS, European Datum 1950): 30SUJ932629, 675 m a.s.l., 13 May 2006, V. J. Arán 6423 (Hb. Arán 135-02-22a); idem, 3 Jun 2011, V. J. Arán 7669 (SEV 271160, MA, MAF, VAL, COA, ABH, SESTAO, VIT, LPA, Hb. Arán 135-02-22c); idem, 19 Jun 2011, V. J. Arán 7681 (SEV 271964, FCO, JACA, GDA, SALA, Hb. Arán 135-02-22d). Ciudad Real province, Cabezardos, laguna de la Carrizosa, UTM: 30SUJ9200, 24 May 1986, Carrasco et al. (MACB 25261).

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References

- Castroviejo, S. 2010. Flora ibérica. Vol. 17. – Real Jard. Bot. Madrid, CSIC.
- Cope, T. A. and Stace, C. A. 1978. The *Juncus bufonius* L. aggregate in western Europe. – *Watsonia* 12: 113–128.
- Fernández-Carvajal, M. C. 1981. Revisión del género *Juncus* L. en la Península Ibérica. I. Categorías supraespecíficas y clave para las especies. – *Anales Jard. Bot. Madrid* 38: 79–89.

- Fernández-Carvajal, M. C. 1982a. Revisión del género *Juncus* L. en la Península Ibérica. II. Subgéneros *Juncus* y *Genuini* Buchenau. – *Anales Jard. Bot. Madrid* 38: 417–467.
- Fernández-Carvajal, M. C. 1982b. Revisión del género *Juncus* L. en la Península Ibérica. III. Subgéneros *Subulati* Buchenau, *Pseudotenageia* Krecz. & Gontsch. y *Poiophylli* Buchenau. – *Anales Jard. Bot. Madrid* 39: 79–151.
- Fernández-Carvajal, M. C. 1983. Revisión del género *Juncus* L. en la Península Ibérica. IV. Subgéneros *Juncinella* (Fourr.) Krecz. & Gontsch., *Septati* Buchenau y *Alpini* Buchenau. – *Anales Jard. Bot. Madrid* 39: 301–379.
- Kirschner, J. et al. 2002. *Juncus* sect. *Tenageia*. – In: Orchard, A. E. and Wilson, A. J. G. (eds), *Species Plantarum. Flora of the World* 8. *Austr. Biol. Resour. Study*, pp. 2–17.
- Kirschner, J. et al. 2004. A new *Juncus* of the section *Tenageia* from Morocco and Egypt. – *Preslia* 76: 371–376.
- Romero-Zarco, C. 2008. *Juncus rechingeri* Snogerup, nueva especie para la flora europea. – *Acta Bot. Malacitana* 33: 339–341.
- Romero-Zarco, C. 2009. Contribución al conocimiento del género *Juncus* (Juncaceae) en el norte de Marruecos. – *Acta Bot. Malacitana* 34: 295–302.
- Romero-Zarco, C. 2010a. *Juncus* L. – In: Castroviejo, S. (ed.), *Flora iberica* 17, *Real Jard. Bot. Madrid, CSIC*, pp. 123–187.
- Romero-Zarco, C. 2010b. El género *Juncus* L. (Juncaceae) en Andalucía (España): datos sobre la distribución regional de sus especies. – *Acta Bot. Malacitana* 35: 57–75.