



New data on daffodils of the *Narcissus nevadensis* complex (Amaryllidaceae) in SE Spain: *N. nevadensis* subsp. *herrerae* subsp. nov., and *N. nevadensis* subsp. *longispathus* comb. nov.

JOSE A. ALGARRA^{1*}, GABRIEL BLANCA², MIGUEL CUETO³ & JULIÁN FUENTES⁴

¹Curator, Botanic Garden Detunda-Cueva de Nerja, C/ Minerva, 7 edif. Zeus n° 3, ES-18014 Granada, Spain; e-mail: josea.algarra@juntadeandalucia.es

²Departamento de Botánica, Facultad de Ciencias, Universidad de Granada, ES-18071 Granada, Spain.

³Departamento de Biología y Geología, CECOUAL, Universidad de Almería, ES-04120 Almería, Spain.

⁴C/ Castillo 5, bajo F, ES-18140 La Zubia, Granada, Spain.

*author for correspondence

Introduction

Narcissus Linnaeus (1753: 289) is a genus widespread in the Mediterranean region and taxonomically very complex, including a broadly variable number of taxa depending on authors. It includes between 26 and 36 species (Webb 1980, Zonneveld 2008), or even up to 110 species recognised in the International Daffodil Register (RHS 2017). In the Iberian Peninsula, 56 taxa (Fernandes 1951) or 33 taxa (Aedo 2013) have been accepted to occur, 10–12 belonging to *N.* subg. *Ajax* (Salisb. ex Haworth 1819: 111) Spach (1846: 432) sect. *Pseudonarcissus* DC. in Redouté (1815: tab. 486). In the south-eastern Iberian Peninsula 16 species (Aedo 2013) to 19 species (Fernandes 1951, Navarro 2011) have been considered, of which one (Aedo 2013) to three (Navarro 2011) correspond to that section, most of them endemic to the area (Bañares *et al.* 2004, Blanca *et al.* 1999, 2000, 2001). The Iberian Peninsula is the centre of diversity for *N.* sect. *Pseudonarcissus*, with *N. nevadensis* Pugsley (1933: 62) being proposed as the ancestral species of this group (Fernandes 1951). Recently, after molecular analyses (Zonneveld 2008, Marques *et al.* 2017), this species has been separated into an independent section: *N.* sect. *Nevadensis* Zonneveld (2008: 130).

The treatment of *N. nevadensis* in recent times has been controversial. It is an endemic complex occurring in the Baetic and sub-Baetic mountain ranges of the southern Iberian Peninsula. Some authors (Ríos *et al.* 1999, Sánchez-Gómez *et al.* 1998, 2000, Zonneveld 2008) have accepted analytic arrangements of the aggregate recognising up to four different taxa (either at specific or subspecific ranks), whereas others (Fernandes 1951, Aedo 2013) have included the variability of the whole aggregate in the variation range of *N. pseudonarcissus* Linnaeus (1753: 289), as *N. pseudonarcissus* subsp. *nevadensis* (Pugsl.) A.Fern. (Fernandes 1951: 183).

As part of our taxonomic work on the southern Iberian flora, a morphological study has been undertaken on the complex of *N. nevadensis*, which recovers several discrete entities, morphologically well-characterised and with discontinuous distribution areas, which deserve taxonomic recognition. In particular, populations occurring in Almjara mountains (SW Granada province) were the focus of taxonomic research to analyse their relationships to the other Baetic and sub-Baetic populations of *N. nevadensis* s.l. The first record of the Almjara plants dates back to 2004, when they were ascribed to “*N. longispathus* s.l.” (in schedae). Later, they were reconsidered and finally assigned to *N. nevadensis* (Navarro 2011). However, recognisable morphological differences with regard to both latter taxa made identification unsatisfactory.

For the purpose of clarifying this issue, a total of 199 measurements were taken of 30 different characters (Table 1) from 187 individuals of Almjara populations. The measurements were made in two different years (172 measurements in 2005 and 27 in 2016) and reflect the variability of the 4 surviving populations (plus one extinct population), although some of these have very few members. Morphological differences were detected in 2005 but, at that moment, the genetic information still was not available. The measurements were taken in the field on fresh material from 3 main populations, except preparations for the magnifying glass which were taken in the laboratory.

