



Three new species of *Narcissus* L. subgenus *Ajax* Spach (*Amaryllidaceae*), restricted to the meadows and forests of south-eastern Spain

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This paper provides descriptions of three new *Narcissus* species—*Narcissus segurensis* sp. nov., *N. alcaracensis* sp. nov. and *N. yepesii* sp. nov.—that are endemic to the mountains of south-east Spain (Sierras de Alcaraz and Segura) and grow in meadows or deciduous oak forests. Characters, both vegetative and floral, used for determining resemblances and differences with other known taxa are discussed.

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ADDITIONAL KEY WORDS:—endemics – Sierra de Alcaraz – Sierra de Segura.

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INTRODUCTION

This paper results from ethnobotanical and taxonomic studies by Rivera and Obón since 1982 and floristic and taxonomic studies by Ríos and Alcaraz on riparian

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environments in south-east Spain since 1985. Preliminary results were given in Ríos *et al.* (1993), Ríos (1996) and Ríos & Alcaraz (1996). The study of *Narcissus* subgenus *Ajax* relating to the systematics of the subgenus and the history of domestication in this group and early cultivars will be published elsewhere.

The Iberian Peninsula is the centre of diversity for *Narcissus* subgenus *Ajax* (= Sect. *Pseudonarcissus*) (Fernandes, 1951). Since 1933, when Pugsley's monograph was published, between 20 and 30 taxa belonging to subgenus *Ajax* Spach have been described from this area. Fernandes (1951) proposed *N. nevadensis* as the ancestral species of subgenus *Ajax*, and hence the south-east of the Iberian Peninsula as the centre of origin for this group. Since then Fernández Casas (1982–1987) and co-workers (Dorda & Fernández Casas, 1984a, b, 1990, 1994; Dorda, Rivas Ponce & Fernández Casas, 1991) described an astonishingly high number of new taxa in this subgenus. A large number is confirmed in a detailed current analysis involving comparison of 43 OTUs and 31 characters by Ríos, Rivera, Alcaraz and Obón (in prep.), although others are simply synonyms to previously published taxa.

Subgenus *Ajax* shows high morphological diversity and instability, presumably connected with a recent and continuing speciation process (Fernández Casas, 1984b). The taxonomic treatment of this subgenus varied. The approach of Linnaeus (1753) was extremely synthetic while Pugsley's (1933) work reveals inadequate knowledge of the group. Meanwhile the approach of Jordan (1903) was excessively analytic, as was that of Fernández Casas (1982–1987). The approach adopted in *Flora Europaea* (Tutin *et al.*, 1980) by Barra & López (1983, 1984) and by Aseginolaza *et al.* (1984) was to treat diversity at subspecific level.

Most of the taxa previously described were from plants raised in the garden whose bulbs had been collected in the wild, mainly in northern and central Spain, northern Portugal and the Pyrenees. The limited nature of botanical exploration of the mountain areas of southern and eastern areas of Spain prior to 1930 resulted in these southern taxa not being recorded in the classical botanical literature. Exploration in this area since that time has revealed new taxa, e.g. *N. nevadensis* and *N. longispathus*. Fernandes (1951) considered it the centre of origin for this subgenus. Field studies and the discovery of new taxa have continued to the present (Fernández Casas 1982–1987).

The main southern mountain ranges (Sierra Nevada, Subbéticas and Cazorla), which constitute the centre of origin for this subgenus, have yielded a few taxa of subgenus *Ajax*. With the exception of *N. bujei*, *N. nevadensis* and *N. longispathus*, there have been no contributions to the recent crop of new species, which originated from central Spain and the Pyrenees. The lack of detailed botanical exploration in the Segura range would appear to indicate an underestimation of local variability in *Narcissus*. The presence of siliceous substrates and rainfall over 1100 mm has resulted in the presence of a higher biotope diversity in Sierra de Segura than in the western Cazorla—the latter is nearly exclusively inhabited by *N. longispathus*, a species endemic to Cazorla and Mágina. The floristic catalogues of Jaén, covering the eastern mountain zones (Fernández Galiano & Heywood, 1960; Fernández López, 1983; Pajarón, 1988; Gómez Mercado, 1989), have recorded little local variability of this subgenus, although some have cited *N. pseudonarcissus* s.l. in addition to the well known *N. longispathus*. Ríos *et al.* (1993) identified the populations from the northern Sierra de Alcaraz as *N. nevadensis*, but then went on to carry out a more detailed study involving the discovery of new localities and variability at the population level. Several dozen individuals were examined in the field, and measurements made of

ten individuals from each locality. In addition, more detailed winter fieldwork, focusing on forested areas, has resulted in the finding of one of the new taxa described here.