According to the new findings on the phylogeny of the *Narcissus* sect. *Nevadensis* (= sect. *Pseudonarcissus* p.p.) in the southern Iberian Peninsula (Jiménez *et al.* 2009, Medrano *et al.* 2014, Marques *et al.* 2017) and the present

morphological study on this group, we describe here a new subspecies, *Narcissus nevadensis* subsp. *herreriae* Algarra, Blanca, Cueto & J. Fuentes, and establish a new combination, *N. nevadensis* subsp. *longispachus* (Degen & Hervier ex Pugsley) Algarra, Blanca, Cueto & J. Fuentes. Consequently, here we consider 3 subspecies within the *N. nevadensis* complex: *N. nevadensis* subsp. *nevadensis*, *N. nevadensis* subsp. *longispachus*, and *N. nevadensis* subsp. *herreriae*, which are discussed below.

TABLE 1. Main anatomical characteristics of the accepted three subspecies of *Narcissus nevadensis*.

	<i>Narcissus nevadensis</i> subsp. <i>longispachus</i>	<i>Narcissus nevadensis</i> subsp. <i>nevadensis</i>	<i>Narcissus nevadensis</i> subsp. <i>herreriae</i>
Leaves length (cm)	40–60	120–130	14.7–80.0
Number of leaves	1–2	1–2	1–3
Scape length (cm)	30–170	80–100	13.0–79.2
Maximum width (scape)	3.7	8.0	11.0
Spathe length (mm)	60–100	20–60	33–71
Number of flowers	1–2(–3)	1–3(–4)	1–3(–4)
Colour tepals/corona	concolorous	concolorous to discolorous	concolorous (discolorous)
Pedice (mm)	40–90	20–30	16–74
Position of the flower	horizontal	horizontal	horizontal or suberect
Perianth tube length (mm)	10–15	15–25	13–22
Perianth segments length (mm)	25–32	15–20	17–31
Perianth segments position	erecto–patent or patent	patent to erecto–patent	patent to erecto–patent
Perianth segments rotation	twisted or not twisted	twisted or not twisted	twisted or not twisted
Corona length (mm)	25–30	15–20	19–30
Corona profile	flat or concave	flat	flat or concave
Corona margin	crenate	crenate-toothed	crenate-toothed
Anther/filament length	0.6	-	0.9–1.3
Stamen insertion (mm)	2–3	4–5	3–8
Relative width of semi-leaves	asymmetrical	symmetrical	asymmetrical
Section of leaves	slightly channelled	slightly channelled	keeled
Leaf width (mm)	7.0	6.7–10.5	5.0–15.0
Leaf depth (mm)	0.9–1.0	1.1–1.8	1.1–1.5
Leaf: Number of keels	4	2	2
Leaf: Pseudo-keels or angular projections	present	absent	present
Leaf: Parenchyma	lax–lacunose	lax–lacunose	lax–lacunose
Scape section	terete	angular with two keels	angular with two keels
Scape: Supplementary keels	absent	present	present
Scape: Parenchyma	fistulose	fistulose or lax–lacunose	fistulose

Narcissus nevadensis subsp. *herreriae* Algarra, Blanca, Cueto & J. Fuentes *subsp. nov.* (Figure 1).

Type:—SPAIN. Granada: Jayena, Sierra de Almiñara, bco. de la Culebra, 30SVF2781, 1070 m elevation, 09 April 2016, peat-like pastures over dolomitic limestone, G. Blanca & J. Fuentes (holotype: GDA 62658!; isotypes: GDA 62657!, MA!, MGC!, COA!, SEV!).

Description:—Leaves longer than scape, 2-keeled; scape thickness 5–8 (–9) mm, with section angular 2-edged, with several smaller supplementary keels; spathe 33–71 mm long; solitary flowers or in umbels of 2–3 (–4); pedicels 40–64 mm; tepals and corona usually concolorous; corona 19–30 mm long, crenate-toothed.

Eponymy:—The subspecific epithet honours Dr. Carlos M. Herrera, who made molecular studies of daffodils from *N. sect. Pseudonarcissus* in southern Spain, and encouraged our study.