MATERIAL AND METHODS

Specimens of closely related taxa from MA and MUB herbaria were studied. The anatomical characters of leaves and scapes emphasized by Dorda and Fernández Casas (1984, a, b, 1994) were considered and studied in fresh specimens, and the new results compared with the above publications. More than 30 characters were analysed and comparisons made with most of the wild and cultivated taxa (over 30), using Syn-Tax version 5.0 package (Podani, 1991). The results of the study have contributed to an understanding of the systematics of this complex group and revealed the distinguishing features of the new taxa from those yet described. We have examined the original descriptions and illustrations, and type material when available. The bioclimatic features follow Rivas-Martínez (1996).

TAXONOMY

Narcissus segurensis Ríos, D. Rivera, Alcaraz & Obón **sp. nov.**

Type. Holotypus: Spain, province of Jaén, Sierra de Segura, in the site called Nava del Espino (Orcera), at 1350 m, 13. iii. 1996, S. Ríos & J. López-Bernal (holotypus: MA). Isotypes: specimens of the same exsiccata MUB 27982, 27983. Icon: Fig. 1E–H.

Diagnosis. *Narcissus* Sect. *Pseudonarcissi*, medius vel minus, foliis carinatis forma 'V' similibus. Corona brevis tepalisque adpressis. A *Narcisso* longispatho caulibus minoribus, foliis tenuibus carinatis ut in scapo striatis, spathis et pedicellis brevioribus, tepalis erectis numquam patentibus nec tortuosis et multo brevioribus, corona brevior, insertione staminum subbasali a base tubi corollini 2–3 mm distante differt. A *N. eugeniae*, *N. genesii-lopezii* et *N. radinganorum* pedicellis longioribus differt. A *N. bujei* insertione staminum subbasali, antherisque maioribus, corona brevior minus lobata differt. A *N. Muñozii-garmendiae* cui valde similis, spatha et pedicellis longioribus differt. A *N. minore* scapis foliisque maioribus, spathis, pedicellis et corona longioribus differt.

BULB 1.6–2 cm, OVOID. **LEAVES** 13–16 × 0.6–0.7 cm, 0.6–1.5 mm deep, linear, suberect, glaucous, keeled. **SCAPE** 18–23 × 0.28–0.4 cm, more or less compressed, angular, 2-edged, fistulose, excluding the lower part. **FLOWERS** solitary, somewhat erect. **SPATHE** bright green, hyaline after anthesis, 4–4.2 cm, sheathing for its lower half, concealing the pedicel (14–25 mm) and projected beyond the perianth. **PERIANTH** lemon yellow; tube 10–12 mm, segments, 14–16 mm, ovate-lanceolate, mucronate to acuminate, erect to ascending, not twisted. **Corona** 15–17 × 14–15 mm, deep yellow cylindrical to scarcely expanded at mouth, rounded toothed. **STAMENS** 20–21 mm, inserted 2–3 mm above the base of the tube, anthers 10–11 mm.

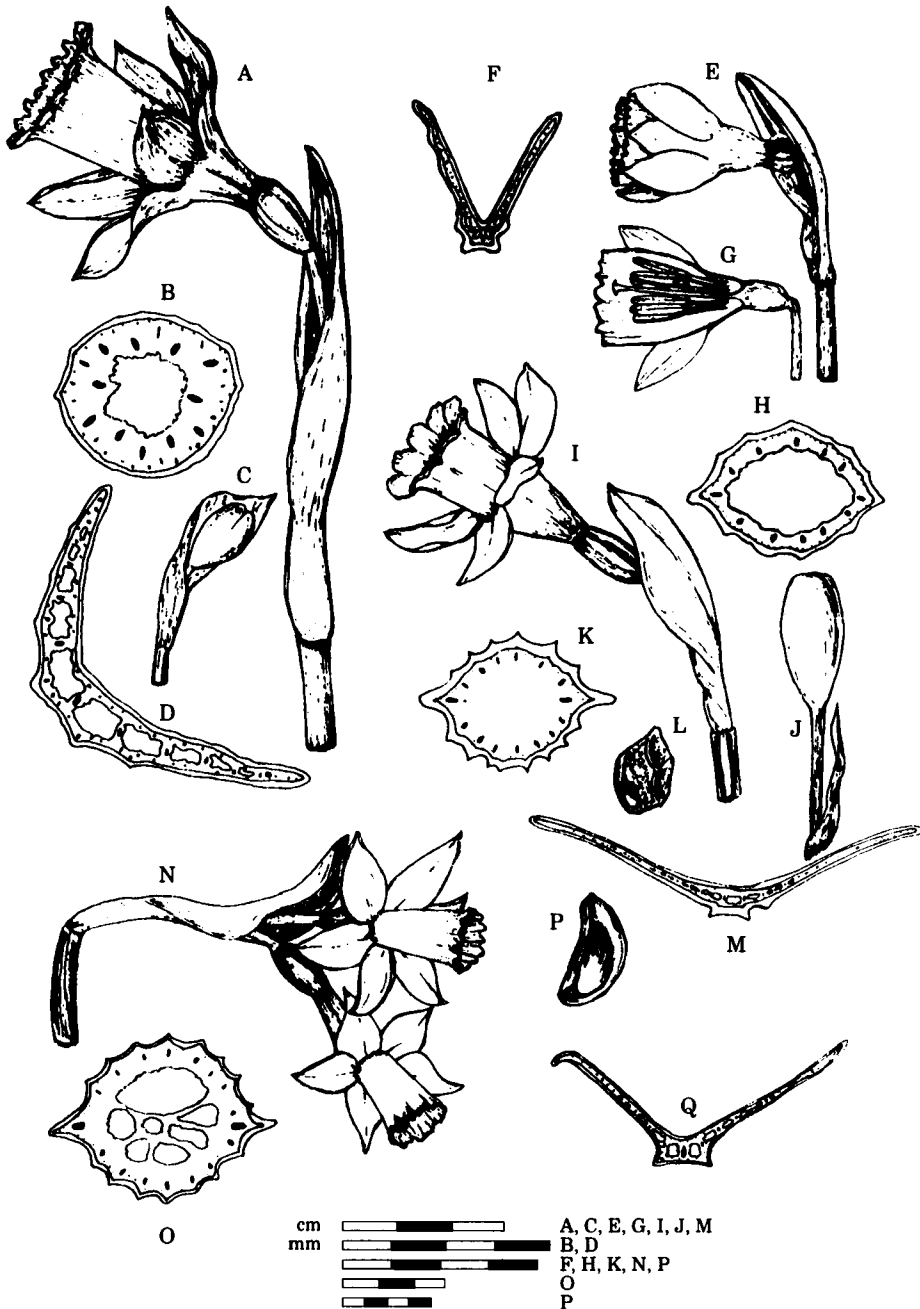


Figure 1. Comparative anatomy and macromorphology of *N. longispathus* and the three new taxa *N. segurensis*, *N. alcaracensis* and *N. yepesii*. *N. longispathus*: A, flower and summit of scape; B, section of scape; C, fruit; D, section of leaves. *N. segurensis*: E, flower and summit of scape; F, section of leaves; G, stamens insertion upper the basal hypanthium; H, section of scape. *N. yepesii*: I, flower and summit of scape; J, fruit; K, section of scape; L, seed; M, section of leaves. *N. alcaracensis*: N, flower and summit of scape; O, flower and summit of scape; P, seed; Q, section of leaves.