Habitat and distribution:—*Narcissus nevadensis* subsp. *herreriae* is known so far from a mountainous area of southern Spain, within the “Natural Park of Sierras de Tejeda, Almiñara y Alhama”, in SW Granada province (Fig. 2), between 980 and 1400 m elevation. It grows in riparian hygrophilous communities which are usually degraded by fire-prevention treatments and by frequent uprooting by storms, together with *Erica erigena* R. Ross in Dandy (1969: 164), *Rubus ulmifolius* Schott (1818: 821), and *Scirpoides holoschoenus* (Linnaeus 1753: 49) Soják (1972: 127).

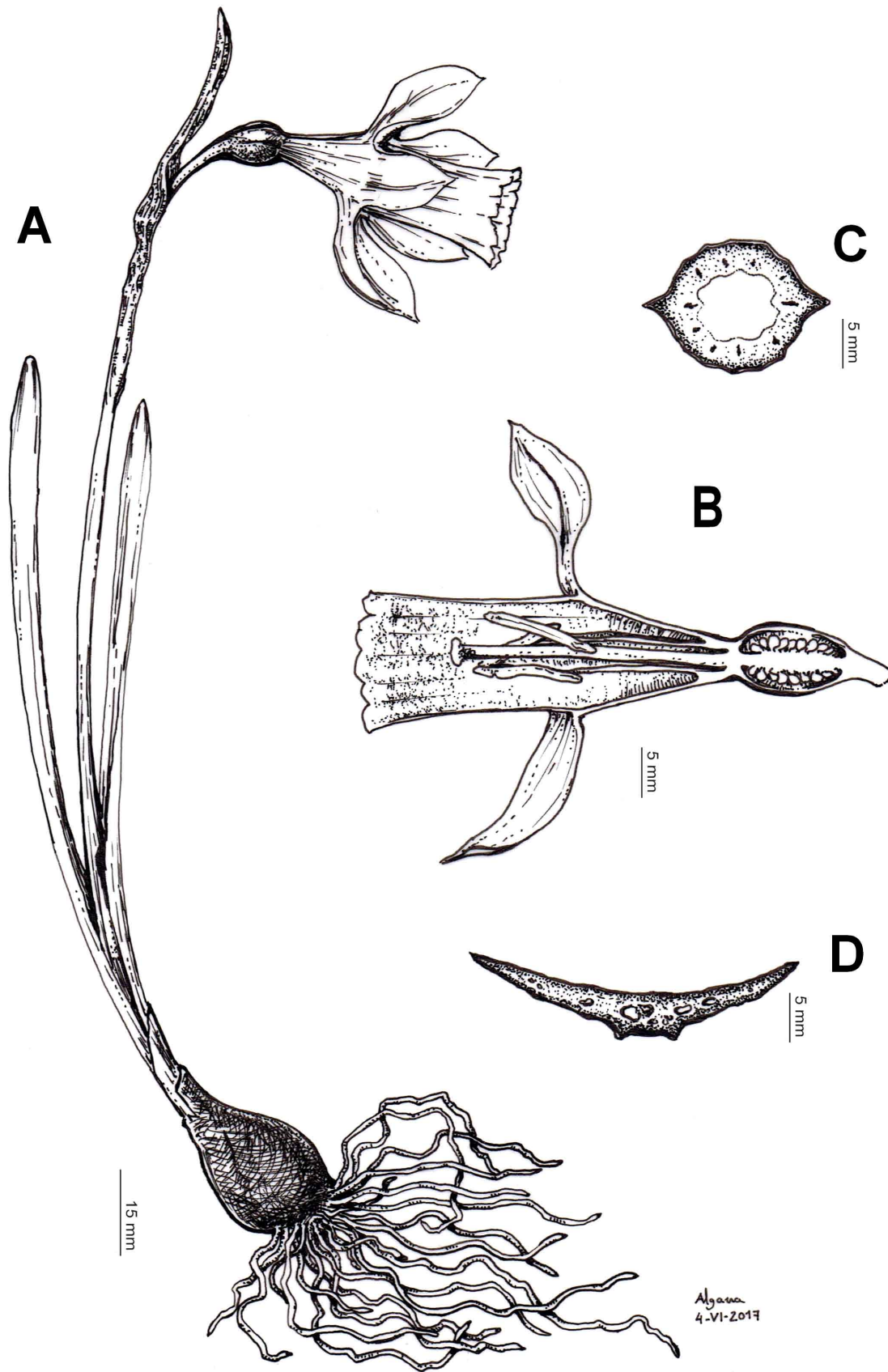


FIGURE 1. *Narcissus nevadensis* subsp. *herrerae* (from the isotype GDA 62657). **A** Habit; **B**. Flower section; **C**. Stem section; **D**. Leaf section.