TABLE 1. Main characteristics of the three new taxa of *Narcissus* subgenus *Ajax* Spach of south-east Spain and the other closely related taxa

Taxa	Leaves length (cm)	No. leaves	Scape (cm)	Spathe (mm)	No. flowers	Colour tepals/corona	Pedice (mm)	Position of the flower
<i>N. alpestris</i>	5-20	1-3	5-15	30-40	1	concolorous	10-12	drooping
<i>N. bajai</i>	20-35	2	15-35	40-60	1	concolorous	8-35	horizontal
<i>N. calcicarpotamus</i>	30-40	1-2	30-40	30	1	concolorous	3-5	erect to horizontal
<i>N. confusus</i>	15-30	3-4	4-25	30-53	1	concolorous	2-16	horizontal
<i>N. eugeniae</i>	15-20	1-3	15-20	27-32	1	concolorous	0-3	erect to suberect
<i>N. fontqueri</i>	15-25	1-2	15-30	28	1	concolorous	0-1	horizontal
<i>N. gemesti-lopezii</i>	9-12	1-3	9-10	30-40	1	concolorous	3-4	erect to suberect
<i>N. longispalhus</i>	40-60	1-2	30-170	60-100	1-2(3)	concolorous	40-90	horizontal
<i>N. minor</i>	8-12	-	12-15	28-32	1	concolorous	10-15	horizontal or suberect
<i>N. moleroi</i>	11-20	2-4	11-20	22-30	1	concolorous	5-8	drooping
<i>N. Muñozii-garmendiae</i>	10-35	1-2	10-35	25-30	1 (2)	concolorous	10-20	suberect to horizontal
<i>N. nevadensis</i>	120-130	1-2	80-100	20-60	1-3(4)	concolorous to discolorous	20-30	horizontal
<i>N. primigenius</i>	10-15	1-2	10-15	15-20	1	concolorous	0-2	erect
<i>N. radriganonum</i>	25-35	2	25-40	30	1	concolorous	4-6	suberect
<i>N. segurensis</i>	9-16	1-2	8-23	40-42	1	concolorous	14-25	horizontal
<i>N. yeppesti</i>	13-61	2-3	16-35	40-90	1(2)	concolorous to discolorous	18-55	horizontal or suberect
<i>N. alcaracensis</i>	11-43	1-2	10-26	43-60	1-2	concolorous	15-46	horizontal

TABLE 2. Main characteristics of the perianth parts of the three new taxa of *Narissus* subgenus *Ajax* Spach of south-east Spain and the other closely related taxa

Taxa	Perianth tube (mm)	Perianth segments (mm)	Perianth segments position	Perianth segments rotation	Corona length (mm)	Corona profile	Corona margin	Anther/ filament length	Stamen insertion (mm)
<i>N. alpestris</i>	9-11	18-22	erect	twisted	25-30	flat	crenate	-	-
<i>N. bijeri</i>	12-13	15-28	erecto-patent	twisted	16-30	flat or concave	lobed	0.5	5
<i>N. calcicarpianus</i>	16-18	20-23	erect	not twisted	25-28	concave	crenate	0.6	6-8
<i>N. confusus</i>	10-20	6-19	patent	not twisted or twisted	17-35	flat or concave	lobed	-	-
<i>N. eugeniae</i>	14-18	19-21	erecto-patent	twisted or not twisted	21-22	flat or concave	crenate	0.8	0
<i>N. fontqueri</i>	26-28	17-18	erect to suberect	twisted	18	concave	crenate-toothed	-	-
<i>N. gemessii-lopezii</i>	11-13	15-16	suberect	twisted	18-19	flat	lobed or toothed	1	1-2
<i>N. longispalhus</i>	10-15	25-32	erecto-patent to patent	twisted or not twisted	25-30	flat or concave	crenate	0.6	2-3
<i>N. minor</i>	13-15	16-21	erecto-patent	not twisted	16-21	flat to concave	-	-	4
<i>N. moleroi</i>	9-11	24-30	patent	twisted	24-30	convex	crenate	-	-
<i>N. muñozii-garmendiae</i>	9-12	9-14	erecto-patent erect	not twisted	10-14	flat or concave	crenate	-	-
<i>N. nevadensis</i>	15-25	15-20	patent to erecto-patent	twisted or not twisted	15-20	flat	crenate-toothed	-	4-5
<i>N. prinigenius</i>	15-20	10-14	suberect	not twisted	15-20	concave	crenate	-	-
<i>N. radiganorum</i>	15-16	17-18	erect	not twisted	18-19	convex	toothed	0.6	3
<i>N. segurensis</i>	10-12	14-16	erect	not twisted	15-17	convex	crenate-toothed	1.1	2-3
<i>N. yepetii</i>	12-17	19-25	patent to erecto-patent	twisted	15-30	concave	lobed or toothed	0.7-0.8	0
<i>N. alcaracensis</i>	13-15	14-22	patent	not twisted or twisted	15-23	flat or concave	toothed	0.8	0