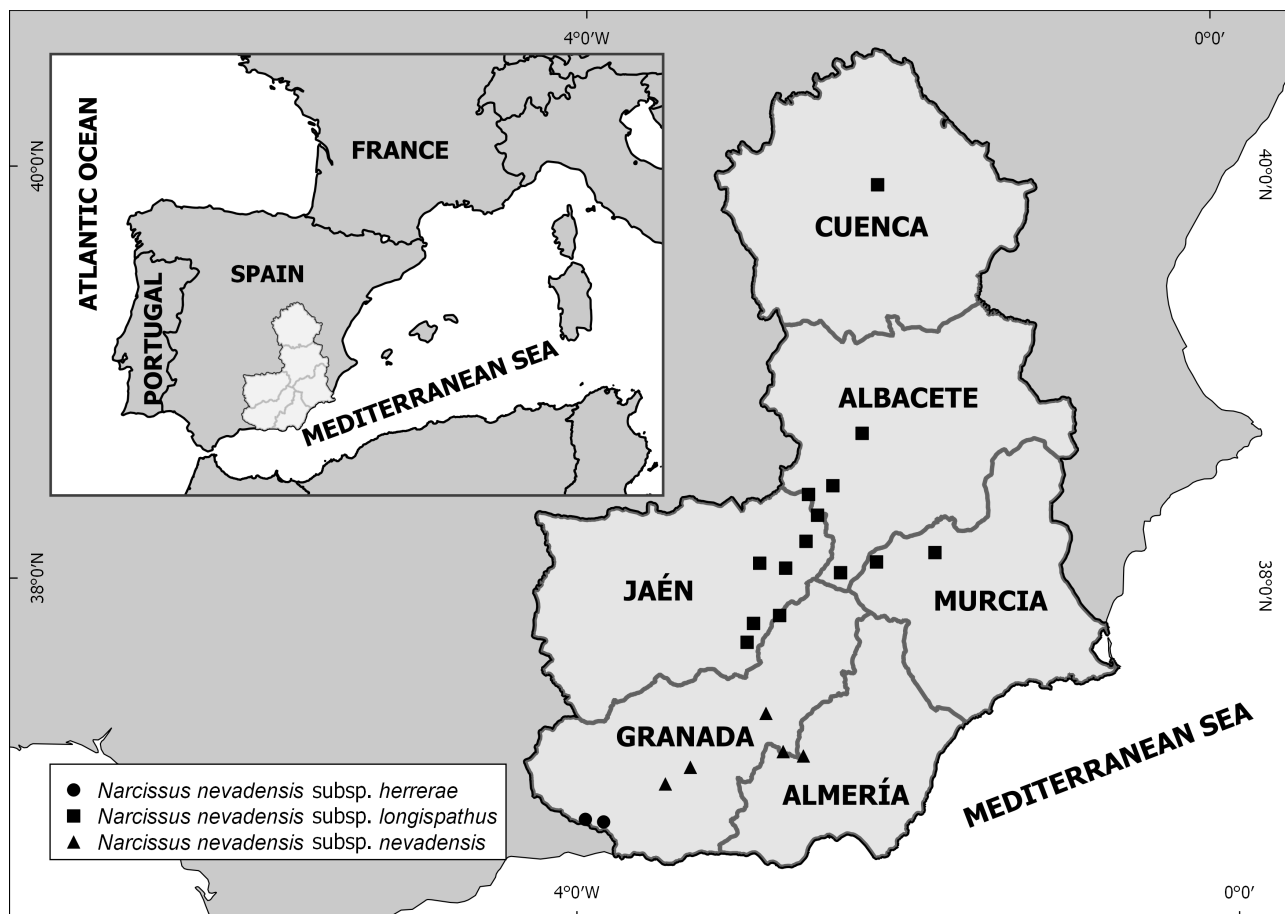


FIGURE 2. Distribution map of the taxa studied within the complex of *Narcissus nevadensis* (based on direct observations).

Phenology:—Flowering in March to April, and fruiting in June.

Conservation status:—The newly described subspecies is a narrow endemic of Sierra de Almirajara, in southwestern Granada province. For this reason, legal and management conservation measures are needed. According to the IUCN (2012) categories, here we consider *N. nevadensis* subsp. *herrerae* as Endangered (EN) based on criteria A4, and B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v). It is recommended to increase the vigilance in the headwaters of the rivers to avoid improper forest work and uncontrolled water abstraction (Table 2).

Taxonomic relationships:—According to the genetic analyses on *N. sect. Pseudonarcissus* (Jiménez *et al.* 2009, Medrano *et al.* 2014, Marques *et al.* 2017), the taxonomic treatment of the section in previous publications (Zonneveld 2008, Navarro 2011), shows a distinction of species that appears to be more consistent than the more recent proposal in *Flora iberica* (cf. Aedo 2013), whereby all the trumpet daffodils from the Baetic and sub-Baetic ranges are assigned to a single taxonomic entity, *N. pseudonarcissus* subsp. *nevadensis*. The results of our morphological study (Tab. 2) show that three morphologically distinct entities can be distinguished, which have discontinuous distribution areas, and which deserve recognition at subspecific rank. This treatment is coherent with a previous phylogenetic analysis showing three genetically distinct groups with very strong bootstrap support (cf. Medrano *et al.* 2014).

The new arrangement we propose here for that complex includes three allopatric taxa (Fig. 2). First, the newly described *Narcissus nevadensis* subsp. *herrerae* is restricted to the Natural Park of Sierras de Tejeda, Almirajara y Alhama (SW Granada province). Secondly, *N. nevadensis* subsp. *nevadensis* occurs only in Sierra Nevada National Park, Sierra de Baza Natural Park, and in Sierra de los Filabres (Granada and Almería provinces). Finally, *N. nevadensis* subsp. *longispathus* is taxonomically the most complex subspecies and shows a broader distribution; its area extends through the Natural Park of Sierras de Cazorla, Segura y las Villas, where the type locality is placed (Jaén and Albacete provinces); the Natural Park of Sierra de Castril (Jaén province plus adjacent NE areas of Granada province); some neighbouring areas of the provinces of Murcia and Albacete; and one disjunct location in Cuenca province (cited there as subsp. *nevadensis* by García Cardo 2014). It is worth mentioning that this subspecies has often been accepted at species rank as *N. longispathus* Degen & Hervier ex Pugley (1933: 54), and even some of its populations had been recently described also as independent species, namely *N. segurensis* S. Ríos *et al.* (1999: 155) and *N. yepesii* S. Ríos

et al. (1999: 161), both from Sierra de Segura (Albacete province), *N. alcaracensis* S. Ríos *et al.* (1999: 160) from Sierra de Alcaraz (Albacete province), and *N. enemeritoidi* (Sánchez-Gómez *et al.* 1998: 63) Sánchez-Gómez *et al.* (2000: 430) from Sierra de Moratalla (Murcia province). However, the reliability of these four latter species was not upheld by subsequent molecular (Medrano & Herrera 2008, Zonneveld 2008, Jiménez *et al.* 2009) and taxonomic works (Navarro 2011), and accordingly they are synonymised here to a widely recircumscribed *N. nevadensis* subsp. *longispathus*, a combination that we establish here.

TABLE 2. Main information about conservation status assessment of the 5 known populations of *Narcissus nevadensis* subsp. *herreriae*. D: estimation, E: direct count.