TABLE 3. Anatomy of the leaves of three new taxa of *Narcissus* subgenus *Ajax* Spach of south-east Spain and the other closely related taxa. asym. asymmetric; sym. symmetric

Taxa	Relative width of semi-leaves	Section of leaves	Leaf width (mm)	Leaf depth (mm)	Number of keels	Pseudo-keels or angular projections	Parenchyma
<i>N. alpestris</i>	sym.	keeled or deeply channelled	2.8-4.6	0.5-0.8	2 (+)	present	lax-lacunose
<i>N. bujeri</i>	sym.	slightly channelled	5.7-8.5	0.7-2.7	2	absent	lax-lacunose
<i>N. calcicarpellanus</i>	both types	slightly channelled	5.9-9.0	0.8-0.9	0-6	present	lax
<i>N. confusus</i>	sym.	channelled	6.0-10.0	0.5-0.9	0-4	present	lax-lacunose
<i>N. eugeniae</i>	both types	slightly channelled or flat	5.2-7.0	0.6-1.0	2-5	present	lax-lacunose
<i>N. fontqueri</i>	asym.	slightly channelled	6.8	0.6	4-6	present	lax-lacunose
<i>N. genesii-lopezii</i>	both types	slightly channelled	4.5-7.7	0.7-1.0	0-6	present	dense
<i>N. longispathus</i>	asym.	slightly channelled	7.0	0.9-1.0	4	present	lax-lacunose
<i>N. muleri</i>	asym.	slightly channelled	7.6-8.7	0.7-0.9	1-2	absent	lax-lacunose
<i>N. mudozii-garmendiae</i>	asym.	slightly channelled	3.8-8.0	0.6-0.9	2-3	present	lax-lacunose
<i>N. neadensis</i>	sym.	slightly channelled	6.7-10.5	1.1-1.8	2	absent	lax-lacunose
<i>N. primigenius</i>	sym.	slightly channelled	6.9	0.9	4	present	lax-lacunose
<i>N. radiaganorum</i>	asym.	slightly channelled	5.1	0.7	2	absent	lax
<i>N. sequensis</i>	asym.	keeled	6.0-7.0	0.4-0.5	3-4	present	lax-lacunose
<i>N. yepesi</i>	asym.	flat slightly channelled	7.0-14.0	0.5-0.8	2-4	present	dense-lax
<i>N. alcaracensis</i>	asym.	slightly channelled	6.0-11.0	0.8-0.9	2-3	present	lax-lacunose

TABLE 4. Anatomy of the scape of the three new taxa of *Narcissus* subgenus *Ajax* Spach of south-east Spain and the other closely related taxa

Taxa	Scape section	Supplementary keels	Parenchyma	Maximum width (mm)
<i>N. alpestris</i>	angular with two keels	absent	fistulose	3.4
<i>N. bujei</i>	terete	absent	fistulose	6.7
<i>N. calcicarpetanus</i>	angular with two keels	present	fistulose	5.9
<i>N. confusus</i>	terete to angular with two keels	absent	fistulose	5.2
<i>N. eugeniae</i>	terete to angular with two keels	absent	fistulose	4.7
<i>N. fontqueri</i>	terete to angular with two keels	present	fistulose	3.4
<i>N. genesii-lopezii</i>	angular with two keels	present	dense or lax-lacunose	4.8
<i>N. longispathus</i>	terete	absent	fistulose	3.7
<i>N. moleroi</i>	angular with two keels	present	fistulose	5.4
<i>N. muñozii-garmendiae</i>	angular with two keels	absent	fistulose or lax-lacunose	5.3
<i>N. nevadensis</i>	angular with two keels	present	fistulose or lax-lacunose	8.0
<i>N. primigenius</i>	angular with two keels	present	fistulose	3.7
<i>N. radinganorum</i>	angular with two keels	present	dense	2.6
<i>N. segurensis</i>	angular with two keels	absent	fistulose	4.0
<i>N. yepesii</i>	angular with two keels	present	dense or lax-lacunose	3.0 4.0
<i>N. alcaracensis</i>	angular with two keels	present	lacunose	4.5