Location	Population size	Area (m ²)	Threats
Arroyo de la Venta	260(D)	10407	Grazing, lowering of phreatic level, predation, illegal collection, climatic change
Barranco de las Golondrinas	238(D)	900	Fire-prevention treatments, lowering of phreatic level, predation, illegal collection, climatic change
Prados de Machiche	12370(E)	17518	Forest treatments, lowering of phreatic level, predation, illegal collection, climatic change
Río Alhama	4(D)	900	Grazing, lowering of phreatic level, predation, illegal collection, climatic change
Los Morros	0(D)	900	Extinct by water abstraction

Narcissus nevadensis subsp. *longispathus* (Degen & Hervier ex Pugsley) Algarra, Blanca, Cueto & J. Fuentes *comb. & stat. nov.* ≡ *N. longispathus* Degen & Hervier ex Pugsley (1933: 54), basionym; ≡ *N. pseudonarcissus* subsp. *longispathus* (Degen & Hervier ex Pugsley) Fernandes (1933: 54); ≡ *N. hispanicus* subsp. *longispathus* (Degen & Hervier ex Pugsley) Fernández Casas (2000: 126).

Key for the identification of the accepted subspecies of *Narcissus nevadensis*

1. Flowers with tepals and corona discolourous, corona length 15–20 mm; pedicels 20–30 mm long *N. nevadensis* subsp. *nevadensis*
- Flowers with tepals and corona usually concolorous, corona length 19–30 mm, pedicels 40–90 mm long 2
2. Leaves with 4 keels; scape section maximum width 4 mm, subterete, spathe 60–100 mm, flowers 1 (2–3) through scape *N. nevadensis* subsp. *longispathus*
- Leaves with 2 keels; scape section maximum width 8 (9) mm, 2-edged, spathe 50–68 mm, flowers 1–3 (4) through scape *N. nevadensis* subsp. *herreriae*

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ANNEX 1. Studied selected material in alphabetical order.

Narcissus nevadensis subsp. *herreriae* (paratypes):—SPAIN. Granada: Alhama de Granada, Arenas del Rey, arroyo de la Venta, 1000 m, 30SVF2281, 25 April 2000, *A. Pulido Pastor* (MA643254!); ibidem, April 2000, *A. Pulido Pastor* (MA650886!); Alhama de Granada, Sierra de la Almirajara, 30SVF2781, 12 April 2005, 1100 m, *J. Algarra & F. Donaire* (GDA62656!); Alhama de Granada, Sierra de la Almirajara, Prados de Machiche, 30SVF2682, 1110 m, 12 April 2005, *J. Algarra, F. Donaire & E. Sofos* (GDA62654!); ibidem, 30SVF2682, 1118 m, 12 April 2005, *F. Donaire & J. Algarra* (GDA62655!).

Narcissus nevadensis subsp. *longispathus*:—SPAIN: Albacete: Bienservida, Sierra de Alcaraz, Pico de la Sarga, 1600 m, 30SWH4062, 6 April 1993, *I. Álvarez & N. Yagüe* (MA550692!); Catalmerezos, prados juncuales supramediterráneos, 12 June 1988, *P. Ríos, F. Alcaraz & A. Robledo* (MA508892!); Paterna del Madera, 30SWH5268, 19 April 1984 (MA329905!); Peñascosa, nacimiento del Río Pesebre, 5 May 1991, *S. Ríos* (MA508900!). Cuenca: Villar de Olalla, lagunas de Ballesteros, 930 m, 30TWK7227, 17 April 2013, *O. García Cardo* (MA874864!). Granada: Sierra de Castril, Castril, cabecera del bco. del Buitre, entre cerro de La Pincilla y Picón del Durillo, 30SWG1692, 1790 m, 29 April 2014, *J. Fuentes* (GDA61292!); Sierra de Castril, Castril, Los Chorreadores, 1700 m, 30SWG1590, 29 April 2014, *J. Fuentes* (GDA61293!). Jaén: Cazorla, Río Guadalquivir, entre Vadillo Castril y Fuente del Hierro, 30SWG0596, *J. Fuentes* (GDA62659!); Cazorla, barranco del Guadalentín, 1300 m, 30SWG1495, 27 May 1976, *González Rebollar, Muñoz Garmendia & Soriano* (MA481477!); Cazorla, de El Chorro al nacimiento del Guadalquivir, 24 March 1992, *A. Barra* (MA505858!); Cazorla, Linarejos, Fuentes de los Perros, 30SWG0797, *A. Benavente* (MA774845!); Quesada, Sierra de Cazorla, ad radices montium Cerro Navahonda dictum, iuxta flumen Guadalquivir, 1250 m, 30SWG0289, 6 April 1989, *M. Ruiz Rejón* (SALA10917!); Sierra de Cazorla, 1500 m, 30SWG0082, 1 April 1984, *A. Sañudo & Fdez. Casas* (MA827717!); Sierra de Cazorla, Fuentes del Guadalquivir, 19 March 1979, *F. Muñoz Garmendia* (MA235130!); Sierra de Cazorla, nacimiento del Guadalquivir, 1400 m, 1 April 1984, *A. Sañudo & Fdez. Casas* (MA827720!); Sierra del Pozo, falda del Pico Cabañas, bordes del arroyo, 1750 m, 30SWG08, 28 March 1978, *Molero Mesa* (MA235128!); Sierra del Pozo, nacimiento del río Guadalquivir, 1380 m, 4 March 1980, *G. López, R. Morales, F. Muñoz Garmendia & E. Valdés* (MA235129!); Villacarrillo, Sierra de Cazorla, Lancha de la Escalera, 1500 m, 30SWH0813, 16 April 1978, *Pajarón* (MA223504!); Villacarrillo, Sierra de Cazorla, Lancha de la escalera, 1500 m, 30SWH0813, 16 April 1978, *Pajarón* (SALA22731!); Villacarrillo, Sierra de las Villas, cerca de Collado del Perenoso, 30SWH0914, 8 July 2008, *A. Benavente* (MA792593!). La Poza, 1500 m, May 1905, *E. Reverchon* (MA148154!). Murcia: Calar de la Santa, arroyo Blanco, 1180 m, 30SWH7322, 22 April 2007, *C. Aedo* (MA768730!); Moratalla, Sierra de Villafuerte, 1200 m, 30SWH72, 2 April 1998, *Sánchez Gómez & Carrillo* (MA624646!); ibidem, 1200 m, 30SWH72, 2 April 1998, *Sánchez Gómez & Carrillo* (MGC48285!).

Narcissus nevadensis subsp. *nevadensis*:—SPAIN. Granada: Baza, Cortijo Narváez, Barranco del Peral, 1450 m, 30SWG1241, 29 March 1996, *F.B. Navarro* (GDAC40578!); Baza, Sierra de Baza, Barranco del Peral, 1450 m, 30SWG1241, 01 April 1995, *F.B. Navarro* (GDAC40577!); Dornajo, 30SVG60, 11 May 1963, *Camacho* (GDA239!); Güéjar Sierra, barranco de los Tejos, 30SVG6006, 25 May 1996, *M. Ruiz* (GDA27981!); Güéjar Sierra, barranco de Soria, 2050 m, 30SVG7416, 25 May 1996, *M. Ruiz* (GDA27982!); Sierra Nevada, barranco del Maitena, 30SVG81, 17 March 1990, *E. García Aguilera & E. García Vargas* (GDA31949!); Sierra Nevada, Barranco río Monachil, 1450 m, 30SVG6006, 07 April 1999, *M.J. Martínez-Lirola* (GDAC43597!); Sierra Nevada, Barranco Tejos, 30SVG7416, April 1995, *M. Ruiz & R. Sánchez* (GDAC44080!); Sierra Nevada, base del Trevenque, 30SVG50, 28 March 1987, *G. Blanca* (GDAC43872!); Sierra Nevada, Dornajo, 30SVG60, 11 May 1963, *Muñoz Medina* (GDAC34278!); Sierra Nevada, Güéjar Sierra, Vacares, orientación sur, 30SVG7204, 15 May 1994, 2250 m, *García Aguilera & Travesí Ibáñez* (GDA26525!); Sierra Nevada, Río Dúrcal, orientación W, 1700 m, 30SVG50, 18 April 1989, *R. Travesí Ibáñez* (GDA31948!); Sierra Nevada, barranco Soria, 2050 m, 30SWG6316, 1 May 2010, *C. Aedo* (MA805736!); Sierra Nevada, juncuales sobre sustrato calizo, 1400 m, 30SVG5905, *A. Sañudo & Fdez. Casas* (MA827769!).