Distribution. Mountains of southern Spain: Sierra de Segura (Province of Jaén). 1200–1400 m. Supramediterranean, humid. This species belongs to an eastern Iberian group of species from whose may have derived *N. minor* L., which is only known in cultivation.

Phenology. Flowering in March. Seeds maturing May.

Habitat. Borders of ripicolous and mesohydrophilous hazelnut and mountain elm forests (*Corylus avellana* L., *C. hispanica* D. Rivera *et al.*, *Ulmus glabra* Huds.) dominated and characterized by *Sorbus torminalis* (L.) Crantz, *Acer granatensis* Boiss., *Ilex aquifolium* L., etc. Community developed on allochthonous siliceous sediments (Facies Utrillas) (*Geo urbani-Coryletum avellana* Valle, Mota & Gómez-Mercado, 1986) in the vicinity of deciduous oak climatic forest (*Berberido australis* – *Quercetum pyrenaicae* Valle, Gómez Mercado & Mota, 1988).

Specimens studied. SPAIN: Nava del Espino, Orcera, (Jaén), 13. iii. 1996, S. Ríos & J. López-Bernal (MA, MUB 27982, 27983); Nava del Espino, Orcera, (Jaén), 8. iv. 1996, S. Ríos, D. Rivera, C. Obón & A. Verde (MUB 27981).

***Narcissus alcaracensis* Ríos, D. Rivera, Alcaraz & Obón sp. nov.**

Narcissus nevadensis Auct (Ríos *et al.*, 1993) non Pugsley.

Type. Holotypus: Spain, province of Albacete, Sierra de Alcaraz, in the seasonal small lagoon which constitutes the spring of the stream Pesebre, near Peñascosa, 1270 m, 9. iv. 1996, S. Ríos, D. Rivera, C. Obón & A. Verde (holotypus: MA). *Isotypes.*

specimens of the same exsiccata (MUB 27943, 27944, 27945, 27946). Icon: Fig. 1 N–Q.

Diagnosis. *Narcissus* Sect. *Pseudonarcissi*, medius, glaucescens, foliis asymmetricis inferne bicarinatis scapo aequilongis vel superantibus. Scapus frequenter biflorus, pedicellus longus; flores medii; corona subcylindrica, concolor. A *Narcisso nevadense* scapo denso foliisque brevioribus foliis praeterea asymmetricis tenuioribus, scapo singulo vel bifloro, tubo brevior differt. A *Narcisso longispatho* scapo foliisque brevioribus et angulosis, foliis praeterea latioribus, tepalis erectis differt. A *N. eugeniae*, *N. genesii-lopezii* et *N. radinganorum* spatha pedicellisque longioribus et scapis saepe bifloris differt. A *N. bujei* staminibus basalibus, corona minus lobata differt.

BULB 1.6–2.6 cm, ovoid, provided with 1 or 2 scapes. LEAVES 13–43 × 0.6–0.11 cm, 0.8–0.9 mm deep, linear, suberect, glaucous, keeled, with a hyaline sheath to 8 cm. SCAPE 10–26 × 0.4–0.45 cm, more or less compressed, markedly angular (with 14 acies), 2-edged, lacunose. FLOWERS solitary (75–80%) or in pairs (20–25%), somewhat erect. SPATHE bright green, hyaline after anthesis, 4.3–6 cm, sheathing for its lower half, concealing the pedicel (15–46 mm) and projected beyond the perianth. PERIANTH 24–28 mm, lemon yellow; tube 14–22 mm, segments, 14–22 mm, ovate-lanceolate, mucronate, patent, not twisted. Corona 15–23 × 9–13 mm, deep yellow cylindrical to scarcely expanded at mouth, rounded toothed. STAMENS 19–30 mm, inserted at the base of the tube, anthers 7–14 mm. SEEDS black, laterally compressed, 4–5 mm, not apiculate.

Distribution. Mountains of southern Spain: Sierra de Alcaraz (Province of Albacete). 1200–1400 m. Supramediterranean, subhumid.

Phenology. Flowering in March–April. Seeds maturing May or early June.

Habitat. Borders of a seasonal lagoon covered by large sedge communities (*Mag-nocaricion elatae* W. Koch 1926) dominated by *Carex hispida* Willd. and *C. elata* All.

Specimens studied. SPAIN: Springs of Río Pesebre, Peñascosa (Albacete), 9. iv. 1996, *S. Ríos*, *D. Rivera*, *C. Obón* & *A. Verde* (MA, MUB 27943, 27944, 27945, 27946); Springs of Río Pesebre, Peñascosa (Albacete), 12. vi. 1988, *S. Ríos* (MUB 26785); Springs of Río Pesebre, Peñascosa (Albacete), 10. vi. 1989, *S. Ríos* (MUB 29202); Springs of Río Pesebre, Peñascosa (Albacete), 5. v. 1991, *S. Ríos* (MUB 33478, 33479).

***Narcissus yepesii* Ríos, D. Rivera, Alcaraz & Obón sp. nov.**

= *Narcissus longispathus* Auct. non Pugsley.

Type. Holotypus: Spain, province of Jaén, Sierra de Segura, meadows of Fuente de la Jordana, near the mountain Yelmo (*Mons Galeatus*) (Segura de la Sierra), at 1300 m, 8. iv. 1996, *S. Ríos*, *D. Rivera*, *C. Obón* & *A. Verde* (holotypus: MA). *Isotypes.* specimens of the same exsiccata (MUB 27935, 27936, 27937, 27938, 27939). Icon: Fig. 11–M.

Diagnosis. *Narcissus* Sect. *Pseudonarcissi*, medius vel minus. Folia asymmetrica scapo aequilonga vel superantia, bi- vel tricarinata; scapi biflori frequentes, compacti et angulosi; spathae longae; pedicelli longi; flores medii vel maiores; corona subcylindrica

et concolor. A *Narcisso nevadensi* scapis foliisque multo brevioribus, foliis praeterea asymmetricis et tenuioribus, scapis praeterea medulla compacta munitis, floribus tubo brevioribus, staminibusque basalibus differt. A *N. longispatho* scapo foliisque brevioribus, foliis praeterea latioribus, tepalis brevioribus, staminibus basalibus, fructibus duplo longioribus differt. A *N. muñozii-garmendiae* spatha et pedicellis multo longioribus differt. A *N. eugeniae*, *N. genesii-lopezii* et *N. radinganorum* isdem et scapis bifloris differt. A *N. bujei* staminibus basalibus, coronaque minus lobata differt. *Narciso Yepes* celeberrimo musico murgetano, in memoriam dicata est haec species.

This species is named in memory of the recently deceased concert guitar player and world famous musician Narciso Yepes, born in Lorca (Murcia), roughly 100 km east of the species' type locality.

BULB 1.5–2.5 cm, ovoid. **LEAVES** 19–31 × 0.5–0.14 cm, 0.5–0.8 mm deep, linear, suberect, glaucous, keeled, with a hyaline sheath 15 cm long. **SCAPE** 16–35 cm × 3.5–4 mm, more or less compressed, markedly angular (with 14 acies), 2-edged, compact. **FLOWERS** solitary, sometimes 2, somewhat erect or nearly horizontal. **SPATHE** bright green, hyaline after anthesis, 4–9 cm, sheathing for its lower half, concealing the pedicel (18–55 mm) and projected beyond the perianth. **PERIANTH** lemon yellow; tube 12–17 mm, segments 13–28 mm, ovate-lanceolate, mucronate to acuminate, patent, twisted. **Corona** 15–30 × 10–16 mm, deep yellow funnel-shaped and expanded at mouth, rounded toothed to lobulate. **STAMENS** 19–28 mm, inserted at the base of the tube, anthers 8–13 mm. **SEEDS** shining black, sharp angled, 3–4 mm, shortly apiculate.

Distribution. Mountains of southern Spain: Sierra de Segura (Province of Jaén). 1200–1400 m. Supramediterranean, humid.

Phenology. Flowering in April. Seeds maturing May or early June.

Habitat. Supramediterranean grasslands of tall grasses and rushes (*Molinio-Holoschoenion* Braun-Blanq. ex Tchoo 1948) dominated by *Scirpus holoschoenus* L. and *Cirsium pyrenaicum* (Jacq.) All., near the springs but without riparian dynamic.

Specimens studied. Fuente de la Jordana, near the mountain Yelmo, Segura de la Sierra (Jaén), 1300 m, 8. iv. 1996, S. Ríos, D. Rivera, C. Obón & A. Verde (MA, MUB 27935, 27936, 27937, 27938, 27939); Arroyo de la Balasna, Orcera, (Jaén), 1250 m, 9. iv. 1996, S. Ríos, D. Rivera, C. Obón & A. Verde (MUB 27930, 27931, 27932); Arroyo de la Balasna, Orcera, (Jaén), 1250 m, 2. iv. 1989, S. Ríos, A. De la Torre & A. Robledo (MUB 33477).

RELATED TAXA

The following taxa are closely related to *N. segurensis*, *N. alcaracensis* and *N. yepesii*: *N. alpestris* Pugsley, *N. primigenius* (Fernández Suarez ex M. Lániz) Fern. Casas & M. Lániz, *N. muñozii-garmendiae* Fern. Casas, *N. radinganorum* Fern. Casas, *N. genesii-lopezii* Fern. Casas, *N. calcicarpetus* Fern. Casas, *N. eugeniae* Fern. Casas, *N. confusus* Pugsley, *N. nevadensis* Pugsley, *N. longispathus* Pugsley and *N. bujei* (Fern. Casas) Fern. Casas, according to geographical or taxonomic proximity. The relevant features are displayed in Tables 1–4. The macromorphology also reveals similarities of *N. segurensis*

to *N. minor* L. (Pugsley, 1933), but there is little resemblance of the three new species to geographically close taxa like *N. longispathus* and *N. nevadensis*. Floral morphology and section of leaves and scape are quite different. *N. alcaracensis* and *N. yepesii* are more closely related with taxa endemic to central Spain.

The case of *N. minor* is noteworthy because the analysis of early illustrations and floral characters used in the study of the domestication process in subgenus *Ajax* shows quite a close resemblance to an illustration by Barrelier and to the endemic taxa of the Sierra de Alcaraz and Sierra de Segura. In fact Rivera (1984) has shown the presence of Barrelier in Alcaraz based on the localities given for '*Rubeola montana*' and '*Polium montanum*', most likely in Spring which would have enabled him to collect daffodils. Unfortunately the daffodils illustrated are not accompanied with locality information (Barrelier, 1714). *Narcissus segurensis*, or *N. alcaracensis*, or both, may have been involved in the origin of the complex of cultivated daffodils known as *N. minor*, presumably through accidental hybridization, because intentional systematic hybridization in this subgenus did not take place before the last quarter of the nineteenth century (Pugsley, 1933; Bahnert, 1992).

DISCUSSION

Extensive botanical exploration in Spain has resulted in the discovery of a large number of new taxa of vascular plants. At first sight this might be considered to be a consequence of an overly analytical approach, but in fact it is more closely related to very complex topography and to high habitat diversity. In the case of *Narcissus* subgenus *Ajax* in a area of no more than 10 km² populations are found in meadows, temporary lagoons, riparian forests or climatic oak forests. Morphological variability has been shown to be more or less related to the habitat characteristics. The isolation of the different populations of south-east Spain, although not complete, is higher than in north Spain, and is reflected in the few natural intrasectional hybrids found. Hence variations there are extreme and abrupt instead of the gradual changes detected in the northern Spanish populations.

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APPENDIX

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